

THE NEW RACE: SPEEDING UP CLIMATE CHANGE INNOVATION

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The threat posed by climate change has finally been recognized, and governments have begun taking actions to reduce greenhouse gas emissions to attempt to mitigate the potential damage. While government regulations may require reductions in greenhouse gas emissions, insufficient technology exists to achieve the necessary reductions without severe economic consequences. Encouragement of the development and dissemination of technologies related to emissions reductions will be a crucial aspect of any climate change policy. Current intellectual property law, however, does not provide sufficient encouragement for this necessary innovation. Thus, as others have proposed, modification of existing intellectual property systems is a way to further encourage innovation. The creation of a green technology program for protecting environmental technologies that includes relaxation of the non-obvious patentability requirement in conjunction with a shorter period of protection may be part of a solution. This should be combined with a compulsory licensing program that values technologies by their environmental potential. Current databases which are maintained by the EPA should be expanded to increase awareness of technologies, and the expertise of both the EPA and the USPTO should be utilized in determining whether environmental inventions should receive protection under the program.

I. INTRODUCTION

In relation to climate change issues, time is of the essence. The predicted effects of climate change have already started to occur.²

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The United States needs to encourage the creation and disclosure of climate change innovation to mitigate potentially catastrophic effects. Current U.S. intellectual property instruments and existing and proposed research and development funding are not enough to speed up innovation to the extent necessary to prevent disaster. New intellectual property policies should be promulgated to encourage the creation and disclosure of innovation.

This article will initially summarize the current climate change regulatory environment and the need for innovation. It will then discuss why current intellectual property policies fail to encourage innovation to the extent needed. Finally, this article will examine various proposals for improving our intellectual property system in the area of climate change and recommend initial steps the U.S. could take to encourage the development and disclosure of climate change innovations by balancing economic incentives for innovation with the need to quickly reduce greenhouse gas emissions.

Climate change is expected to impact the U.S. in several ways: heat waves are expected to increase in “magnitude, frequency, and duration”; air quality is expected to decline as regional ozone levels and particulate matter concentrations increase; severe weather events, such as hurricanes, are expected to increase and strengthen; and instances of vector-borne diseases are projected to change and increase.³ Unfortunately, irreversible impacts on temperature and rainfall have already occurred so even with immediate mitigation measures it will be impossible to avoid all adverse impacts.⁴

As respected scientists have long recognized, the causal relationship between the rise in global temperature and the increase

² See Susan Solomon et al., *Irreversible Climate Change Due to Carbon Dioxide Emissions*, 106 PROC. NAT’L ACAD. SCI. 1704, 1704 (2009); Marcus Hoy, *International Group of Scientists Says ‘Worst Case’ Climate Scenarios Occurring*, 40 ENV’T. REP. 616, 616 (2009).

³ Regulating Greenhouse Gas Emissions Under the Clean Air Act, 73 Fed. Reg. 44,354 (proposed July 30, 2008) (to be codified at 40 C.F.R. § 1) (stating expected changes).

⁴ See Solomon et al., *supra* note 2, at 1709.

in greenhouse gases has been thoroughly established.⁵ This relationship was debated in non-scientific arenas for many years despite overwhelming evidence supporting the fact of climate change.⁶ The debate has recently shifted.⁷ Political and industrial groups acknowledge that climate change is occurring,⁸ and they are working with governments at all levels to develop mitigation measures.⁹ In the U.S., regional, state, and local governments and coalitions have already implemented reduction measures such as emissions caps and alternative energy mandates to address climate

⁵ See, e.g., James Hansen, et al., *Target CO₂: Where Should Humanity Aim?*, 2 OPEN ATMOSPHERIC SCI. J. 217 (2008); *Massachusetts v. EPA*, 549 U.S. 497, 504 (2007) (calling the rise in global temperatures “well-documented” and discussing how scientists see the trend in global temperatures and greenhouse gas concentration as interrelated). The EPA recently confirmed this relationship. See Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 18,886 (proposed April 24, 2009) (stating that “[t]hese high atmospheric levels are the unambiguous result of human emissions”).

⁶ See *Debating Climate Change*, PUBLIC BROADCAST STATION, <http://www.pbs.org/now/science/climatedebate.html> (last visited Oct. 13, 2009) (detailing some of the past climate change debates).

⁷ See Jeffrey Ball, *Exxon Mobil Softens Its Climate Change Stance*, PITTSBURGH POST-GAZETTE, Jan. 11, 2007, available at <http://www.post-gazette.com/pg/07011/753072-28.stm> (discussing how companies like Exxon Mobil have made efforts to cut ties with skeptics of global warming as part of a growing trend).

⁸ International and domestic governments and, more recently, industry groups have acknowledged this and have begun focusing on potential solutions for climate change. See *EEI Board Embraces Climate Legislation*, ENVTL. LEADER, Jan. 16, 2009, <http://www.environmentalleader.com/2009/01/16/eei-board-embraces-climate-legislation> (describing potential solutions suggested by Edison Electric Institute, an organization whose members provide around seventy percent of U.S. electricity needs).

⁹ See, e.g., WESTERN CLIMATE INITIATIVE, BACKGROUND DOCUMENT AND PROGRESS REPORT FOR ESSENTIAL REQUIREMENTS OF MANDATORY REPORTING (Jan. 6, 2009), <http://www.westernclimateinitiative.org/component/remository/func-startdown/118/> (describing cap and trade programs in western states and their reporting requirements); see also *infra* Part II.C (describing other international and domestic programs currently in place).

change.¹⁰ Although Congress has not yet passed a comprehensive approach, a federal scheme appears to be on the near horizon.¹¹

Noticeably absent from these measures and proposals, however, are specific methods for achieving these reductions.¹² Greenhouse gas emissions are directly related to energy consumption,¹³ which, along with population growth, is currently rising.¹⁴ Not surprisingly, the significant reductions that have been

¹⁰ See PEW Center for Climate Change, State Legislation from Around the Country, http://www.pewclimate.org/what_s_being_done/in_the_states/state_legislation.cfm (last visited October 11, 2009). In addition to the regional programs, a number of states have enacted climate-change related legislation and programs for mitigating emissions. *Id.* See also Leora Falk, *Regional Emission Trading Programs Unlikely if Federal Program Exists*, *WRI Fellow Says*, 39 ENV'T. REP. 2304 (2008).

¹¹ Several recent bills in Congress have proposed federal climate change legislation, and the majority of these bills have relied primarily on using cap and trade methodology to regulate and eventually reduce greenhouse emissions. See, e.g., Lieberman-Warner Climate Security Act of 2008, S. 3036, 110th Cong. § 2 (2008) (proposing cap 71% below 2005 level in 2050); Safe Climate Act of 2007, H.R. 1590, 110th Cong. (2007) (proposing a 5% per year reduction from 2030–2050 and 80% below 1990 in 2050). While these bills are being debated in Congress, the EPA is taking steps to evaluate its role in climate change policy. See U.S. EPA OFF. INSPECTOR GEN., REPORT NO. 09-P-0089, EPA NEEDS A COMPREHENSIVE RESEARCH PLAN AND POLICIES TO FULFILL ITS EMERGING CLIMATE CHANGE ROLE (Feb. 2, 2009).

¹² See, e.g., Lieberman-Warner Climate Security Act of 2008, § 2 (proposing reductions but not defining how those reductions will occur). Although many of these caps do target certain industries, they do not define how reductions should be achieved. *Id.* Similarly, the IPCC only gives general ideas of how to achieve reductions and admits that research and development of new technologies will be required to achieve “stabilization targets.” INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, FOURTH ASSESSMENT REPORT: MITIGATION OF CLIMATE CHANGE 18 (2007), <http://www.ipcc.ch/ipccreports/ar4-wg3.htm>.

¹³ See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 12, at 27–28 (discussing relationship between fuel use and greenhouse gas production). Once society transitions to renewable energy that does not use fossil fuels, this correlation will not be as linear as it is now. See *id.* at 43–46 (discussing impacts of transition to renewable energy on greenhouse gas emission levels).

¹⁴ U.S. Census Bureau, Annual Population Estimates 2000 to 2008, <http://www.census.gov/popest/states/NST-ann-est.html> (last visited Mar. 18, 2009) (showing population trends).

mandated will be difficult to attain.¹⁵ Disturbingly, even the proposed emissions reductions, while significant, are unlikely to be enough. Some scientists are now calling for even greater greenhouse gas reductions than those which have already been proposed to limit the potentially catastrophic effects of climate change.¹⁶ To achieve the emission reductions contemplated by scientists and legislation, new ideas and innovations in all sectors of the economy are necessary, and there is no time to delay.¹⁷ Greenhouse gas levels may have already surpassed a tipping point, causing irreversible effects.¹⁸ Consequently, innovative and creative concepts will need to be explored and utilized quickly and efficiently.¹⁹

The massive scope of the climate change problem makes it different from other critical issues the U.S. has faced in the past. Previous challenges with solutions rooted in technological advancement were more limited in scope.²⁰ For instance, issues related to meeting electronic needs through technological development have previously been successfully addressed by

¹⁵ This has already been demonstrated by the European Union's cap and trade program, where some countries have had difficulty meeting the specified targets. See European Environmental Agency, EU-15 On Target for Kyoto Despite Mixed Performances, <http://www.eea.europa.eu/pressroom/newsreleases/eu-15-on-target-for-kyoto-despite-mixed-performances> (last visited Oct. 16, 2009); see also *infra* Part II.A (discussing the EU's cap and trade program).

¹⁶ See Hansen, et al., *supra* note 5, at 18.

¹⁷ See *infra* Part II.B (discussing need for innovation). The World Business Council for Sustainable Development lists fifty-eight different patent categories as areas where innovation may be relevant to climate change. See Eco-Patent Commons Classification List, <http://www.wbcsd.org/web/projects/ecopatent/IPC-codes-March2009.pdf> (last visited Oct. 20, 2009) (including categories for solar energy, transmission lines, new fuels and fusion reactors).

¹⁸ See Solomon, et al., *supra* note 2; Hoy, *supra* note 2.

¹⁹ See Hansen, et al., *supra* note 5, at 217 (discussing the urgent need to reduce greenhouse gas emissions); see also INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 12 (calling for mitigation measures between now and 2030).

²⁰ See, e.g., PEW CENTER FOR GLOBAL CLIMATE CHANGE, U.S. TECHNOLOGY AND INNOVATION POLICIES, LESSONS FOR CLIMATE CHANGE 36–39 (Nov. 2003), [http://www.pewclimate.org/docUploads/US%20Technology%20&%20Innovation%20Policies%20\(pdf\).pdf](http://www.pewclimate.org/docUploads/US%20Technology%20&%20Innovation%20Policies%20(pdf).pdf) [hereinafter PEW CENTER LESSONS] (discussing innovation techniques related to the electronic industry).

impacting only one sector of the economy, but addressing climate change will require actions that impact the entire economy.²¹ Similarly, while defense-related technologies have been successfully encouraged through domestic policy, addressing climate change will require action on a global scale.²² The large scope of the problem and the disastrous effects of inaction make encouraging the development of technologies related to climate change distinct and urgent.

Historically, the main approaches used to encourage innovation have included providing funding for research and development and targeting intellectual property policies.²³ To date, direct government funding of research and development has been the primary method to promote critical climate change innovation.²⁴ Not surprisingly, funding research and development is the main incentive for technological development included in the legislative proposals related to climate change.²⁵ This method has been successful in the past²⁶ and should be part of U.S. climate change

²¹ Compare *id.* at 36–39 with *id.* at 2–5 (discussing the development of digital electronics technologies as compared with the needs of climate change).

²² See Gaetan Verhoosel, *Beyond the Unsustainable Rhetoric of Sustainable Development: Transferring Environmentally Sound Technologies*, 11 GEO. INT'L ENVTL. L. REV. 49, 53 (1998) (discussing how global action will be necessary to address environmental issues); see also *infra* Parts I.C and III.A (discussing the need for the U.S. to encourage climate change related innovation and discussing types of encouragement used for past issues for defense and medical related purposes).

²³ See *infra* Part III (discussing past U.S. policies for encouraging innovation).

²⁴ See U.S. EPA, Climate Change Technology Program, <http://www.epa.gov/climatechange/policy/cctp.html> (last visited Nov. 1, 2009); see also PEW CENTER LESSONS, *supra* note 20, at 2–5, 16 (discussing need for policies other than research and development).

²⁵ See, e.g., Low Carbon Economy Act of 2007, S. 1766, 110th Cong. § 1 (2007) (proposing funding for research and development); Climate Stewardship and Innovation Act of 2007, S. 280, 110th Cong. § 1 (2007) (proposing funding for research and development).

²⁶ For example, the Defense Advanced Research Projects Agency has successfully produced several innovations related to computers and information technologies. See Defense Advanced Research Projects Agency, Learn About DARPA, <http://www.darpa.mil/#learn> (last visited Oct. 28, 2009); see also PEW CENTER LESSONS, *supra* note 20, at 17.

policy. However, contrary to some suggestions,²⁷ government funding of research and development, by itself, will not provide sufficient encouragement to produce all the climate change innovations that are needed.²⁸

This issue is not resolved by current intellectual property policies, which, in certain circumstances, actually inhibit innovations being brought to the market.²⁹ Further contributing to the problem, regulatory schemes such as cap and trade programs have been shown to discourage development and disclosure of innovation.³⁰ Therefore, U.S. policymakers need to take a fresh look at our intellectual property policies and determine whether those policies adequately encourage climate change innovation.³¹ This evaluation supports making changes to the current intellectual property regime to provide motivation for the creation and disclosure of innovative ideas and products related to climate change prevention.³²

²⁷ Many of the congressional bills propose government funded research and development as the sole means of encouraging innovation. See PEW CENTER FOR GLOBAL CLIMATE CHANGE, LEGISLATION IN THE 110TH CONGRESS RELATED TO GLOBAL CLIMATE CHANGE, http://www.pewclimate.org/what_s_being_done/in_the_congress/110thcongress.cfm [hereinafter PEW CENTER LEGISLATION]. Most bills do not propose any changes to intellectual property policy to encourage climate change. See *id.*

²⁸ See PEW CENTER LESSONS, *supra* note 20, at 16 (opining that “R&D investment alone is not sufficient to bring about innovation.”).

²⁹ For example, the patent process can, and often does, take years to navigate, delaying the time when inventions may be available to the public. See *infra* Part III.A (discussing the time constraints of patent law). Trade secret law may also discourage disclosure where a company has no means under current law to be compensated for the disclosure of a trade secret. See *infra* Part III.A (discussing trade secrets).

³⁰ For example, a cap and trade system can discourage companies from disclosing information related to an invention to retain a competitive advantage on the market. See *infra* Part II.A (discussing disadvantages of cap and trade systems).

³¹ See Estelle Derclaye, *Intellectual Property Rights and Global Warming*, 12 MARQ. INTELL. PROP. L. REV. 263, 266–69 (2008) (discussing importance of providing intellectual property protection to provide incentives for new technology).

³² See *infra* Part III (discussing why current intellectual property instruments do not effectively encourage climate change innovation).

II. THE RACE CONDITIONS: CLIMATE CHANGE POLICY AND THE NEED FOR INNOVATION

In an effort to reduce greenhouse gas emissions, governments have enacted or proposed various regulations. Crucially, however, the limitations on available technology may make it difficult for such regulations to have the desired effect.

A. *The Regulatory Environment*

Scientists agree that significant widespread reductions of greenhouse gas emissions are necessary to reduce the potentially devastating effects of climate change.³³ However, U.S. leaders are still debating how the government should respond to the climate change problem. Both Congress and the EPA are examining various federal regulatory mechanisms to limit emissions, including emissions cap and trade systems and carbon taxation.³⁴

Cap and trade systems to reduce greenhouse gases have already been promulgated by international groups, states, and local coalitions.³⁵ For instance, the largest climate change trading system currently in use is in the European Union (“EU”).³⁶ It covers more than 10,000 facilities and around half of the EU’s carbon dioxide emissions.³⁷ While it has had some level of success, the EU’s cap and trade system has encountered problems with enforcement and achieving desired target levels.³⁸

³³ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 12, at 15 (stating that “[i]n order to stabilize the concentration of GHGs in the atmosphere, emissions would need to peak and decline thereafter”).

³⁴ *See, e.g.*, Regulating Greenhouse Gas Emissions Under the Clean Air Act, 73 Fed. Reg. 44,354 (proposed July 30, 2008); Safe Climate Act of 2007, H.R. 1590, 110th Cong. (2007). Congress has made progress towards passage of one climate change related bill. *See* American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (2009) (passed in House of Representatives in June 2009). The Senate will examine this bill in Fall 2009.

³⁵ *See, e.g.*, European Union Emission Trading System, http://ec.europa.eu/environment/climat/emission/index_en.htm (last visited October 11, 2009).

³⁶ *See id.*

³⁷ *Id.*

³⁸ The U.S. government has suggested lessons that can be learned from these problems. *See* U.S. GAO, GAO-09-151, INTERNATIONAL CLIMATE CHANGE PROGRAMS: LESSONS LEARNED FROM THE EUROPEAN UNION’S EMISSIONS

The cap and trade systems currently in use vary in scope. Some cover only large sources such as power plants, while others also include smaller sources; some focus exclusively on carbon dioxide emissions, while others include all greenhouse gases.³⁹ Congressional proposals are similar to the emissions caps already in effect in other countries. For instance, the American Clean Energy and Security Act of 2009, which passed the House of Representatives in June 2009, set forth different caps, allocation methods, and coverage.⁴⁰ If enacted, it would cap greenhouse gas emissions to 97% of 2007 levels by 2012, 83% by 2020, 58% by 2030, and 17% by 2050.⁴¹

The U.S. has some history of using cap and trade programs under the Clean Air Act's Acid Rain Program.⁴² This program, like the climate change legislative proposals, was promulgated to reduce air emissions.⁴³ To accomplish this, the Acid Rain Program capped allowable emissions and required facilities to operate

TRADING SCHEME AND THE KYOTO PROTOCOL'S CLEAN DEVELOPMENT MECHANISM (Nov. 2008), *available at* <http://www.gao.gov/new.items/d09151.pdf> (discussing uncertain results of the EU program and lessons that may be learned from the program).

³⁹ See European Union Emission Trading System, http://ec.europa.eu/environment/climat/emission/index_en.htm (last visited October 11, 2009) (describing the program's focus on carbon dioxide emissions and certain sources).

⁴⁰ See H.R. 2454, 111th Cong. (2009). In December 2008, ten different economy-wide cap and trade proposals were before the 110th Congress. See Pew Center for Global Climate Change, Economy-Wide Cap & Trade Proposals in the 110th Congress, <http://www.pewclimate.org/federal/analysis/congress/110/cap-trade-bills>.

⁴¹ See *id.* The Edison Electric Institute, an association of investor-owned electric companies, recently endorsed an eighty percent reduction in greenhouse gas emissions by 2050. See Edison Electric Institute, Global Climate Change Points of Agreement, http://www.eei.org/ourissues/TheEnvironment/Climate/Documents/EEI_Climate_Points_of_Agreement.pdf (last visited Oct. 11, 2009).

⁴² See 42 U.S.C. § 7651 (2006).

⁴³ Compare, Safe Climate Act of 2007, H.R. 1590, 110th Cong. (2007) with 42 U.S.C. § 7651 (2006); see also *North Carolina v. EPA*, 531 F.3d 896, 902 (D.C. Cir. 2008) (per curiam) (describing that the purpose of the Acid Rain Program is “to reduce acid rain deposition nationwide” and that “in doing so [the Program] creates a cap-and-trade program for sulfur dioxide . . . emitted by fossil fuel-fired combustion devices”).

within their allowances, reduce emissions to balance with allowances, or buy allowances from another facility.⁴⁴ An allowance authorized a utility or industrial source to emit one ton of emissions (SO₂ in the case of the Acid Rain Program) during a given year or any year thereafter.⁴⁵ At the end of each year, the source was required to hold allowances at least equal to its annual emissions so that a source that emits 1,000 tons of SO₂ must hold and use 1,000 allowances.⁴⁶ Thus, this SO₂ cap and trade system, like the proposed climate change trading schemes, imposes specific emissions limitations and does not encourage reductions below those specified levels.

Another regulatory mechanism being discussed is carbon taxation.⁴⁷ Carbon taxation would directly tax each ton of carbon from certain sources.⁴⁸ Carbon taxation has many advantages over cap and trade programs, including encouraging emission reductions below levels specified by an emissions cap and creating less opportunity for hot spots over disadvantaged neighborhoods.⁴⁹ In addition to concentrating other pollutants, hot spots can cause localized impacts in vulnerable communities because climate change is also predicted to increase local smog, which deteriorates air quality.⁵⁰ Furthermore, cap and trade systems have involved significant problems with monitoring and enforcement.⁵¹

⁴⁴ See § 7651b(a).

⁴⁵ See § 7651b(f).

⁴⁶ See § 7651b(g).

⁴⁷ See, e.g., H.R. 2454, 111th Cong. (2009) (legislation proposing a carbon tax).

⁴⁸ See, e.g., America's Energy Security Trust Fund Act of 2007, H.R. 3416, 110th Cong. (2007) (proposing to impose a fifteen dollar per ton tax on certain carbon substances).

⁴⁹ See Lynn Garner, *Making Solar, Wind Tax Credits Refundable Key to Meeting Obama's Goal, Industry Says*, 40 ENV'T. REP. 123 (2009) (discussing the efficiency of carbon taxes); Mark Z. Jacobson, *On the Causal Link Between Carbon Dioxide and Air Pollution Mortality*, 35 GEOPHYSICAL RESEARCH LETTERS L03809 (2008) (discussing localized effects).

⁵⁰ See Jacobson, *supra* note 49.

⁵¹ See Letter from Laurie Williams & Allan Zabel, to Congress, Re: Climate Change Legislation (May 4, 2008), available at http://www.ejmmatters.org/docs/open_letter_from_epa_lawyers%5B1%5D.pdf (citing difficulties with under-reporting in Europe). This is illustrated by other cap and trade systems

Enforcing a complex cap and trade system is both time intensive and difficult since companies have a motivation to underreport their emissions.⁵²

Despite the advantages of a carbon tax as compared to an emissions trading system, Congress will likely enact an emissions trading system for political reasons.⁵³ While cap and trade legislation is supported by some industry leaders who have argued that it gives them essential flexibility, many industry leaders still oppose any legislation at all.⁵⁴ However, even if the current legislation does not pass, the EPA has the ability to make changes to the regulation of greenhouse gases under the Clean Air Act.⁵⁵ In the interim, it appears that the EPA does intend to start regulating greenhouse gas emissions from mobile sources.⁵⁶

such as the RECLAIM program in Los Angeles and the EU's cap and trade programs. See Lesley K. McAllister, *Beyond Playing "Banker": The Role of the Regulatory Agency in Emissions Trading*, 59 ADMIN. L. REV. 269, 272–73 (2007) (stating that RECLAIM, a cap-and-trade program for SO₂ and NO_x emissions in Southern California, which began in 1994, had considerable enforcement and compliance difficulties).

⁵² See Letter from Laurie Williams & Allan Zabel, to Congress, Re: Climate Change Legislation (May 4, 2008), available at http://www.ejmatters.org/docs/open_letter_from_epa_lawyers%5B1%5D.pdf.

⁵³ The main opposition against a carbon tax approach appears to be political. See Garner, *supra* note 49 (stating that “[w]hile many economists agree . . . that a carbon tax is the most efficient, direct vehicle for reducing carbon emissions and promoting a market for clean energy, lawmakers consider such a tax to be a political nonstarter on Capitol Hill”). Observers believe that the cap and trade legislation before Congress may not pass in 2009. Dean Scott, *Bill May Clear Congressional Committees, But Will Likely Fall Short of Passage in 2009*, 40 ENV'T. REP. 9 (2009).

⁵⁴ See Andrew S. Ross, *Chevron Backs Oil Groups 'Energy Citizen,'* S.F. GATE, August 20, 2009, <http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2009/08/19/BUMS19AKJ9.DTL>.

⁵⁵ Steven D. Cook, *Obama Administration Expected to Face Immediate Decisions on Greenhouse Gases*, 40 ENV'T. REP. 11 (2009).

⁵⁶ The EPA recently proposed greenhouse gas emission standards for vehicles. See Proposed Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, 74 Fed. Reg. 49,454 (proposed Sept. 28, 2009) (to be codified at 40 C.F.R. § 86,600). Title II of the Clean Air Act coverage includes motor vehicles, which are defined as “any self-propelled vehicle designed for transporting persons or property on a street or highway.” 42 U.S.C. § 7550(2) (2006).

In conjunction with mandatory emissions caps, many proposed bills allocate money for research and development and technology incentives to encourage innovation.⁵⁷ However, no bill currently proposes altering intellectual property laws to provide an incentive for climate change technology.⁵⁸

B. *The Need to Speed-Up Climate Change Related Innovation*

Regardless of the methods used to regulate greenhouse gas emissions, significant reductions are critical to prevent further warming and irreversible destabilization of the climate system.⁵⁹ The proposed reductions and those already implemented cannot be readily achieved with current technology.⁶⁰ Although research and development efforts are ongoing and exciting new discoveries have been made,⁶¹ the technology to reduce greenhouse gas emissions to the extent necessary does not yet exist.⁶² As one economist

⁵⁷ See PEW CENTER LEGISLATION, *supra* note 27.

⁵⁸ *Id.* Some bills require intellectual property policies to be studied. For example, Senate Bill 280, The Climate Stewardship and Innovation Act of 2007, provided that the “Director of the Patent and Trademark Office, in consultation with representatives of interested parties in the private sector, shall conduct a study to determine the extent to which changes to the U.S. patent system are necessary to increase the flow of climate change-related technologies.” S.280, 110th Cong., at Sec. 318 (2008).

⁵⁹ See, e.g., The University of New South Wales Climate Change Research Centre, 2007 Bali Climate Declaration By Scientists, <http://www.climate.unsw.edu.au/bali> (last visited Oct. 11, 2009) (discussing consensus regarding the need for action and the potential consequences of inaction).

⁶⁰ See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 12, at 17–18 (stating that the lower the desired emission level, the greater the need for new technology which requires “that barriers to development, acquisition, deployment and diffusion technologies are effectively addressed”).

⁶¹ For example, a California group, Innovalight, has discovered an innovative way to make solar panels more efficient, and a group at Berkley has found a method for transforming yeast into pure hydrocarbon fuels that can be used in current automobiles. See Fred Krupp, *Climate Change Opportunity*, WALL ST. J., April 8, 2008, at A20. Other examples of corporate innovation include a method for using power plant emissions to grow algae, which can in turn be burned for energy, and a method of using an enzyme that removes carbon dioxide in the human bloodstream in a filter for smokestacks. *Id.*

⁶² See PEW CENTER LESSONS, *supra* note 20, at 5 (“Many of the technologies needed do not yet exist commercially or are too costly”); see also Janice Valverde, *Chu Says ‘Transformational Technologies’ Vital for Transition to*

summarized, “our current technologies cannot support both a decline in carbon dioxide emissions and an expanding global economy. If we try to restrain emissions without a fundamentally new set of technologies, we will end up stifling economic growth, including the development prospects for billions of people.”⁶³ Many others, including leaders from the UN, agree that innovation is necessary.⁶⁴ In fact, this need for innovative technology may be vastly underestimated.⁶⁵

While there is agreement that technological innovation is necessary, the question remains: “to what degree should policy focus directly on motivating such innovation?”⁶⁶ Some experts think our focus should be on further developing and utilizing technologies that we currently have, rather than developing new ones.⁶⁷ Regardless of whether the focus is on further developing existing technologies or inventing new ones, the reality is that climate change innovation is needed.

Merely mandating emissions reductions through an emissions cap or carbon tax are not enough to induce this necessary innovation for several reasons. Initially, reliance on market mechanisms is not likely to incentivize the investment in research and development to foster the necessary new ideas. For innovation to become most valuable in the marketplace, it generally must go

Clean-Energy Economy, 40 ENV'T. REP. 621 (2009) (discussing calls for the need for new technology).

⁶³ Jeffrey D. Sachs, *Keys to Climate Protection*, 298 SCI. AM. 40 (2008).

⁶⁴ See, e.g., Carolyn Whetzel, *Economic Stimulus Packages Should Promote Low-Carbon Infrastructure*, U.N. Official Says, 39 ENV'T. REP. 2307 (2008) (discussing the statement of the Deputy Executive Secretary of the United Nations Framework Convention on Climate Change, who said that providing carbon markets alone will not be sufficient and called for governments to provide “seed money to spur development of energy efficient technologies”).

⁶⁵ See Roger Pielke Jr., Tom Wigley & Christopher Green, *Dangerous Assumptions*, 452 NATURE 531, 531–32 (2008).

⁶⁶ *Id.*

⁶⁷ See Massachusetts Institute of Technology, *Energy: Facing Global Warming*, TECH. REV., <http://www.technologyreview.com/special/oil/index.aspx> (last visited Oct. 24, 2009) (discussing examples of technologies that already exist but are underutilized).

through an intensive iterative process.⁶⁸ Competing ideas are also being continually refined.⁶⁹ This process takes time, during which profits are not being realized.⁷⁰ Furthermore, some inventions never yield any economic benefit in this potentially long and expensive process.⁷¹ Long-term investment is not encouraged in an emissions trading program because companies focus on the least-cost reduction method instead of finding new ways to reduce emissions.⁷²

Experience with cap and trade programs has shown that they do not encourage innovation.⁷³ Although the EPA has stated that the SO₂ cap and trade system provided innovation incentives,⁷⁴ the evidence of the program's results suggests otherwise.⁷⁵ The Acid

⁶⁸ The Pew Center for Climate Change has broken down this process into the following steps: "invention, development, adoption, learning, and diffusion of technology into the marketplace." PEW CENTER LESSONS, *supra* note 20, at iv.

⁶⁹ For example, solar and wind power technologies are constantly being improved to be more efficient and cost effective. *See id.* at 13.

⁷⁰ *See id.* at iv (stating that "gains from new technologies are realized only with widespread adoption, a process that takes considerable time and typically depends on a lengthy sequence of incremental improvements that enhance performance and reduce costs"). As an example, gas turbines were not marketable for decades after they were developed. *Id.*

⁷¹ *See* RICHARD G. NEWELL & NATHAN E. WILSON, RESOURCES FOR THE FUTURE, TECHNOLOGY PRIZES FOR CLIMATE CHANGE MITIGATION 2 (2005), <http://www.rff.org/documents/RFF-DP-05-33.pdf>.

⁷² *See* JOHN CARLIN, DEPARTMENT OF ENERGY, ENVIRONMENTAL EXTERNALITIES IN ELECTRIC POWER MARKETS: ACID RAIN, URBAN OZONE, AND CLIMATE CHANGE, http://www.eia.doe.gov/cneaf/pubs_html/rea/feature1.html (last visited Oct. 5, 2009) (describing how utilities consider costs of controls in the short term, not long term externalities, when decided pollution control methods)

⁷³ *See* Allen Bellas & Ian Lange, *Impacts of Market-Based Environmental and Generation Policy on Scrubber Electricity Usage*, 29 ENERGY J. 151, 160 (2008) (determining that the Clean Air Act's cap and trade policy had little impact on efficiency improvements made to SO₂ scrubbers).

⁷⁴ *See* U.S. EPA, Cap and Trade, <http://www.epa.gov/captrade/lessons.html> (last visited Oct. 5, 2009). The EPA also states that the cap and trade system creates more efficient use of government resources, more benefits at less cost, strict emissions limits that yield dramatic reductions, high levels of compliance, transparency and accountability, regulatory certainty, and flexibility. *See id.*

⁷⁵ *See* Bellas & Lange, *supra* note 73, at 160 (suggesting deregulation of the utility industry led to innovations in pollution control). Economists have

Rain Program's cap and trade system demonstrated that companies will find the most economical way to comply with a cap and trade program.⁷⁶ This did not directly translate into environmental benefits and innovative ideas. For example, under the Acid Rain Program, many companies resorted to the cheaper choice of switching to low sulfur coal instead of constructing scrubbers, which would have reduced the SO₂ emissions by over ninety percent.⁷⁷ Notably, the technology used to reduce SO₂ emissions also has not advanced in any significant way due to the cap and trade program.⁷⁸

Moreover, emissions trading and carbon taxation can create economic incentives contrary to reducing emissions in industries as a whole. This is especially true for efficiency innovations which are more important now than ever.⁷⁹ Companies that discover and

suggested that other types of regulatory programs may reduce compliance costs more than a cap and trade program. *See, e.g.,* Dallas Burtraw et al., *Sulfur Dioxide Control by Electric Utilities: What Are the Gains from Trade?*, 108 J. POL. ECON. 1292, 1293 (2000) (predicting that the "cost savings [for electric utilities] would be twice as great if the alternative to trading were forced scrubbing" rather than a cap and trade scheme).

⁷⁶ *See* Burtraw et al., *supra* note 75. Since scrubbing is one of the more expensive ways to reduce emissions, companies ended up buying different fuel as a way to reduce emissions. *Id.*

⁷⁷ *See* COMPETITIVE ENTERPRISE INSTITUTE, MARKET-BASED CHIMERA: EMISSIONS TRADING FAILS TO DELIVER (July 6, 1999), <http://cei.org/gencon/004,01639.cfm>; *see also* EPA Scrubbing Cost Information, <http://www.epa.gov/ttn/catc/dir1/ffdg.pdf> (last visited Oct. 5, 2009) (estimating that the cost of scrubbing a ton of pollution ranges between \$150 and \$300 for a dry scrubber installed on a unit that is over 200 MW).

⁷⁸ Companies still rely on scrubbers as their main method of control. RAVI K. SRIVASTAVA, U.S. EPA, CONTROLLING SO₂ EMISSIONS: A REVIEW OF TECHNOLOGY (2000), http://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=18978 (describing types of control equipment used for stationary sources). Scrubbers have been used by companies for decades. *See* Bellas & Lange, *supra* note 73, at 151 (describing how invention of scrubbers coincided with the passage of the Clean Air Act in 1970). Although the efficiency of these devices has modestly improved, no new inventions have been developed that can control SO₂ as well as a scrubber. *See id.* at 160 (describing the improvements made to SO₂ control technology).

⁷⁹ *See* Valverde, *supra* note 62. Efficiency improvements are considered one of the main methods for reducing emissions. *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 12, at 10, Table SPM.3.

implement ways to improve efficiency will gain a competitive advantage over less efficient companies that need more carbon credits or are paying a larger carbon tax.⁸⁰ In addition, the companies creating the efficiency innovations may not find the lengthy and expensive patent process worthwhile or fruitful.⁸¹ If companies do not go through the patent process, these efficiency innovations will likely be kept secret.⁸² Thus, emission caps and carbon taxes could discourage widespread disclosure of innovations and inhibit greater emissions reductions and opportunities to spur new innovation. Additional measures beyond the regulatory mandates must be taken to encourage climate change related innovation. Funding research and development, which has been included in legislative and executive proposals, is one necessary element of encouraging innovation. However, policy changes in intellectual property are also necessary to encourage both innovation and disclosure.⁸³ The combination of an intellectual property policy with an environmental policy is necessary to effectively encourage the development and distribution of climate change technology.⁸⁴

C. *Current Attempts to Speed-Up Climate Change Innovation*

Domestically, there is no comprehensive plan in place for encouraging climate change innovation and disclosure.⁸⁵

⁸⁰ This assumes that the companies are subject to climate-change mandates, which, as is demonstrated by the limited scope of some of the climate change legislation, may not be true for some types of industries. *See, e.g.*, American Clean Energy and Security Act of 2009 (describing how emission caps only cover regulated sources, which are sources from specific industries that emit over a certain threshold).

⁸¹ *See infra* Part III.B (describing problems with the patent process common with environmental inventions).

⁸² *See infra* Part III.A (describing why many efficiency gains are protected as trade secrets).

⁸³ Policies that mandate the necessary emissions reductions are also a critical element of an effective climate change policy.

⁸⁴ *See, e.g.*, PEW CENTER LESSONS, *supra* note 20, at v (stating that “[t]he technological response to climate change will depend critically on environmental and energy policies as well as technology policies”).

⁸⁵ A comprehensive legislative scheme still has not been passed, although the federal government has started funding climate change related technology

Nevertheless, the need for innovation has been recognized and money has been put aside for research and development.⁸⁶ Notably, on April 27, 2009, the Obama administration released a plan to increase the commitment to research and development through increased funding and increased focus on encouraging innovation through education.⁸⁷ These steps are moving in the right direction. Absent from these discussions, however, is a modification of current intellectual property policies to encourage both the creation of new technologies and their disclosure.⁸⁸

In contrast, on the international scene, the EU has made encouraging eco-technologies a “cornerstone” of its climate change strategy.⁸⁹ Initially, the EU funded research and development for a wide range of projects related to climate change mitigation.⁹⁰ Similarly, the European Commission funds

projects. *See, e.g.*, Grant Opportunities for Carbon Capture Technologies, <http://www07.grants.gov/search/search.do?oppId=47854&flag2006=false&mode=VIEW> (last visited Oct. 5, 2009). Efforts to date have been mostly limited to providing funding for research and development at both state and federal levels. *See, e.g.*, California Senate Bill, S.B. 128 (Cal. 2009) (seeking to create a climate change institute to research and develop technologies that reduce and mitigate greenhouse gas emissions).

⁸⁶ *See, e.g.*, Steven D. Cook, *USDA Loans Carbon Cooperative \$300 Million for Carbon Dioxide Capture, Storage Project*, 40 ENV'T REP. 169 (2009) (discussing how the USDA recently loaned money to a power cooperative to develop a carbon dioxide capture storage project).

⁸⁷ *See* Press Release, White House, Office of the Press Secretary, Fact Sheet: A Historic Commitment to Research and Education (April 27, 2009), *available at* http://www.whitehouse.gov/the_press_office/Fact-Sheet-A-Historic-Commitment-To-Research-And-Education/. This measure is proposed to fund projects including geothermal demonstration projects, geothermal research and development, and solar development and deployment. *Id.*

⁸⁸ Similarly, the Intergovernmental Panel on Climate Change has not advocated for specific policies to spur innovation. *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 12, at 218–20. This is seen as a major shortcoming in the IPCC's recommendations. *See* Pielke et al., *supra* note 65, at 532 (discussing limitations of the recommendations).

⁸⁹ *See* EUROPEAN UNION, SECOND REPORT OF ETAP IMPLEMENTATION (May 2007), http://ec.europa.eu/environment/etap/files/may07_etap_report.pdf.

⁹⁰ *See* European Union, *Action Against Climate Change: Research and Development to Fight Climate Change*, http://ec.europa.eu/environment/climat/pdf/brochures/research_en.pdf (last visited Oct. 7, 2009). Some examples of research being funded under this program include a project for

innovation through its LIFE-Environment Initiative.⁹¹ In addition to funding research, the EU enacted an Environmental Technologies Action Plan to encourage the development and implementation of innovative eco-technologies.⁹² The primary goals of this plan are to get research to the markets, improve market conditions, and support development of new technologies in developing countries.⁹³ Notably, however, these region-wide policies have not yet been implemented across the EU.⁹⁴

Private organizations have also taken steps to directly encourage climate change innovation. For example, one group offers support to companies researching and developing new green technologies.⁹⁵ Another organization encourages innovation through the transfer of information related to environmental ideas, recognizing the inherent value that environmental information

developing a method to produce crystalline silicon photovoltaic modules at lower cost and a project to investigate means to store hydrogen. *Id.*

⁹¹ See European Union, LIFE by Theme: Energy & Climate, <http://ec.europa.eu/environment/life/themes/energy/index.htm> (last visited Oct. 11, 2009). The subject matter of LIFE projects includes “energy production and distribution, renewable energy technologies, energy-efficiency in areas such as industry, services, buildings, transportation, lighting and equipment, as well as the reduction of greenhouse gases.” *Id.* The description of each LIFE project must include information about the project’s background, objectives, and results. *Id.*

⁹² See European Union, Environmental Technologies Action Plan, http://ec.europa.eu/environment/etap/index_en.html (last visited Oct. 14, 2009).

⁹³ See *id.* Proposed methods for accomplishing this include developing a system to verify that technologies reduce emissions and developing a platform for exchanging information on the effectiveness of technologies. *Id.*

⁹⁴ See European Union, ETAP: Official Documents, http://ec.europa.eu/environment/etap/information/documents_en.html (last visited Nov. 1, 2009) (describing how the plan was set up in 2005 and is still in the preparatory work stages).

⁹⁵ See Greenovate! Europe, E.E.I.G., http://www.greenovate-europe.eu/content/greenovate_europe_eeig (last visited Oct. 9, 2009). Greenovate! Europe defines itself as “a new European grouping gathering experienced professionals along the innovation value chain from research to market with a strong focus on eco-innovation. Eco-innovation encompasses all technologies, services, and processes that use less energy and resources, as well as those that reduce waste and pollution.” *Id.*

offers to businesses and organizations.⁹⁶ Yet another company has developed a virtual trading floor for green patents to promote environmental innovation and to link the innovators with the implementers.⁹⁷ Groups have also formed sites to assist smaller governments with climate change related innovation.⁹⁸ For instance, Cities for Climate Protection provides assistance for more than 700 local governments throughout the world to adopt innovative policies and measurements to reduce greenhouse gases.⁹⁹

Other groups are also focused on the disclosure and exchange of new ideas. For example, the World Business Council for Sustainable Development developed an “Eco-Patent Commons” that allows free access to patents.¹⁰⁰ This council believes that free access to ideas will “foster innovation by allowing new players in and freeing resources to work on other problems and improvements.”¹⁰¹ The patents published in this Eco-Patent Commons must “directly or indirectly improve or protect the environment and ecology of the planet.”¹⁰² To determine whether a patent falls under this potentially ambiguous requirement, the

⁹⁶ See Environmental Knowledge Transfer Network, http://ipmnet.globalwatchonline.com/epicentric_portal/site/IPMNET/?mode=0 (last visited Oct. 11, 2009). This organization’s objectives include “catalysing innovation,” “enhancing the uptake of technologies,” “improving knowledge transfer between stakeholders,” and “impacting government policy.” *Id.* This group is centered in the United Kingdom and includes academic institutions. *Id.*

⁹⁷ See Lynx Street.com, <http://www.lynxstreet.com/> (last visited Oct. 5, 2009). As of October 2009, this company appears to be in the initial stages of development since it was still offering incentives to the first hundred sellers of patents. *Id.*

⁹⁸ See International Council for Local Environmental Initiatives, Cities for Climate Protection, <http://www.iclei.org/index.php?id=800> (last visited Oct. 9, 2009).

⁹⁹ See *id.*

¹⁰⁰ See World Business for Sustainable Development, Eco-Patent Commons, <http://www.wbcds.org/templates/TemplateWBCSD5/layout.asp?MenuID=1> (last visited Oct. 9, 2009). The World Business Council for Sustainable Development maintains its Eco-Patent Commons on their website. *Id.* This organization is an association of more than 200 companies whose mission is to provide a catalyst for change. *Id.*

¹⁰¹ *Id.*

¹⁰² *Id.*

Council has designated certain patent categories as presumptively being “Eco-Patents,” and if a patent does not fall under these categories, the burden is on the applicant to demonstrate an environmental benefit.¹⁰³ The list of applicable classes of patents includes obvious categories such as wind energy and less obvious categories such as chemical compositions of glasses.¹⁰⁴

The Eco-Patent Commons has been successful in attracting pledges for nearly one hundred patents for a wide range of technologies.¹⁰⁵ The biggest problem with the Eco-Patent Commons is its inability to attract the core innovation that may be needed to confront climate change. As the Council itself recognized, businesses will likely not donate patents that may give them a competitive advantage.¹⁰⁶ Yet, these are exactly the types of innovations that will likely provide the necessary quick and efficient climate change mitigation measures. While private groups can play a supporting role in encouraging innovation and disseminating information on available technology, a comprehensive policy with more predictable incentives will be necessary to ensure that sufficient innovation and disclosure occur to address the climate change issue. Further government action will be necessary to encourage the necessary innovation.

¹⁰³ *Id.*

¹⁰⁴ See World Business Council for Sustainable Development, List of Eco-Patents, <http://www.wbcd.org/web/projects/ecopatent/IPC-codes-March2009.pdf> (last visited October 20, 2009) (delineating fifty-eight categories). Other examples on this list include categories for solar energy, transmission lines, new fuels, and fusion reactors. *Id.*

¹⁰⁵ See World Business for Sustainable Development, Eco-Patent Commons, <http://www.wbcd.org/templates/TemplateWBCSD5/layout.asp?MenuID=1> (last visited Oct. 9, 2009). DuPont, IBM, Sony, and Xerox are among the companies that have pledged patents. *Id.* See also World Business Council for Sustainable Development, Examples of Eco-Patents, <http://www.wbcd.org/plugins/GENERICDB/result.asp?DBID=8&type=p&MenuId=MTU2MQ> (last visited Oct. 4, 2009) (listing available patents).

¹⁰⁶ See World Business for Sustainable Development, Eco-Patent Commons, <http://www.wbcd.org/templates/TemplateWBCSD5/layout.asp?MenuID=1> (last visited Oct. 9, 2009).

III. THE STARTING LINE: CURRENT TREATMENT OF ENVIRONMENTAL INNOVATION

Existing incentives for the development of new technologies provided by intellectual property law and government regulations such as the Clean Air Act do not provide sufficient encouragement for the creation and disclosure of innovative ideas related to climate change. Currently, ideas related to climate change, such as efficiency improvements and new fuels, may qualify for either patent or trade secret protection.¹⁰⁷ Notably, these intellectual property instruments do not provide any special encouragement for climate change innovation, nor do they take into account the necessity for widespread distribution.¹⁰⁸ Indeed, trade secret protection depends on secrecy for its enforcement; public disclosure only generally occurs if an inventor decides to patent the invention rather than rely on trade secret protection.¹⁰⁹ Many innovations related to climate change are treated as trade secrets, and without any outside encouragement, these innovations will remain buried within their individual companies.¹¹⁰

The lack of encouragement in intellectual property laws is not remedied by Clean Air Act provisions, which generally do not require emission sources to look beyond technologies that are currently publicly available.¹¹¹ Further, even in situations where innovative technology is required, most Clean Air Act provisions

¹⁰⁷ See Michael Gollin, *Using Intellectual Property To Improve Environmental Protection*, 4 HARV. J.L. & TECH. 193, 202–12 (1991) (discussing intellectual property in relation to environmental technologies). Although some material pertaining to climate change may be protected by trademark and copyright law, such information is unlikely to be related to technology for reducing greenhouse gas emissions. Therefore, these intellectual property systems will not be discussed in this article.

¹⁰⁸ See *id.* at 195 (noting that in intellectual property, “[p]roprietary rights in destructive technology are indistinguishable from rights in beneficial technology”).

¹⁰⁹ See *infra* note 113.

¹¹⁰ See *infra* notes 121–22 and accompanying text.

¹¹¹ See, e.g., Gregory Mandel, *Promoting Environmental Innovation with Intellectual Property Innovation: A New Basis for Patent Rewards*, 24 TEMP. J. SCI. TECH. & ENVTL. L. 51, 52 (2005) (discussing the failure of statutes designed to encourage innovation).

only require disclosure of basic emissions-related and process information, which generally is too limited to put others on notice of new innovations.¹¹² Although patent and trade secret laws give various degrees of protection to an inventor, neither type of protection will foster the widespread implementation necessary for climate change mitigation.

A. *Trade Secret Law Will Not Encourage Widespread Sharing of Climate Change Innovation*

Existing U.S. trade secret law, which protects only innovations that remain secret, will by its very nature inhibit the widespread use and development of many innovations related to climate change.¹¹³ Trade secret protection was historically based upon common law principles as articulated in the Restatement of Torts, which defines a trade secret as:

any formula, pattern, device or compilation of information which is used in one's business, and which gives him an opportunity to obtain an advantage over competitors who do not know or use it. It may be a formula for a chemical compound, a process of manufacturing, treating or preserving materials, a pattern for a machine or other device, or a list of customers Generally it relates to the production of goods, as, for example, a machine or formula for the production of an article. It may, however, relate to the sale of goods or to other operations in the business.¹¹⁴

More recently, efforts have been made to provide a statutory basis for trade secret law. The Uniform Trade Secrets Act, which has been adopted in the majority of states, defines trade secrets as:

information, including a formula, pattern, compilation, program, device, method, technique, or process, that: (i) derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other person who can obtain economic value from its disclosure or use, and (ii) is

¹¹² See *infra* Part III.C (describing the various methods the Clean Air Act employs to disclose information related to technology to the public).

¹¹³ Trade secrets provide protection to technical or commercial information that is not generally known to encourage research and development. See, e.g., *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470 (1974).

¹¹⁴ RESTATEMENT (FIRST) OF TORTS § 757 cmt. b (1939).

the subject of efforts that are reasonable under the circumstances to maintain its secrecy.¹¹⁵

The fundamental element of trade secret protection is that the information must be secret to be protected.¹¹⁶ The Uniform Trade Secrets Act thus penalizes employees who disclose employers' trade secrets.¹¹⁷ Similarly, the Freedom of Information Act protects trade secret information from disclosure to the government.¹¹⁸ However, once trade secrets have been disclosed, they are no longer protected.¹¹⁹ Thus, trade secret law encourages inventors not to disclose their inventions, which is directly at odds with the wide-scale dissemination of ideas needed to address climate change.

Trade secret protection can cover everything from secret recipes to manufacturing techniques¹²⁰ and is likely to be available for many innovations related to climate change. Some key mitigation technologies include more efficient end-use electrical equipment, improved electricity and supply efficiency, improved crop management, and improved rice cultivation techniques.¹²¹

¹¹⁵ Unif. Trade Secrets Act § 1, 14 U.L.A. 539 (2000).

¹¹⁶ See Unif. Trade Secrets Act § 1. The Restatement of Torts lists six factors to be used to determine whether a trade secret exists: (1) the extent to which the information is available; (2) the extent to which the information is known by employees or others involved in business; (3) the extent of the measures taken to guard the secrecy of the information; (4) the value of the information; (5) the effort to develop the information; and (6) the ease or difficulty by which the information could be acquired or duplicated by others. RESTATEMENT (FIRST) OF TORTS, § 757 cmt. b (1939).

¹¹⁷ See 18 U.S.C. § 1905 (2006) (listing Trade Secrets Act penalties for employees who disclose trade secrets).

¹¹⁸ See Freedom of Information Act, 5 U.S.C. § 552 (2006).

¹¹⁹ See *K-2 Ski Co. v. Head Ski. Co., Inc.*, 506 F.2d 471, 473–74 (9th Cir. 1974). This rule has been adopted by the Uniform Trade Secrets Act. Thus, if the government discloses a trade secret, it can be a taking. See *Ruckelshaus v. Monsanto Co.*, 467 U.S. 986, 987 (1984) (holding that government disclosure of a trade secret may be a taking).

¹²⁰ One of the most famous trade secrets is the recipe for Coca-Cola. The Eleventh Circuit recently affirmed a conviction of two Coca-Cola employees who attempted to sell trade secrets to Pepsi. See *United States v. Williams*, 526 F.3d 1312 (11th Cir. 2008).

¹²¹ The Intergovernmental Panel on Climate Change, a well-respected international body, has defined these as mitigation measures that it envisions to

Technologies and practices under each of these categories could potentially be protected by trade secrets.¹²²

Some commentators have argued that there is little incentive to keep environmentally beneficial information secret because firms that develop such technology for their own use would be benefited by their competitors' use of the same technology since it would result in similar increased operating costs across the industry.¹²³ This may currently be the case, but if government regulations such as carbon taxation or cap and trade are enacted, operations costs will necessarily increase for the entire industry, and firms could benefit from maintaining their innovations as trade secrets.¹²⁴ In such an environment, trade secret law would provide an incentive to innovate, but there is no special protection for climate change related trade secrets that would promote their disclosure.¹²⁵ Trade secrets related to climate change are thus likely to remain concealed unless something is done to encourage their widespread disclosure. The lack of an incentive to disclose would result in related or competing industries being forced to develop similar technology themselves—an inefficient process—or go without.¹²⁶ Therefore, while trade secret laws can foster some limited innovation by protecting in-house use of inventions, the lack of associated disclosure makes it undesirable as a means of promoting environmental technological innovation.

confront the climate crisis. See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 12.

¹²² See Peter Appel & T. Rick Irvin, *Changing Intellectual Property and Corporate Legal Structures to Promote the U.S. Environmental Management and Technology Systems Industry*, 35 B.C. ENVTL. AFF. L. REV. 397, 405 (2008) (noting that much of the U.S. environmental management and technology systems are “based on trade secrets and individual know-how”).

¹²³ See Mandel, *supra* note 111, at 53–54.

¹²⁴ Such regulations appear likely to be enacted in the near future. See *supra* note 10 and accompanying text.

¹²⁵ As discussed in this article, one of the goals of intellectual property policy should be to encourage disclosure of trade secret information that helps achieve reductions in greenhouse gas emissions. See *infra* Part IV.

¹²⁶ See Appel & Irvin, *supra* note 122, at 405 (discussing how “[c]ompanies are thus forced to reinvent the same approaches within multiple industry sectors, resulting in the loss of economy and speed of innovation”).

B. *Patent Law and Environmental Patents*

Patent law also does not currently provide encouragement for development, quick disclosure, or the widespread availability of technology needed for climate change innovation.¹²⁷ Nevertheless, patenting does provide significant financial incentives, and some climate change related technologies have received, and will continue to receive, patents. The question becomes, however, whether current patent law can simultaneously encourage the widespread deployment of innovations while facilitating profit-making within the time constraints of the climate change problem.

The Constitution gives Congress the power “[t]o promote the Progress of Science and useful Arts, by securing for limited Times to . . . Inventors the exclusive Right to their . . . Discoveries.”¹²⁸ Patents today give the holder exclusive ownership of an invention that lasts for twenty years measured from his or her filing date.¹²⁹ In other words, a patent holder usually has sole discretion as to whether the right to use a particular innovation is shared with others during this time period.¹³⁰ As a tradeoff to these property rights, once a project is patented, information related to the invention is disclosed to the public to help encourage new innovation.¹³¹

¹²⁷ See Natalie M. Derzko, *Using Intellectual Property Law and Regulatory Processes to Foster the Innovation and Diffusion of Environmental Technologies*, 20 HARV. ENVTL. L. REV. 3, 11 (1996) (discussing limitations of patent law for encouraging pollution control technologies).

¹²⁸ U.S. CONST. art. I, § 8, cl. 8. In the U.S. Code, the Patent Act provides the substantive requirements for obtaining a patent: “Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.” 35 U.S.C. § 101 (2008). The first Patent Act was passed in 1790, and it has only been revised three times, in 1793, 1836 and 1952.

¹²⁹ See 35 U.S.C. § 154 (2006). Patents can be extended upon certain conditions. See *id.* § 156.

¹³⁰ See 35 U.S.C. § 261 (2006). Once this time period ends, the invention will be in the public domain.

¹³¹ See *id.* § 111.

To obtain a patent, an inventor must submit an application with the United States Patent and Trademark Office (“USPTO”),¹³² where examiners determine whether the invention meets the criteria for a patent to be issued. This includes, most importantly for environmental technologies, the non-obvious requirement.¹³³ If an invention meets all patent requirements, the inventor is then issued a patent.¹³⁴ This process can, and often does, take a significant expenditure of time and money.¹³⁵ The result of obtaining a patent is that an invention is disclosed while still protecting the inventor’s right to a profit by controlling the invention’s use following disclosure.

Environmental technologies that directly relate to global warming have been patented for years. Patents with climate change benefits have been granted for inventions ranging from shade structures to the production of biofuel from the open ocean.¹³⁶ However, the prosecution process provides little special treatment to encourage these applications. Current USPTO practice does not weigh factors such as the importance of protecting the environment into the patentability equation.¹³⁷ Environmental patents, like all other patents, are handled by the USPTO.¹³⁸ Therefore, under the current system, the patentability

¹³² See *id.* § 111(a)(1).

¹³³ See 35 U.S.C. §§ 101–103 (2006) (requiring that inventions must meet the following criteria in order to be patented: subject matter, utility, novelty, non-obvious, and adequate disclosure).

¹³⁴ See 35 U.S.C. § 151 (2006).

¹³⁵ See U.S. GAO, GAO-07-1102, U.S. PATENT AND TRADEMARK OFFICE: HIRING EFFORTS ARE NOT SUFFICIENT TO REDUCE THE PATENT APPLICATION BACKLOG (Sept. 2007) (discussing delays at USPTO).

¹³⁶ Patent applications have been mentioning global warming in their justifications for over 18 years. See, e.g., Reservoir Fiber Optic Chemical Sensors, U.S. Patent No. 4,892,383 (filed Feb. 17, 1989) (specifically mentioning global warming in its application and stating that “[t]he growing concern over increasing levels of carbon dioxide and other trace gases on a global scale has warranted the need for improved methods for oceanic and atmospheric gas analysis and monitoring”).

¹³⁷ See 35 U.S.C. §§ 101–103 (2006).

¹³⁸ See 35 U.S.C. § 2 (2006) (describing the powers and authority of the USPTO).

of environmental inventions is determined by the same criteria as all other inventions.

The process of obtaining a patent for any invention, including those related to climate change, can be very time-consuming. For example, one patent recently issued for a biosolid scrubbing procedure took approximately two and a half years to process,¹³⁹ and another patent issued for an efficiency improvement for a utility steam generator took over three years to process.¹⁴⁰ Since environmental patents are subjected to the same evaluation process as other patents, there are often long delays in obtaining patents for these technologies as well.¹⁴¹ Recognizing the inherent benefit of environmental patents,¹⁴² the government has enacted regulatory measures to ease the application process. In particular, the Patent Act was amended in 1982 to provide for more efficient processing of environmental patents that will materially enhance the quality of the environment or materially contribute to the development or conservation of energy resources.¹⁴³ This regulatory provision allows patent applications that meet this definition to be declared “special” and to be processed more quickly without requiring an extra fee.¹⁴⁴ Despite the attempt to use this provision to streamline the process for environmental patents, it is unclear whether this procedure actually leads to more efficient processing since several requirements are evaluated before an application will be designated

¹³⁹ Flue Gas Scrubbing Process Utilizing Biosolids, U.S. Patent No. 7,476,372 (filed June 28, 2006) (issued Jan. 13, 2009).

¹⁴⁰ Efficiency Improvement for a Utility Steam Generator with a Regenerative Air Preheater, U.S. Patent No. 7,475,544 (filed November 2, 2005) (issued Jan. 13, 2009) (noting the environmental benefit of the invention almost as an afterthought, stating that “[a]s will be appreciated, the present invention provides an improved steam generator system that eliminates the continuous excess air discharge and its emissions to the environment”).

¹⁴¹ See *supra* note 135 (discussing backlog of patents and the length of time patent review takes).

¹⁴² The environmental benefit related to patents has been recognized in individual patents. See, e.g., Solar Water Heating System, U.S. Patent No. 4,930,492 (filed Jun. 16, 1989).

¹⁴³ See 37 C.F.R. § 1.102(c) (2008).

¹⁴⁴ See *id.*

“special” in the first place.¹⁴⁵ Then, even if an invention meets the long list of requirements to become “special,” which takes time to establish, the “accelerated” examination period can still last up to a year.¹⁴⁶

Another problem with obtaining patent protection for inventions related to climate change is that some innovations are unable to meet the non-obvious requirement for patentability. To meet the non-obvious requirement, an inventor must show that the differences between the invention and what already exists in the public domain would not have been obvious to a person having ordinary skill in the area of art at the time the invention was made.¹⁴⁷ Some environmental technologies have had a difficult time getting over the non-obvious requirement because they are minor improvements to technologies that are already widely used in the field.¹⁴⁸ For example, some companies are able to achieve better pollution reduction efficiencies through changing their operation and maintenance techniques.¹⁴⁹ These types of innovations may be especially susceptible to problems meeting the

¹⁴⁵ See Gollin, *supra* note 107, at 211–12 (discussing how the designation has not improved efficiency). Gollin also states that reduction of time to issuance is unlikely if all of the patents those particular examiners see are labeled “special.” *Id.* This would also be an issue for climate-change related inventions, which cover all aspects of the economy. The USPTO’s Petition to Make Special Under Accelerated Examination Program contains numerous requirements including a requirement that the patent contains three or fewer independent claims and fewer than twenty overall claims. See 37 C.F.R. § 1.102 (2008).

¹⁴⁶ See 37 C.F.R. § 1.102 (2008).

¹⁴⁷ See 35 U.S.C. § 103(a) (2006).

¹⁴⁸ See, e.g., *I.U. Tech. Corp. v. Research-Cottrell, Inc.*, 641 F.2d 298 (5th Cir. 1981) (affirming finding that environmental technology patent was invalid for obviousness). Others have also noted this problem. See, e.g., Appel, *supra* note 122, at 406 (noting issue and proposing that the criteria for non-obviousness be modified for climate-change related innovations); Derzko, *supra* note 127, at 11 (proposing modification of the requirement for certain inventions).

¹⁴⁹ See, e.g., John Guffre, *Eliminating Air Heater Plugging and Corrosion Caused by SCR/SNCR Systems for NOx Control on Coal-Fired Boilers*, 111 POWER ENGINEERING 84 (2007) (discussing operation and maintenance techniques that improve boiler operating efficiencies and pollution control performance).

non-obvious requirement since they are refinements of current technology.

Despite the time, expense, and difficulty involved in obtaining a patent, the process offers some benefits in the climate change arena. Since patent holders are required to complete an intensive review process with the USPTO, the inventions are often refined and improved.

In contrast with trade secrets, patents are disclosed to the public. This disclosure can help spur additional innovation, as well as allow the invention to be used by the public after the patent term expires.¹⁵⁰ The major problem with the patent system, however, is that the owner is able to limit the use of the invention before the expiration of the term.

Therefore, even if the patent process is made more amenable to those seeking environmental patents, the positive aspects of patent law may not translate directly into climate change benefits because a patent holder owns exclusive rights to limit the invention's use.¹⁵¹ This focus on the inventor's rights is not in agreement with the goals of climate change policy, which requires large comprehensive reductions, and there are many limitations to relying on patent law in the climate change context. In particular, patent law allows an inventor to limit access to the invention for twenty years from the filing date if the inventor desires. This poses problems in the area of climate change since it is crucial that certain technologies are widely available because reductions in emissions need to be made quickly.¹⁵² Moreover, patent law allows an inventor to charge any price he or she wants for an invention, which limits the availability of an invention when climate change will require comprehensive reductions.¹⁵³

¹⁵⁰ See IP.com, Technical Disclosures Stimulate Innovation, <http://www.securinginnovation.com/tags/ibm-technical-disclosure-bulle/> (last visited Oct. 5, 2009) (discussing effects on innovation).

¹⁵¹ See 35 U.S.C. § 261 (2006).

¹⁵² See 35 U.S.C. § 154 (2006); *supra* note 18 and accompanying text (discussing the need for rapid development).

¹⁵³ See *supra* notes 20–22 and accompanying text (discussing the scope of the solution).

C. *Compulsory Licensing Related to Climate Change Innovation*

Compulsory licensing provisions may be a partial solution to the problem of a lack of widespread licensing. However, there has traditionally been resistance to compulsory licensing in the U.S.; therefore, only small subsets of patents are currently covered by mandatory licensing provisions.¹⁵⁴ This, along with other issues, inhibits the effectiveness of this type of provision.

Generally, since patent law is focused on the ability of the inventor to make a profit, the right to exclude others from a patent is unbounded.¹⁵⁵ As part of this exclusivity right, a patent holder can refuse to license his patent to others.¹⁵⁶ Compulsory license statutes, which provide the government with the right to mandate licensing for certain types of inventions, are the exception to this rule. These exceptions are specified in statutes and generally reflect situations where the social utility of an invention is deemed important enough to overcome the individual inventor's right to control the sale and use of his invention.

For example, the Atomic Energy Act allows the government to use or license patents related to the production of nuclear materials or atomic energy if this would advance the public interest.¹⁵⁷ This Act specifically provides that if “the invention or discovery covered by the patent is of primary importance in the production or utilization of special nuclear material or atomic energy,” then the Atomic Energy Commission has the right to require licensing of the invention.¹⁵⁸ Another compulsory license provision grants

¹⁵⁴ See Mandel, *supra* note 111, at 59 (discussing how compulsory licensing is “generally . . . frowned upon as an invasion of private property rights”).

¹⁵⁵ See 35 U.S.C. § 271 (2006) (providing rights of patent holder to exclusive use and licensing).

¹⁵⁶ See *id.* § 271(d) (stating that “[n]o patent owner otherwise entitled to relief for infringement or contributory infringement of a patent shall be denied relief or deemed guilty of misuse or illegal extension of the patent right by reason of his having . . . refused to license or use any rights to the patent”).

¹⁵⁷ See 42 U.S.C. § 2183 (2006).

¹⁵⁸ *Id.* (providing that the owner of such patent shall have a hearing and be provided terms the Commission deems equitable to “similar licenses for comparable uses”). These requirements have been found to be “rigid.” *Nuclear Data Inc. v. Atomic Energy Comm’n*, 364 F. Supp. 423 (N.D. Ill. 1973). Interestingly, this provision could be used to license patents related to atomic

patent rights to inventions related to the space program to the government rather than the inventor.¹⁵⁹ The government also has the right to withhold patents for inventions believed to endanger national security¹⁶⁰ and to mandate licensing as a remedy to anti-competitive practice.¹⁶¹

More directly related to climate change, the Clean Air Act requires mandatory licensing of patents by the government when necessary to ensure compliance with the emissions requirements of the Act.¹⁶² The Clean Air Act's mandatory licensing provisions set forth strict standards to determine whether a patent qualifies for mandatory licensing: (1) the patent must be "necessary" for compliance with the provisions of the Clean Air Act;¹⁶³ (2) there must be "no reasonable alternative methods to accomplish" compliance;¹⁶⁴ and (3) without a license, the patent must produce an anti-competitive result.¹⁶⁵ If all these conditions are met, a U.S. district court may issue an order to license the invention on "such reasonable terms and conditions as the court, after hearing, may determine."¹⁶⁶ To implement this provision, the EPA passed a set of policies and procedures to conform to the North American Free Trade Agreement (NAFTA).¹⁶⁷ The EPA's regulations only allow recommendation of a compulsory patent if certain conditions are met, including that: (1) efforts were already made to obtain the patent; (2) the license is limited, non-exclusive, non-assignable, and for the domestic market; and (3) the patent holder is given

energy production, which is viewed by some experts as a necessary part of the climate change solution. *See, e.g.*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 12, Table SPM.3 (calling for "advanced nuclear power" as a key mitigation before 2030).

¹⁵⁹ *See* 42 U.S.C. § 2457 (2006).

¹⁶⁰ *See* 35 U.S.C. § 181 (2006).

¹⁶¹ *See* 15 U.S.C. § 16 (2006).

¹⁶² *See* 42 U.S.C. § 7608 (2006). This provision's usefulness is limited by requirements specified in this section as well as requirements articulated in 40 C.F.R. § 95.3 (2009).

¹⁶³ § 7608(1)(A). This requirement was reaffirmed in a rulemaking. *See* 40 C.F.R. § 95.3 (2008).

¹⁶⁴ § 7608(1)(B).

¹⁶⁵ § 7608(2).

¹⁶⁶ *Id.*

¹⁶⁷ *See* 40 C.F.R. § 95.4 (2009).

adequate compensation.¹⁶⁸ Not surprisingly, with all of these procedural and substantive requirements, this rule has never been used.¹⁶⁹

In addition to the Clean Air Act's provisions and the examples discussed above, another type of compulsory license provisions that may be relevant to climate change relates to government-funded inventions.¹⁷⁰ One provision allows the government to license government-funded inventions patented by small businesses or non-profits if the government agency believes that such steps are necessary to "achieve practical application," to "alleviate health or safety needs," or to "meet requirements for public use specified by Federal regulations."¹⁷¹ This licensing provision could conceivably be used if government entities need certain inventions to meet regulatory requirements.¹⁷² A similar provision allows the U.S. government and its contractors to use any patented invention provided that just compensation is paid.¹⁷³ This can be used broadly throughout the government, provided that the often-difficult just compensation calculation is completed.

These provisions can also be applied to allow government contractors access to protected technology.¹⁷⁴ To obtain the

¹⁶⁸ *See id.*

¹⁶⁹ *See* Mandel, *supra* note 111, at 60 (discussing the lack of use of the provision).

¹⁷⁰ *See, e.g.*, 35 U.S.C. § 203(a) (2006) (allowing the government to license inventions patented by small businesses and nonprofits that were funded by the government). This may be especially relevant with the new government proposals for funding research and development.

¹⁷¹ § 203. In addition to these requirements, the relevant Federal agency must also determine that either the patent holder is not expected to take such steps or that the requirements will not be "reasonably satisfied by the contractor, assignee, or their licensees." *Id.*

¹⁷² Climate change regulatory requirements tied either to alleviating health or safety needs or to meeting public use requirements would need to be enacted to meet the use requirements of this provision. *See id.*

¹⁷³ 28 U.S.C. § 1498(a) (2006). In turn, the Government is required to provide compensation for the invention. *Id.* In other words, the Government possesses the authority to take a compulsory license, but it still needs to compensate for that taking. *See Brunswick Corp. v. United States*, 36 Fed. Cl. 204, 207 (Fed. Cl. 1996).

¹⁷⁴ *See* § 1498(a).

immunity against patent infringement claims under this provision, a contractor must demonstrate that it used the invention for the government's benefit and that the government gave its authorization or consent for such use.¹⁷⁵ This requirement, which has been narrowly construed, can be satisfied by showing the inclusion of a standard authorization and consent provision in a government contract.¹⁷⁶ Using this type of framework, climate change federal regulations could explicitly provide the necessary government benefit language to allow any invention developed through government monies to be subject to compulsory licensing provisions.

Where access to important technology is being denied to industry because of a patent owner's resistance, compulsory licensing provisions could be a mechanism to encourage distribution of innovations related to climate change. Existing provisions, however, are limited to narrow subsets and reliance on them would result in an incomplete, piecemeal approach. Although these existing provisions are helpful, they will not ultimately solve the problem because addressing climate change requires a comprehensive solution.

In sum, to encourage climate change innovation, our current intellectual property policies are not adequate and need to be reexamined.¹⁷⁷ In particular, current policies do not encourage disclosure of all types of climate change related innovation.¹⁷⁸ Unless this is changed, some innovation will never reach the broad marketplace, which will inhibit further potential technology advances.¹⁷⁹ In addition, although current patent law requires full disclosure, obtaining a patent is a lengthy and expensive process,

¹⁷⁵ *See id.*

¹⁷⁶ *See* *Windsurfing Int'l, Inc. v. Ostermann*, 534 F. Supp. 581, 588 (D.C.N.Y. 1982) (discussing construction of § 1498).

¹⁷⁷ *See supra* Part III.A–C (describing intellectual property policies and their shortcomings).

¹⁷⁸ *See supra* Part III.A (describing trade secret laws and why many climate change innovations are protected as trade secrets).

¹⁷⁹ Trade secrets are only protected if they remain secret, which makes disclosure of these innovations unlikely. *See supra* Part III.A.

which is not efficient for all types of inventions.¹⁸⁰ Requirements for obtaining a patent, such as overcoming the non-obvious requirement, may be a further hindrance on obtaining a patent on environmental inventions.¹⁸¹ Even if an invention is patented, an inventor can choose whether or not to permit its use.¹⁸² Existing compulsory licensing provisions are not adequate to remedy this deficiency. Therefore, while some aspects of current intellectual property law support the development and disclosure of new technology, the existing system will not support the innovation to mitigate climate change to the extent necessary.

IV. METHODS TO SPEED-UP CLIMATE CHANGE INNOVATION

Creating a separate system of intellectual property dedicated solely to climate change mitigation technologies can encourage innovation in this area and would remedy some of the deficiencies in the current programs. In fact, this approach has been advocated, in varying forms, by commentators who believe modifying our intellectual property system is a way to remedy its shortcomings in the environmental arena. Suggested modifications to the patent system generally include relaxation of the non-obvious patentability requirement, adjustment of the patent term, and fast tracking applications. Commentators have further suggested that corresponding changes in the areas of permitting and compulsory licensing may be needed to enhance the changes to the patent system.

For example, one commentator has advocated creating a special “environmental patent” with a shortened period of exclusivity and relaxed requirements for non-obviousness to allow protection of “incremental changes” in technology.¹⁸³ This program is suggested to be used in conjunction with changes to the permitting program for environmental technologies, which would combine the technology review done by the USPTO with the

¹⁸⁰ See *supra* Part III.B (describing the lengthy process needed to patent an invention).

¹⁸¹ *Supra* Part III.B.

¹⁸² Patent owners generally have complete authority to decide to whom they will license their invention. See *supra* Part III.B–C.

¹⁸³ See Derzko, *supra* note 127, at 14.

permitting review done by the EPA.¹⁸⁴ Under this proposal, companies would be granted an innovation waiver period where they would have a grace period to test the effectiveness of the technologies.¹⁸⁵ While some aspects of this proposed new patenting system are promising, in total the suggested changes to the environmental permitting requirements would not provide innovators with adequate incentives to promote the dissemination of technology. Additionally, given the large resistance to climate change related permit programs, it is unlikely that this proposal would be implemented in its entirety.¹⁸⁶ Thus, this suggestion would not adequately promote climate change innovation to the extent that is necessary to solve the climate change problem.

Another commentator has suggested reconsidering both the non-obvious and novelty requirements, offering greater approval of research and development elements, and providing fast-track patent review for environmental patents.¹⁸⁷ Although this suggestion would help encourage some innovation, it would not encourage widespread disclosure to the extent necessary to mitigate climate change impacts. Lack of enforcement of the novelty requirement could also result in exclusive rights being granted to inventions that are already available for public use. In addition, as was discussed previously, fast tracking environmental patents in the USPTO was attempted before with, at best, mixed results.¹⁸⁸

Yet another commentator has suggested modifying existing compulsory licensing rules to include climate change related inventions within the patent system.¹⁸⁹ Unfortunately, many believe that compulsory licensing is undesirable because it dilutes any patent incentive.¹⁹⁰ However, as will be discussed later,

¹⁸⁴ See *id.* at 31–32.

¹⁸⁵ See *id.* at 35–36.

¹⁸⁶ See, e.g., H.R. 2454, 111th Cong. (2009) (discussing not allowing the EPA to regulate climate change through its new source review permitting program).

¹⁸⁷ See Appel & Irvin, *supra* note 122, at 406.

¹⁸⁸ See *supra* Part III.B.

¹⁸⁹ See Derclaye, *supra* note 31, at 287–89.

¹⁹⁰ See Derzko, *supra* note 127, at 44 (discussing the failure of the Canadian Patent Act, which relied on compulsory licensing).

compulsory licensing may play an important role when combined with other aspects of an improved intellectual property system applying to environmental technology.

In short, modifications to the existing system have been proposed in various combinations. An effective solution must selectively incorporate aspects from these various proposed modifications to our current system. The ideal solution should also value technologies according to their benefit and protect innovators' rights to these technologies for a set period of time while ensuring public access to needed technology.

A. A Separate Green Technology Program Should Be Developed

The U.S. needs to develop a comprehensive intellectual property policy that encourages the creation and disclosure of climate change innovation.¹⁹¹ As an initial step to encourage innovation, a new green technology program should be developed that would be specifically applicable to a broad range of innovations that reduce or mitigate greenhouse gas emissions. The categories delineated in the Eco-Patent Commons would provide an ideal starting point for determining the patent subjects that should be covered by this new program.¹⁹² The program should combine aspects of patent law that encourage innovation with compulsory licensing that would allow innovations to be immediately available to anyone willing to purchase them. In particular, this program should cover a wide range of projects that increase efficiency, create energy without fossil fuels, or otherwise reduce greenhouse gas emissions.¹⁹³ Under these broad groups,

¹⁹¹ This has been generally recognized by legislation that proposes patent system evaluation. *See* S. 280, 110th Cong. § 318 (2008). Others have proposed modifying the current intellectual property instruments to encourage innovation. *See, e.g.,* Appel & Irvin, *supra* note 122, at 406.

¹⁹² *See supra* note 104.

¹⁹³ The Pew Center suggests the following actions in areas where the U.S. needs technological innovation:

- (1) improve the efficiency of energy conversion and utilization so as to reduce the demand for energy;
- (2) replace high-carbon fossil fuels such as coal and petroleum with lower-carbon or zero-carbon alternatives such as natural gas, nuclear, and renewable energy (e.g., wind and solar);
- (3) capture and sequester the CO₂ from fossil fuels before (or

everything from new solar panels to more efficient engines should be included. Inventions that under the current system could be protected either as trade secrets or with patents would be eligible to participate in the optional program.

The protections of this new green technology program should be limited to innovations that reduce greenhouse gases in ways not currently publicly available. This will preserve technologies that are already available and have been previously disclosed for public use. Therefore, some requirements for obtaining a patent should be retained. For instance, searches similar to prior art searches that are done to determine patentability and an examination of whether an equivalent technology exists should still be required. The innovation should still be subject to the patentable subject matter requirements, which includes “anything under the sun that is made by man,” and the utility requirement should also be preserved.¹⁹⁴ Moreover, the innovator should still demonstrate that the invention is novel, which means that it has not been previously patented, known, or used before.¹⁹⁵ Statutory bar provisions should also be retained because these encourage timely patenting of inventions.¹⁹⁶

Crucially, however, the type of non-obviousness evaluation used for patents should not be required, allowing refinements to existing technology that currently cannot be patented to be disclosed and protected. Removing the non-obvious requirement has been suggested previously as a way to encourage innovation, and this change may be especially effective at “foster[ing] incremental innovation.”¹⁹⁷ However, commentators have

after) it enters the atmosphere; and (4) reduce emissions of GHGs other than CO₂ that have significant impacts on global warming.

PEW CENTER LESSONS, *supra* note 20, at iii.

¹⁹⁴ *Diamond v. Diehr*, 450 U.S. 175, 182 (1981).

¹⁹⁵ *See* 35 U.S.C. § 102(a) (2006).

¹⁹⁶ *See* § 102(b).

¹⁹⁷ Derzko, *supra* note 127, at 14–15 (discussing the potential benefits of reducing the non-obvious requirement); *see also* Mandel, *supra* note 111, at 55 (discussing the effects of modifying the non-obvious requirement for environmental innovations). Similar systems in place in Germany and Japan have been cited as demonstrating the success of such a program. *See* Derzko, *supra* note 127, at 15–18. Furthermore, the U.S. already enacted provisions to make certain inventions for biotechnology processes non-obvious *per se* in some

frequently cast doubt on whether such requirements would have much effect on the number of inventions patented, since the standard has traditionally been flexible and easy to meet.¹⁹⁸ While that may have been true in the past, the recent Supreme Court decision *KSR International Co. v. Teleflex, Inc.* may result in a stricter interpretation of the non-obvious standard in the future.¹⁹⁹ The resulting stricter interpretation could cause even more difficulty in gaining patent protection under the current system, making a new green technology program that incorporates relaxation of non-obviousness even more helpful in encouraging environmental innovation.

In exchange for disclosure, the program should grant the inventor a period of profit-making exclusivity similar to that provided by a patent for a shorter term such as five years.²⁰⁰ The time period for the protection should reflect a balance of the inventor's need for profitability from the innovation and the public's interest in this information being available at a reasonable price in a timely manner. After the initial set time period, an inventor could have the option of trying to extend the exclusivity

situations in the Biotechnology Process Patent Act of 1995. Appel & Irvin, *supra* note 122, at 404.

¹⁹⁸ See Mandel, *supra* note 111, at 55 (arguing that the “[non-obvious] standard is routinely criticized for being too easy to achieve” and therefore does not bar many environmental patents).

¹⁹⁹ 550 U.S. 398 (2007). Commentators have argued that the Court's decision may have been motivated to “combat the rise in substandard patents” which many believed had occurred. Emer Simic, *The TSM Test is Dead! Long Live the TSM Test! The Aftermath of KSR, What Was All the Fuss About?*, 37 *AIPLA Q. J.* 227, 253 (2009). (explaining the argument that the decision has failed to lead to the large changes in non-obvious determinations that were initially anticipated).

²⁰⁰ Similarly, the Orphan Drug Act had a seven year exclusivity period. See Enrique Seoane-Vazquez, et al., *Incentives for Orphan Drug Research and Development in the United States*, 3 *ORPHANET J. RARE DIS.* 33 (2008), available at <http://www.pubmedcentral.nih.gov>. A recent study showed that “the 7-year orphan drug market exclusivity provision had a positive yet relatively modest overall impact on effective patent and market exclusivity life.” *Id.* Commentators have tended to agree that a shorter period of protection is appropriate in return for making it easier to obtain protection. See Derzko, *supra* note 127, at 14.

period if the innovation's novelty or other circumstances warrant more time.²⁰¹ If the invention does not warrant further protection, it should be freely available to the public after the initial time period.

While the system would be optional, it would be desirable to many innovators despite the reduced length of exclusivity because this system would protect innovations that may not meet the traditional patent requirement of non-obviousness. As with a patent, the prospect of an exclusive market will create an economic incentive for inventors to disclose their inventions before similar inventions are released into the market.²⁰² Furthermore, the shortened period may not constitute much of a sacrifice on the part of the inventor since many innovations in this area are useful for less than the ordinary patent term.²⁰³ Inventors will also have an incentive to enter the program because the technology will be widely disseminated. The program should also require that the value of the innovation be determined prior to its release on the open market, making the potential profits more predictable than with a traditional patent.

Importantly, under this framework, the invention should be made available for purchase during the exclusivity period through compulsory licensing requirements. This would be similar to the current treatment of patents that fit under compulsory license provisions except that the price should be determined by the proposed office in conjunction with the innovator based on the utility of the innovation to mitigate climate change emissions or impacts. This type of compulsory licensing will enable the public to enjoy full use of protected technologies. Many commentators have argued against the use of compulsory licenses,²⁰⁴ but others

²⁰¹ For example, if a company expended significant research money to develop the innovation, adding novel features, the period could be extended.

²⁰² This provides an incentive for inventors to go through the patent process. *See supra* Part III.B (discussing patent law).

²⁰³ Mandel, *supra* note 111, at 61.

²⁰⁴ *See id.* at 59 (arguing that compulsory licensing will not encourage environmental innovation); Derzko, *supra* note 127, at 43 (stating that compulsory licenses "dilute the innovation incentives provided by patents"); Matthew S. Bethards, *Condemning a Patent: Taking Intellectual Property by*

have stressed that, because of the crucial nature of the problem, patent rights should not be allowed to be a “barrier to environmental progress.”²⁰⁵ Furthermore, the contention that patent incentives are decreased by compulsory licenses has been disputed.²⁰⁶ At any rate, this type of compulsory licensing will likely meet with less resistance when viewed as part of a comprehensive program in which the inventor helps determine the price of the technology.

This green technology program would have many advantages over the current intellectual property framework. A separate technology program could cover and thus disclose a greater scope of climate change projects. Many efficiency innovations are currently difficult to patent because they often make minor improvements to existing technologies and processes.²⁰⁷ Since many efficiency improvements do not develop wholly new technology, these types of innovations do not always qualify for patent protection. Consequently, under the current intellectual property policies, many efficiency improvements receive trade secret protection, which only protects undisclosed innovations.²⁰⁸ Many types of efficiency innovations could be protected under the green technology program and therefore disclosed to the public and available for use.

Another advantage to creating a separate green technology program to protect environmental innovations is that climate change inventions could be evaluated by a central green technology office, allowing reviewers to view technologies available for climate change mitigation comprehensively. Currently, it is difficult for regulators and the regulated community to fully assess what technology is available because many of the technologies fall under different sectors of the economy, and trade

Imminent Domain, 32 AIPLA Q. J. 81, 117 (2004) (arguing that compulsory licensing may encourage use of trade secret protection).

²⁰⁵ Paul Gormley, Note, *Compulsory Patent Licenses and Environmental Protection*, 7 TUL. ENVTL. L.J. 131, 159 (1993).

²⁰⁶ See Derclaye, *supra* note 31, at 287 (stating that “generally, compulsory licenses could help improve the environment”).

²⁰⁷ See *supra* Part III.B (discussing the requirements for patentability).

²⁰⁸ See *supra* Part III.A (discussing requirements for trade secret protection).

secrets are generally buried in their individual companies.²⁰⁹ Since the country needs a significant economy-wide reduction in greenhouse gas emissions, policymakers will need to have comprehensive information detailing our capability to reduce emissions.²¹⁰ This in turn will enable regulators to more effectively decide which sectors need additional research and development funding to meet reduction targets.

Examination of all environmental inventions in one office would also result in more rapid disclosure of technologies. Scientists have warned that the reductions need to be made quickly, which means that available technology should be implemented as soon as possible.²¹¹ Having one office dedicated to disclosing information related to climate change innovation will make the review of these applications a priority, which should result in a more timely disclosure of a broad array of innovations.

Notably, this type of intellectual property tool for encouraging innovation has already worked. The Orphan Drug Act included a similar modified licensing program.²¹² This Act was passed in 1983 by Congress to stimulate development of drugs to treat rare diseases.²¹³ To encourage innovation regarding rare diseases, the

²⁰⁹ See *supra* Part III.A–B.

²¹⁰ Right now, much of the research funding is not directed toward any specific industry. See, e.g., U.S. House Subcommittee, Fiscal Yr. 2010 Research and Development Spending Estimate, http://science.house.gov/docs/views_estimates_2010.pdf (describing how research money is directed towards agencies with specific goal in mind but not targeted towards specific industry). See *supra* Part II (discussing current proposals for climate-change related research). The proposed scheme will help to focus those discussions.

²¹¹ This warning has come from scientists from the U.S. and throughout the world. See *supra* Part II (discussing need for climate-change related innovation).

²¹² See Orphan Drug Act, Pub. L. No. 97-414 (1983). It was signed into law on January 4, 1983.

²¹³ The Act was amended in 1984 to define “rare diseases” as those affecting less than 200,000 people in the U.S. See U.S. DEP’T HEALTH & HUM. SERVICES, OFF. INSPECTOR GEN., OEI-09-00-00380, THE ORPHAN DRUG ACT: IMPLEMENTATION AND IMPACT 6 (2001), available at <http://oig.hhs.gov/oei/reports/oei-09-00-00380.pdf>. The Orphan Drug Act was cited over a decade ago as a model for encouraging environmental technologies generally as opposed to climate change. See Derzko, *supra* note 127, at 13–15.

law provided the following incentives: (1) seven year market exclusivity; (2) a tax credit of up to half of the cost of human clinical trials; and (3) federal research grants.²¹⁴ This Act applied to both patentable and unpatentable drugs.²¹⁵ This incentive thus allowed a mechanism where companies could recover research and development costs even if the drug was not ultimately patented.²¹⁶ The Orphan Drug Act is administered by the Food and Drug Administration, which applies it only to new drugs or drugs that are “clinically superior” to those currently available.²¹⁷

The Orphan Drug Act has been successful in its goal of stimulating the development of drugs for rare diseases. Government investigations of the success of the Act found that the seven-year marketing exclusivity was the most effective incentive for encouraging the development of orphan drugs.²¹⁸ This is largely due to companies’ abilities to attract funding for the development process.²¹⁹ Its success demonstrates how modification of intellectual property systems may encourage innovation in an area where additional encouragement is needed.

There are a few notable differences between the suggested green technology program and the Orphan Drug Act. The Orphan Drug Act allows a drug manufacturer to have exclusive control over the use of its product for a particular disease. During the period of exclusivity, no similar products can be marketed for that disease.²²⁰ The Orphan Drug Act has been criticized for this limitation on the availability of technology.²²¹ The green

²¹⁴ See 21 U.S.C. § 360 (2006).

²¹⁵ This was added in the 1985 amendment to the Act. See U.S. DEP’T HEALTH & HUM. SERVICES, *supra* note 213.

²¹⁶ See Seoane-Vazquez, et al., *supra* note 200.

²¹⁷ The FDA’s criteria for clinical superiority are that the drug must be more effective than an approved orphan drug, safer than an orphan drug, or the new drug will make a major contribution to patient care. See 21 C.F.R. § 316.3 (2009).

²¹⁸ See U.S. DEP’T HEALTH & HUM. SERVICES, *supra* note 213 (assessing the effectiveness of the Act).

²¹⁹ *Id.*

²²⁰ See Seoane-Vazquez, et al., *supra* note 200.

²²¹ See, e.g., Rebecca S. Eisenberg, *The Role of the FDA in Innovation Policy*, 13 MICH. TELECOMM. TECH L. REV. 345, 359-61 (2007).

technology program, on the other hand, would make innovations available to anyone able to purchase them through mandatory licensing.

The proposed green technology program's exclusive marketing provisions will encourage timely disclosure of climate change inventions while the relaxation of patentability requirements will allow protection of a broader range of inventions. The location of examination in one office will allow relevant inventions to reach the public faster by reducing the time required for the patenting process, which can take years to complete under the current system, causing valuable time to be lost. Such reductions occurred under the Orphan Drug Act, which had reduced average duration of time to designate a product to under a half a year in 2000.²²²

B. *Climate Change Ideas Should Be Valued Relative to Their Environmental Contribution*

The economic incentive to create innovations should be directly linked to the environmental value of the greenhouse gas reduction. By doing this, a green technology program can effectively balance an inventor's need to make a profit with the demands of climate change. Although this green technology program will be most effective if coupled with a carbon tax, no matter which regulatory policy is ultimately chosen there will be a value for technology that reduces greenhouse gases either as a tax or a tradable allowance.²²³

Tying the invention to this value will directly link innovation incentives to regulatory mandates. The value of the innovation can be tied to the value of the reduction in two ways: (1) the innovation can be valued by how large the reduction is; and (2) the innovation can be valued according to the need for the reduction.²²⁴ An innovation's impact on greenhouse gas levels should be estimated by the inventor and verified by the agency. For

²²² See U.S. DEP'T HEALTH & HUM. SERVICES, *supra* note 213, at 11. The time in 2000 was down from a high of 267 days in 1996. *Id.* Regardless of which figure is relied on, this is quicker than the long time periods it can take to patent an invention. *Supra* Part III.B.

²²³ See *supra* Part II (discussing the current regulatory environment).

²²⁴ This assumes that significant greenhouse gas reductions will be mandated.

example, if an invention will reduce energy usage in a process by ten percent, which translates into ten tons per year, the company wishing to purchase this innovation could pay a certain percentage of the value of ten tons of carbon credits to obtain and use this technology. It can be assumed that the company will use the technology for the entire exclusivity period, which, as described above, could be five years for most inventions.

A company buying the technology could avoid purchasing carbon credits or paying carbon taxes by using pollution control technologies, which would result in a savings to the company and to the environment.²²⁵ Moreover, companies are likely to save fuel and energy costs through use of the innovations, further encouraging use of these innovative reduction means. In other words, companies will be able to save regulatory and energy costs by implementing new technologies to mitigate greenhouse gas emissions. Thus, a valuation directly related to the ability of a particular technology to reduce emissions will take these profits and the advantages to the potential buyer into account. This type of valuation would have the advantage of allowing innovators to predict the value of their inventions by connecting mitigation potential of the innovation to current values for reducing emissions. This type of predictability has been proven to lead to investment.²²⁶

Another advantage to this type of valuation mechanism is that the program could eventually fund itself by using a percentage of the revenues from the sales of the innovation to fund the office. At least one industry representative has recommended using proceeds from environmental regulations to fund carbon dioxide control projects.²²⁷ In addition to the benefits mentioned above, this mechanism will focus the evaluation on the ability of various inventions to reduce emissions.

²²⁵ See CARLIN, *supra* note 72 (discussing various types of regulations and their effectiveness).

²²⁶ See U.S. DEP'T HEALTH & HUM. SERVICES, *supra* note 213. The predictability of the market exclusivity provision in the Orphan Drug Act successfully attracted investment for orphan drug development. *Id.*

²²⁷ See Steven D. Cook, *Duke Energy CEO Wants Auction Proceeds to Fund Carbon Dioxide Control Projects*, 39 ENV'T. REP. 2303 (2008).

C. *The Office Should Be Staffed By the EPA*

The EPA will play an important role in the implementation of any climate change policy. The EPA has already developed methodologies to assist companies in measuring greenhouse gas emissions and has started working on many different aspects of climate change.²²⁸ This type of expertise is necessary to evaluate the usefulness of climate change innovation and to assess the innovation's potential to reduce greenhouse gas emissions. The suggested office dedicated to evaluating climate change technology should be staffed by the EPA to assure that this innovation policy complements the agency's other work related to climate change.

By delegating responsibilities of this program to the EPA, technology information, which is currently housed in many different agencies, would be consolidated, allowing the agency to have a comprehensive view of the information. One of the current problems with climate change related innovation is that even employees at the EPA may be unaware of the full range of available technology.²²⁹ The EPA has acknowledged that their employees are often forced to rely on their own "informal networks and contacts" to get the information necessary to perform their duties.²³⁰ This program would increase awareness of available technologies and consolidate the technology information that is currently housed with many different sources.²³¹

The staff of the USPTO should be allowed to participate in the determination of whether a proposed invention is novel, but staff from the EPA should make the final determination of whether it fits within the "green" category, as well as its value relative to

²²⁸ See U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2007 (Apr. 15, 2009), <http://www.epa.gov/climatechange/emissions/downloads09/InventoryUSGhG1990-2007.pdf> (last visited Oct. 9, 2009).

²²⁹ See U.S. EPA OFF. INSPECTOR GEN., *supra* note 11, at 15–16 (discussing problems caused by the unavailability of information among employees).

²³⁰ *Id.* at 15–16. The employees reported that they got their information from "other federal agencies, non-governmental organizations, academic researchers, and international organizations." *Id.*

²³¹ *Id.*

mitigating climate change.²³² This is essential because the USPTO is currently overloaded, and the office is not focused on environmental protection and climate change issues like the EPA.²³³ Notably, the Orphan Drug Act successfully took a similar approach by having the FDA implement the Act instead of the USPTO.²³⁴

In addition, the EPA has already explored environmental innovations by creating the Technology Innovation Program to advocate for more effective and less expensive approaches for cleaning hazardous waste sites and groundwater.²³⁵ The purpose of the program is to provide “robust technology and market information” and remove “policy and institutional impediments related to the deployment of these technologies.”²³⁶ The program includes technical and logistical assistance through a Technology Integration and Information Branch, a Technology Assessment Branch, an Analytical Services Branch, and an Environmental Response Team.²³⁷ In sum, since the EPA staff is better informed about climate change and the need to mitigate greenhouse gas emissions than the USPTO, the EPA is in the better position to implement the recommended program.

²³² This communication will help prevent some of the communication issues created by the Orphan Drug Act when similar products have pursued different tracks, with some applying for Orphan Drug status while others applied for patents. *See Anticompetitive Abuse of the Orphan Drug Act: Invitation to High Prices: Hearing Before the Subcomm on Antitrust, Monopolies and Business Rights of the S. Comm. on the Judiciary*, 102nd Cong. (1992) (statement of James P. Love, Director, Taxpayer Assets Project), available at <http://www.cptech.org/ip/health/orphan/orphan92.html> (stating that Orphan Drug protection can even block patented products in certain cases).

²³³ *See* U.S. GAO, *supra* note 135.

²³⁴ *See* Orphan Drug Act, 21 U.S.C. §§ 360aa–360ee (2006).

²³⁵ *See* U.S. EPA, About Technology Innovation Program, <http://www.epa.gov/tio/about.htm> (last visited Oct. 10, 2009).

²³⁶ *Id.*

²³⁷ *Id.*

D. *The Office Should Create a Searchable Database*

There is a significant need for a central database housing information on available technologies.²³⁸ Problems have been noted with cities' abilities to obtain current information regarding climate change.²³⁹ Indeed, the EPA itself has recognized this need. In a recent evaluation by the EPA's Office of Inspector General, a number of EPA regions identified areas where additional information is needed for work on climate change issues.²⁴⁰ The needs that the EPA identified include: (1) gathering technical information on technologies that reduce greenhouse gas emissions and improve energy efficiency; (2) developing methods to assess the effectiveness of such technologies and climate change policies; and (3) creating strategies to adapt to and prevent climate change damage.²⁴¹ One reason that many of the EPA offices feel left in the dark is because the EPA's Office of Research and Development does not have a systematic way to communicate its research results.²⁴² To help facilitate communication among the EPA's various offices, the Office of Research and Development recently started a web-based tool called Environmental Science Connector and a public website called Science to Achieve Results.²⁴³ Although these measures are a step in the right direction, more still needs to be done to encourage communication of information on technologies that are available.

This proposed database should be viewed as something similar to, but more powerful than, the current databases the EPA

²³⁸ This need has been recognized and is part of legislative proposals. *See, e.g.,* Climate Stewardship and Innovation Act of 2007, S. 280, 110th Cong. § 319 (2007). This section provides that the "Secretary of Energy shall establish a national lessons-learned and best practices program to ensure that lessons learned and best practices concerning energy efficiency and greenhouse gas emission reductions are available to the public." *Id.*

²³⁹ *See* Dean Scott, *Improved Research, Dissemination Needed To Help States Prepare for Climate Impacts*, 40 ENV'T. REP. 623 (2009) (discussing recommendations for improved communication to assist local government decisions).

²⁴⁰ *See* U.S. EPA OFF. INSPECTOR GEN., *supra* note 11, at 7–8.

²⁴¹ *See id.*

²⁴² *Id.* at 16.

²⁴³ *See id.*

manages.²⁴⁴ For example, currently only general information about technology determinations made for controlling air pollution from stationary sources are disclosed to the public.²⁴⁵ To facilitate this disclosure, the EPA maintains an online searchable database, the BACT/RACT/LAER Clearinghouse, that shows permit determinations made by state and local air pollution control agencies.²⁴⁶ The information in this database includes some cryptic technology information, emissions limitations, and general process information.²⁴⁷ While this format could be a starting point for the creation of a comprehensive database, the level of information presented must be drastically increased to provide disclosure of new technologies.

The EPA also currently maintains a database called the New and Emerging Environmental Technologies (NEET) Clean Air Technologies Database.²⁴⁸ In NEET, owners, manufacturers, developers, and research sponsors can list both commercially available and emerging technologies.²⁴⁹ In contrast to the information in the RACT/BACT/LAER Clearinghouse, this database has information supplied by developers about technologies that have not yet been widely considered in the permitting process.²⁵⁰ A database for green licenses could incorporate some aspects of the EPA's current databases with more information to form a central repository.

²⁴⁴ See U.S. EPA, RACT/BACT/LAER Clearinghouse, <http://cfpub.epa.gov/rblc/htm/bl02.cfm> (last visited Oct. 11, 2009).

²⁴⁵ See U.S. EPA, Clean Air Technology Center, <http://www.epa.gov/ttn/catc/> (last visited Oct. 11, 2009).

²⁴⁶ See *supra*, note 244.

²⁴⁷ *Id.* A user of the database can search under any of these fields to find relevant permitting decisions. *Id.*

²⁴⁸ See U.S. EPA, New and Emerging Technology Database, <http://neet.rti.org/> (last visited Oct. 16, 2009). This particular database is maintained by a contractor with support from EPA's Office of Air Quality Planning and Standards. *Id.*

²⁴⁹ See *id.* Organizations have advertised this website to their constituents. See, e.g., Small Business Environmental, <http://www.smallbiz-enviroweb.org/compliance/environmentalcontroltechnologies.aspx> (last visited Oct. 11, 2009).

²⁵⁰ See U.S. EPA, New and Emerging Technologies, <http://neet.rti.org/neet/FAQ.htm> (last visited Oct. 16, 2009).

The EPA should start by first including all of the various technologies that are currently on the public market.²⁵¹ Many technologies are publicly available for free.²⁵² This availability may be especially helpful because small business owners and municipalities may not have access to technology that may be known by larger cities and companies. The proposed database would help solve this problem by facilitating disclosure. The included technologies should be categorized and indexed to test the utility of the database. This sort of indexing has been started by private companies, and to a certain extent, the EU, but it has not been attempted on a comprehensive scale.²⁵³ A comprehensive database of available climate change innovations would be an invaluable tool for industries trying to determine how to reduce their greenhouse gas emissions, and it should be a fundamental part of the proposed green technology program.

V. CONCLUSION

The comprehensive scope of the problem makes climate change different than other critical issues the U.S. has faced in the past. The U.S. needs to take a fresh look at its intellectual property policies and retool the framework to encourage climate change innovation. Current intellectual property law does not promote sufficient climate change innovations since many cannot qualify as patents, and, even if they do, the patent process is too long to be effective in mitigating climate change. Since many inventions can only qualify as trade secrets, they will not be disclosed to benefit the public. A green technology program would encourage development, disclosure, and use of climate change technology. This program should provide protection for a broader range of climate change innovations and should include compulsory licensing that values the innovations relative to their ability to mitigate climate change to ensure availability for public use. The program should be managed by the EPA and should be facilitated

²⁵¹ Some of this information has been made available by various organizations. *See supra* Part II.C.

²⁵² This may be because they were not protected by a patent or their patent protection has expired. *See id.*

²⁵³ *See id.*

by a comprehensive database that lists available innovations and the types of products and processes to which each innovation may be applied.