How Cap and Trade Will Fuel the Global Economy

by Aaron Ezroj

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Editors' Summary

Many commentators have expressed concerns that cap and trade will increase the costs faced by businesses and perhaps stall economic growth. While these concerns are understandable, as cap and trade will increase costs for at least some businesses, these commentators often fail to recognize the multitude of business opportunities that cap and trade will create. In fact, cap and trade programs and related measures will create new and exciting opportunities for the financial sector, low-carbon technologies, carbon capture-and-storage projects, plug-in and other advanced technology vehicles, and legal and nonlegal consulting. Cap and trade is not just an environmental effort that will curb the effects of global warming. It also presents a wide range of business opportunities that will fuel the global economy.

Cap-and-trade programs and related measures will spark a wide range of business opportunities. The financial sector will grow to facilitate hundreds of billions of dollars worth of climate change-related exchanges. By 2050, markets for low-carbon technologies are likely to be worth at least $500 billion annually, and possibly much more.[1] Numerous carbon capture-and-storage projects will emerge. Plug-in and other advanced technology vehicles will become the norm. Moreover, a plethora of legal and nonlegal consulting agencies will be advising government agencies and companies on climate change. Countries and companies should position themselves now in order to take full advantage of these opportunities.

The European Union (EU) has done the most to position itself and companies within it. Although it initially disfavored cap and trade, the EU has implemented the world's most expansive cap-and-trade program: the EU Emission Trading System (EU ETS).[2] Following the implementation of the EU ETS, financial markets in London are overseeing the trading of billions of dollars in carbon allowances. Diplomats in Brussels are negotiating guidelines for offset projects in China. Moreover, Copenhagen is becoming the global center for the development of wind turbine technology. These efforts have provided the EU and companies within it with a significant head start in positioning themselves for the transition to a low-emissions global economy.

Eying the success of cap and trade in Europe, New Zealand is moving forward with the New Zealand Emissions Trading Scheme (NZ ETS), Australia is moving forward with the Australian Carbon Pollution Reduction Scheme (CPRS), and individual states and provinces within the United States and

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1. Nicholas Stern, The Stern Review: Economics of Climate Change 270 (Cambridge Univ. Press 2007) (Lord Nicholas Stern led the development of the *Stern Review* while he served as the Head of the Government Economic Service for the United Kingdom (U.K.). The *Stern Review* is one of the most comprehensive studies of the economics of climate change.).
2. Jürgen Lefevere, The EU Greenhouse Gas Emission Allowance Trading Scheme 108 (Climate Change Policy 2005) (Jurgen Lefevere worked on the design of the EU ETS while at the Field School in London and currently oversees the program's operation as an Environment Director General.).

Canada are moving forward with their programs and joining larger regional collectives, such as the Regional Greenhouse Gas Initiative (RGGI) in the northeastern United States and the Western Climate Initiative (WCI) in the western United States and Canadian Provinces. The U.S. federal government is also contemplating putting together a program of enormous proportions, involving agencies such as the U.S. Environmental Protection Agency (EPA), the U.S. Department of Agriculture, the Federal Energy Regulatory Commission, and the Commodities Futures Trading Commission, among others. As more countries and regions enact cap-and-trade programs, these programs will fuel the global economy.

I. Financial Markets

In 2008, transactions on the global carbon market amounted to $92 billion.[3] There were over three billion spot, future, and option contracts traded for a variety of reasons, including compliance, risk management, and arbitrage.[4] Between 2007 and 2008, the value of transactions nearly doubled for the EU ETS.[5] As current cap-and-trade programs expand to cover more sectors of the economy and other countries and regions develop cap-and-trade programs, the global carbon market will continue to grow rapidly. While it is impossible to forecast the growth of this emerging sector with exact accuracy, it has been projected that if all developed countries had carbon markets covering all fossil fuels, the global carbon market would grow by 200%.[6] Moreover, if markets were established in all the top 20 emitting countries, the global carbon market would grow by 400%.[7] According to Louis Redshaw, the head of environmental markets at Barclays Capital: "Carbon will be the world's biggest commodity market, and it could become the world's biggest market overall."[8]

Allowances are the basic unit traded within the global carbon market.[9] A single allowance provides a compliance entity[10] with the right to emit one ton of carbon dioxide (CO_2) or CO_2 equivalent.[11] Allowances are introduced into the market through a distribution made by a government agency or an auction, and resulting revenue funds policy mandates. Allowances are then traded between compliance entities through market exchanges or over-the-counter transactions. At the end of each compliance period, compliance entities surrender allowances to a designated regulator for each ton of CO_2 or CO_2 equivalent that they emitted during the period.[12]

Emissions trading enables a compliance entity to emit more than permitted by its current holding of allowances if it can obtain spare allowances from another compliance entity. The overall environmental outcome is the same as if both compliance entities used their allowances exactly, but with the important difference that both buying and selling companies benefited from the flexibility allowed by trading.[13] Moreover, emissions trading encourages compliance entities to find cost-effective ways to reduce their emissions, which allows compliance entities to purchase fewer allowances.[14]

However, the price for allowances is not static. The price of an allowance can spike upward as a result of weather fluctuations. For instance, a low water year affects the generation of hydroelectricity.[15] The price of an allowance can spike downward if there is a recession, there is less demand for energy, and in turn compliance entities require less allowances to emit greenhouse gases (GHGs).[16] Moreover, the price of an allowance can change as a result of market speculation from investment banks who themselves have no compliance obligations but are still active in carbon markets. Or, the price of

3. The EU ETS had $91,910,000,000 worth of transactions, New South Wales had $183,000,000 worth of transactions, the Chicago Climate Exchange had $309,000,000 worth of transactions, the RGGI had $246,000,000 worth of transactions, and Assigned Amount Units had $211,000,000 worth of transactions. Karan Capoor & Philippe Ambrosi, State and Trends of the Carbon Market 2009 at 5 (World Bank 2009).
4. *Id.*
5. *Id.*
6. Stern, *supra* note 1, at 271.
7. *Id.*
8. James Kanter, *Carbon Trading: Where Greed Is Green*, N.Y. Times (June 20, 2007).
9. It is unclear whether offsets will one day trade in a similar manner as allowances and be fungible commodities. Some scholars have suggested that this will be the case. *See* Jonas Monast et al., U.S. Carbon Market Design: Regulating Emission Allowances as Financial Instruments 6 (Nicholas Inst. 2009) ("For the purposes of this paper, we assume that offset credits, once verified, will be eligible to trade in the marketplace in a manner similar to carbon allowances.").
10. Compliance entities are companies that are required to comply with a cap-and-trade program and purchase allowances for the greenhouse gases (GHGs) that they themselves emit or are responsible for in some other manner. The types of companies considered compliance entities varies between programs. For example, with the RGGI, only stationary utilities are compliance entities. RGGI Model Rule 12/31/08. On the other hand, California's cap-and-trade program and the proposed U.S. cap-and-trade program cover fuel deliverers in addition to stationary sources. Preliminary Draft Regulation for a California Cap-and-Trade Program, §95820 (California Air Resources Board 2009). H.R. 2454, 111th Cong. (2009).
11. *See* H.R. 2454, 111th Cong. §712 (2009) (listing CO_2 equivalence for various GHGs, CO_2 being 1, methane being 25, sulfur hexafluoride being 22,800, nitrogen trifluoride being 17,200, among others).
12. Monast et al., *supra* note 9, at 6-7; *see also generally* Justin Kirk, *Creating an Emissions Trading System for Greenhouse Gases: Recommendations to the California Air Resources Board*, 26 Va. Envtl. L.J. 547 (2008) (providing significant background information on California's cap-and-trade program and other programs).
13. Green Paper on Greenhouse Gas Emissions Trading Within the European Union COM (2000) 87.
14. *Id.*
15. Design Recommendations for the WCI Regional Cap-and-Trade Program, 1.11.4 (Western Climate Initiative 2009) (explaining that a three-year compliance period allows covered entities to manage short-term changes in operation and brace for low water years that affect the generation of hydroelectricity).
16. Capoor & Ambrosi, *supra* note 3, at 6 (providing a chart displaying how the price of allowances has responded to the recession during parts of 2008 and 2009).

allowances can change as a result of environmental nongovernmental organizations (NGOs) purchasing allowances to retire, and thus restricting the ability of compliance entities to emit GHGs.[17]

Furthermore, if compliance entities do not have enough allowances to surrender at the end of a compliance period, they will be forced to pay heavy penalties. The EU ETS fines compliance entities 100 euros for each ton of CO_2 or CO_2 equivalent emitted for which the operator has not surrendered an allowance.[18] RGGI has a 3x allowance penalty for each ton of CO_2 or CO_2 equivalent emitted for which the operator has not surrendered an allowance. Additionally, each day and each excess ton of emissions is considered separate violations of state law for which the source can be subject to administrative or civil fines and proceedings.[19]

Because the price for allowances fluctuates and compliance entities need to make sure that they will have enough allowances or else they will face heavy penalties, carbon markets currently include or are likely to include a number of financial instruments to manage risk.[20] These instruments, referred to as derivatives, include forward contracts, futures contracts, option contracts, and swaps. Forward contracts allow buyers and sellers to agree upon the delivery of allowances at a specified date.[21] Futures contracts give the holder the right to sell a specified quantity of allowances at a specific price within a specified time, regardless of the market price for allowances.[22] Option contracts give the holder the right to buy a specified quantity of allowances at a specific price within a specified period of time, regardless of the market price for allowances.[23] Lastly, swaps allow for the exchange of one asset or liability for another asset or liability.[24]

17. The EU ETS, for instance, allows for the voluntary retirement of allowances. "Member States shall take the necessary steps to ensure that allowances will be cancelled at any time at the request of the person holding them." Directive 2003/87/EC, art. 12.
18. Directive 2003/87/EC, art. 16:
    > Member States shall ensure that any operator who does not surrender sufficient allowances by 30 April of each year to cover its emissions during the preceding year shall be held liable for the payment of an excess emissions penalty. The excess emissions penalty shall be EUR 100 for each tonne of carbon dioxide equivalent emitted by that installation for which the operator has not surrendered allowances.
19. "There is a 3x allowance penalty, and each day and each excess ton of emissions will be considered separate violations of state law for which the sources can be subject to administrative or civil fines and proceedings." RGGI Model Rule 12/31/08 XX-6.5(d); *see also* state laws implementing guidelines proposed by the RGGI Model Rule: §22a-174-31: Control of Carbon Dioxide Emissions/CO_2 Budget Trading Program (Connecticut); 1147: CO_2 Budget Trading Program Regulations (Delaware); DEP Chapter 156: CO_2 Budget Trading Program Regulations (Maine); Subtitle 9: Maryland CO_2 Budget Trading Program Rules (Maryland); 310 CMR 7.70: CO_2 Budget Trading Program Regulations (Massachusetts); Chapter Env-A 4600: CO_2 Budget Trading Rule (New Hampshire); N.J.A.C. 7:27C: CO_2 Budget Trading Regulation (New Jersey); DEC Adopted Part 242: CO_2 Budget Trading Regulations (New York); Air Pollution Control no. 46: CO_2 Budget Trading Program (Rhode Island); and, Vermont CO_2 Budget Trading Program Regulations (Vermont).
20. Monast et al., *supra* note 9, at 7-8 (Energy industries have been using derivatives to manage the risk of fluctuations in fuel prices by locking in prices for future years. Compliance entities subject to a cap-and-trade program may have similar concerns over price fluctuations and derivatives contracts, for allowances could allow compliance entities the ability to manage this risk.).
21. Monast et al., *supra* note 9, at 7.
22. Monast et al., *supra* note 9, at 8.
23. *Id.*
24. *Id.*

In the EU ETS, the majority of allowance-based instruments are traded as derivatives, rather than allowances. Concerns over allowance price volatility or a low volume of allowances may also make this the case in a U.S. carbon market.[25]

Robust carbon markets, involving allowances and derivatives, will lead to numerous employment and investment opportunities. Large investment firms are well aware of the enormous potential that cap and trade presents for the financial industry and are already active in markets for carbon emissions and other climate-related commodities.[26] In 2006, Goldman Sachs made a minority equity investment in Climate Exchange PLC, which owns the European Climate Exchange, the Chicago Climate Exchange, and the newly created California Climate Exchange.[27]

II. Alternative Energy

In 2007, the size of the market for renewable energy products was approximately $38 billion and employed approximately 1.7 million people.[28] Overall, the market grew by 25% in 2005.[29] Within the overall total, some renewable energy technologies grew at an even faster rate. The global installcapacity of solar photovoltaic rose by 55% in 2005.[30] The market for wind power grew by nearly 50%.[31] In the year prior to August 2006, the market capitalization of solar companies grew 38-fold to $27 billion.[32] Growth in the biofuel sector only rose by 15% in 2005, but still the total market for the sector is worth over $15 billion.[33] It has been predicted that by the year 2050, the annual market for low-carbon technologies could be worth hundreds of billions of dollars and employ over 25 million people.[34]

A study conducted by the United Kingdom's (U.K.'s) Secretary of State for Energy and Climate Change, explained: "Climate change is not only one of the most significant challenges of our generation; it also presents a huge opportunity. Supplying the demands of a low-carbon economy offers a significant potential contribution to the economic growth and job creation in the U.K."[35] Further, the study projected that whole new industrial sectors may emerge and will provide around 100 billion pound sterling worth of investment opportunities and up to 500,000 U.K. renewable energy jobs.[36]

Moreover, the study emphasized:

> The current economic difficulties make this even more important: now is the not the time to scale back our ambi-

25. Monast et al., *supra* note 9, at 7.
26. Goldman Sachs, Environment, http://www2.goldmansachs.com/citizenship/environment/business-initiatives.html (last visited May 15, 2010).
27. *Id.*
28. Stern, *supra* note 1, at 270.
29. *Id.*
30. *Id.*
31. *Id.*
32. *Id.*
33. *Id.*
34. *Id.*
35. The U.K. Renewable Energy Strategy 27 (HM Government 2009).
36. *Id.* at 179.

> tions on tackling climate change and securing our energy supplies. The increased levels of investment in renewable energy in the U.K. and across Europe over the next decade and beyond will involve significant adjustment costs, but the high investment in renewable energy has the potential to boost our economy in the short term and will help kick-start our long-term transition to a low-carbon economy.[37]

The best way for a country and companies within it to capitalize on opportunities in the renewable energy market is to adopt a cap-and-trade program and related measures. Doing so allows for: (A) auction revenue to be allocated to alternative energy projects; (B) offsets enabling projects that would otherwise not be feasible; and (C) renewable energy certificates that subsidize the development of alternative energy projects.

A. *Auction Revenue Will Be Allocated to Alternative Energy Projects*

When allowances are auctioned, the revenue from the auction is used to fund specific policy mandates. In H.R. 2454, which details the U.S. House of Representative's proposal for a cap-and-trade program, allowance revenue is used to provide rebates for low- and moderate-income families; to offset increased costs faced by consumers of electricity, natural gas, and heating oil; to subsidize GHG capture and storage; to support other domestic and international technology programs; to safeguard the competitiveness of energy-intensive, trade-exposed industries; and to support domestic and international adaptation programs. From 2012 to 2050, 15% of allowance revenue will go to renewables, efficiency, GHG capture and storage, autos, and other green technologies.[38]

California's cap-and-trade program may also devote auction revenue to carbon reduction technologies, such as alternative energy projects. The Economic and Technology Advancement Advisory Committee, which has been advising the California Air Resources Board, recommended using allowance revenue to fund research and development and to support a green technology workforce training program.[39]

B. *Offset Credits Enable Projects That Would Otherwise Not Be Feasible*

Carbon offset credits are awarded for GHG reductions from renewable energy projects that are "additional," meaning that they would not have been financially viable without the prospect of revenue from the sale of offsets.[40]

Renewable energy projects are unlikely to qualify for offset credits within a U.S. cap-and-trade program because project developers would have difficulty demonstrating that a renewable energy project would not have been financially viable without the prospect of offset revenues. In a U.S. cap-and-trade program, energy sector emissions will likely be capped. This will make fossil fuels more expensive and thus make renewable energy sources more attractive.[41]

However, while domestic renewable energy projects are unlikely to qualify for offset credits in a national emissions reduction program, renewable energy projects will still qualify for offset credits in countries without GHG emissions controls on their energy sectors.[42] The EU encourages companies within it to support capacity-building activities in developing countries to help them take advantage of the Clean Development Mechanism (CDM) in a manner that supports sustainable development in the host's country.[43] Indeed, the Kyoto Protocol reads:

> The purpose of the CDM *shall be to assist Parties not included in Annex I in achieving sustainable development* and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3.[44]

Currently, a large percentage of offset credits are generated from renewable energy projects in countries without GHG emissions controls. Thirty-five percent of the projects in the CDM pipeline are renewable energy projects.[45] There are 399 wind CDM projects in China, producing 22,209 megawatts (MW) of electricity, and 320 wind CDM projects in India, producing 5,915 MW of electricity.[46] There are 819 hydro CDM projects in China, producing 25,896 MW of electricity, and 130 hydro CDM projects in India, producing 5,737 MW of electricity.[47] Moreover, 30% of the projects in the Joint Implementation (JI) pipeline are renewable energy projects.[48]

H.R. 2454 lays out a framework for international offset-crediting and emphasizes that credits can only be issued for projects in developing countries.[49] Thus, assuming that a large percentage of offset credits are generated from renew-

37. *Id.* at 27.
38. Climate Policy Memo #4—Distribution of Allowances Under the American Clean Energy and Security Act (Waxman-Markey) (Pew Center on Global Climate Change 2009).
39. Climate Change Scoping Plan 69-70 (California Air Resources Board, Dec. 2008).
40. There are various tests for additionality. These tests are best summarized in a study released by the U.S. Government Accountability Office (GAO). As explained in the study, the most popular test for additionality is financial additionality. This test finds an offset project to be additional if the project would have a lower than acceptable rate of return without revenue from offsets, and thus offsets are a decisive reason for implementing the project. Carbon Offsets: The U.S. Voluntary Market Is Growing, but Quality Assurance Poses Challenges for Market Participants 26-27 (U.S. GAO 2008).
41. Jonathan L. Ramseur, The Role of Offsets in a Greenhouse Gas Emissions Cap-and-Trade Program: Potential Benefits and Concerns 6 (Congressional Research Service 2008).
42. *Id.*
43. Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 Amending Directive 2003/87/EC Establishing a Scheme for Greenhouse Gas Emission Allowance Trading Within the Community, in Respect of the Kyoto Protocol's Project Mechanisms (L 338/22) (art. 1).
44. Kyoto Protocol, art. 12 (emphasis added).
45. UNEP RISO CENTRE, http://cdmpipeline.org/cdm-projects-type.htm (last visited Oct. 1, 2009).
46. *Id.*
47. *Id.*; *see also* Michael Wara, *Measuring the Clean Development Mechanism's Performance and Potential*, 55 UCLA L. Rev. 1759, 1780 (2008) (providing further detail on renewable energy projects in the CDM project pipeline).
48. UNEP RISO CENTRE, http://cdmpipeline.org/ji-projects.htm (last visited Oct. 1, 2009).
49. H.R. 2454, 111th Cong. §743 (2009).

able energy projects in countries without GHG emissions controls, offset credits will continue to enable projects that would otherwise not be feasible.

C. Renewable Energy Certificates Will Subsidize the Development of Alternative Energy Projects

Renewable Energy Certificates (RECs) are awarded for each MW-hour of renewable energy generated from qualifying renewable energy projects, such as wind, solar, geothermal, and certain hydropower projects.[50] Typically, RECs are unbundled and sold separately from the underlying electricity generated by renewable energy projects,[51] allowing renewable energy generators to sell both RECs and the wholesale electricity they produce. Overall, RECs act as a subsidy for the development of alternative energy projects.

Currently, REC registries are being set up in many states, regions, and countries.[52] California requires utilities to meet part of their electricity demand through renewable energy sources. The California Energy Commission estimates that renewable energy sources generate 12% of California's retail electricity load.[53] California S.B. 107 requires investor-owned utilities to increase the share of renewables in their electricity portfolios to 20% by 2010. At the same time, public-owned utilities are encouraged to meet the same target.[54] Recently, Gov. Arnold Schwarzenegger called for renewables to make up 33% of electricity portfolios and accordingly, it is anticipated that renewable energy sources will generate 33% of California's electricity by 2020.[55]

H.R. 2454 amends the Public Utility Regulatory Policies Act of 1978 to require retail electricity suppliers to meet 20% of their electricity demand through renewable energy sources and energy efficiency by 2020. Each retail electricity supplier that annually sells four million MW-hours of electricity or more would need to submit RECs equal to at least three-quarters of their allotted requirement.[56]

Other countries are also enacting systems involving mechanisms similar to RECs. For example, a Renewables Obligation (RO) was introduced in the U.K. in 2002. Under the RO, generators receive Renewable Obligation Certificates (ROCs) for renewable electricity. Electricity suppliers are incentivized to buy ROCs from generators, and ROCs provide renewable generators with financial support in addition to what they receive from selling their electricity. The RO has so far increased RO-eligible renewable electricity generation in the U.K. from 1.8% of the country's electricity load in 2002 to 5.3% of the country's electricity load in 2008.[57]

It is unclear whether RECs will be part of a cap-and-trade program or be a related measure in a larger climate change legislative package. Principally, RECs serve as proof that one MW-hour of electricity was generated and delivered to the grid from a qualifying renewable energy source, but the definition of RECs has been extended to imply or explicitly claim that RECs also offset GHG emissions and should be treated as offset credits.[58] There are, however, serious problems with treating RECs as offset credits. First, it is difficult to prove ownership with RECs. Operation of the electric power grid is complex, and it is difficult to establish linkage between renewable energy generation and changes in generation at other power plants on the grid.[59] Second, REC programs have eligibility requirements that do not necessarily consider additionality. While some renewable energy projects may not have been implemented without RECs, other projects may have been implemented without them.[60]

However, whether RECs are directly incorporated into a cap-and-trade program or whether they are supplemental as part of a larger climate change legislative package, they will certainly encourage the development of renewable energy projects.

III. GHG Capture and Storage

Cap and trade will also lead to the development of numerous GHG capture-and-storage projects. Domestic and international offset projects are rapidly increasing in number. In 2007, the value of transactions in the primary market for offset projects grew 34% to $8.2 billion. Currently, the market is dominated by the main offset mechanisms of the Kyoto Protocol: the CDM and the JI. In 2007, CDM transactions accounted for 87% of project-based transaction volumes and JI transactions doubled in volume and tripled in value. The remaining market activity was split among other compliance mechanisms and voluntary purchases.[61]

The offset market is highly sophisticated, involving a number of government, quasi-government, and private-sector participants. At its 21st meeting, the CDM Executive Board discussed work on the registration of CDM project activities as part of the CDM Management Plan. The CDM Executive Board decided to: "Make publicly available relevant information, submitted to it for this purpose, on proposed CDM project activities in need of funding and on investors seeking opportunities, in order to assist in arranging funding of CDM project activities, as necessary." Subsequently, the United Nations Framework Convention on Climate Change (UNFCCC) established the UNFCCC CDM Bazaar, which

50. Mark Holt & Gene Whitney, Greenhouse Gas Legislation: Summary and Analysis of H.R. 2454 as Passed by the House of Representatives 1 (Congressional Research Service 2009).
51. Michael Gillenwater, Redefining RECs (Part 1): Untangling Attributes and Offsets 1 (Princeton Univ. 2007).
52. *Id.* at 15.
53. Climate Change Scoping Plan 44 (California Air Resources Board, Dec. 2008).
54. California's largest public-owned utilities are also voluntarily adopting policies to achieve 20% renewables by 2010 or 2011. Climate Change Scoping Plan 45 (California Air Resources Board, Dec. 2008).
55. *Id.*
56. Mark Holt & Gene Whitney, Greenhouse Gas Legislation: Summary and Analysis of H.R. 2454 as Passed by the House of Representatives 1 (Congressional Research Service 2009).
57. The U.K. Renewable Energy Strategy, *supra* note 35, at 54.
58. Maintaining Carbon Market Integrity: Why Renewable Energy Certificates Are Not Offsets 2 (Offset Quality Initiative 2009).
59. Gillenwater, *supra* note 51, at 14.
60. Maintaining Carbon Market Integrity, *supra* note 58.
61. Anja Kollmuss et al., A Review of Offset Programs: Trading Systems, Funds, Protocols, Standards, and Retailers 4 (Stockholm Environment Inst. 2008).

is a web-based facility serving as a platform for the exchange of information on CDM project opportunities.[62]

There are offset retailers, such as Climate Trust, TerraPass, NativeEnergy, and Myclimate. Offset prices vary by factors, such as project type, location, and stringency of offset program requirements.[63] Certified emission reductions (CERs), awarded for CDM projects, and emission reduction units (ERUs), awarded for JI projects, can be valued at upward of 80% of the trading price of EU allowances.[64] Prices for voluntary offset credits vary significantly based on project types, project locations, standards used, offset quality, delivery guarantees, and contract terms.

Recently, JP Morgan agreed to purchase EcoSecurities, an offset aggregator, for $204 million.[65] EcoSecurities has been involved in the carbon market for over 10 years and has offices and representatives in more than 20 countries and five continents.[66] It sources, develops, and trades emissions reductions credits[67] and manages a diverse portfolio of credits, including different project types, project locations, volumes, technologies, methodologies, risk profiles, contract terms, volumes, and sustainability co-benefits.[68]

As more countries and regions enact cap-and-trade programs and the demand for offsets increases, two project types are likely to expand rapidly: (1) methane capture and destruction projects; and (2) biological sequestration projects.

A. *Methane Capture and Destruction Projects Will Become Extremely Popular*

Methane capture and destruction projects are likely to become extremely popular because methane has 25 times the heat-trapping ability of CO_2 and the global warming potential of GHGs influences the volume of offsets generated by a project. A developer who reduces one ton of methane gas receives 25 times the credits that they would receive for reducing one ton of CO_2.[69]

Current practices could be changed to curb emissions. For instance, in the United States, coal mines account for about 10% of all man-made methane emissions. Because the gas can present a safety risk for miners, methane released during the extraction of coals is removed through ventilation fans and vented into the atmosphere. Through an offset project, the methane could instead be recovered and burned to produce energy or flared to reduce its heat-trapping ability when it is released into the atmosphere.[70]

In 2007, about 49% of the U.S. offset supply was produced from projects that capture and destroy methane from coal mines, agricultural operations, or landfills.[71] Ninety-three of the 211 projects that produced U.S. offsets were methane projects.[72] The Clean Energy Jobs and American Power Act considers: "methane collection and combustion projects at active underground coal mines"; "methane collection and combustion projects at landfills"; and, "nonlandfill methane collection, combustion and avoidance projects involving organic waste streams that would have otherwise emitted methane in the atmosphere, including manure management and biogas capture and combustion."[73]

B. *Biological Sequestration Will Result in Numerous Forestry Projects*

Forestry and other land use projects aimed at sequestering GHGs will also increase in popularity. These projects can reduce and avoid the atmospheric buildup of GHGs in a number of ways. First, tree biomass and soils can act as carbon sinks, removing and storing CO_2.[74] Statistics released in an EPA study explained that afforestation can sequester 2.2-9.5 tons of CO_2 per acre per year,[75] and reforestation can sequester 1.1-7.7 tons of CO_2 per acre per year for 90 to more than 120 years before saturation occurs.[76] Second, CO_2 emissions can be avoided by using biofuels rather than fossil fuels.[77] Third, agricultural emissions from fertilizers can be reduced by changing livestock management and fertilizer applications.[78]

The Kyoto Protocol vaguely promised to include emissions reductions for forestry and other land use projects because these projects have the potential to sequester CO_2.[79] However, there are concerns about how much CO_2 these projects actually remove from the atmosphere, how to measure the CO_2 that they remove, and whether the removal from the

62. About the CDM Bazaar, http://www.cdmbazaar.net/about (last visited Dec. 9, 2009).
63. Kollmuss, *supra* note 61, at 13.
64. Kollmuss, *supra* note 61, at 13-14 (Even though in principle CERs, ERUs, and EU allowances are fully fungible, countries place limits on the amount of CERs and ERUs that compliance entities can purchase.); *see also* Kollmuss, *supra* note 61, at 15 (listing prices for offset credits on primary and secondary markets).
65. Michael Szabo & Paul Sandle, JP Morgan to Buy EcoSecurities for $204 Million (Sept. 14, 2009), *available at* http://www.reuters.com/article/idUSTRE58D37020090914.
66. EcoSecurities, Who We Are, http://www.ecosecurities.com/Home/EcoSecurities_the_carbon_market/Who_we_are/default.aspx (last visited May 15, 2010).
67. *Id.*
68. EcoSecurities, What We Do, http://www.ecosecurities.com/Home/EcoSecurities_the_carbon_market/What_we_do/default.aspx (last visited May 15, 2010).
69. U.S. GAO, *supra* note 40, at 16.
70. *Id.*
71. U.S. GAO, *supra* note 40, at 15.
72. U.S. GAO, *supra* note 40, at 16.
73. Clean Energy Jobs and American Power Act, 111th Cong. §733 (2009).
74. Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture 2-1 (U.S. EPA 2005).
75. Afforestation is the planting of trees on land that did not have trees for some period of time. Afforestation enhances carbon sequestration because land is allocated away from uses with relatively low carbon storage potential, such as crop agriculture, to forests that have high carbon storage potential. *Id.* at 2-2.
76. Forests can also be managed to enhance carbon sequestration. Landowners can use practices, such as fertilization, controlled burning, and thinning, and plant a mix of trees that aid one another to ensure the fastest and most efficient biomass growth and thus highest sequestration potential. *Id.* at 2-2.
77. *Id.* at 2-1.
78. *Id.*
79. The Kyoto Protocol set targets, methods, and timetables for global action against climate change. However, the Kyoto Protocol left a lot of questions unresolved, awaiting further negotiations. For instance, the accounting for forestry and other land use projects required further specification. Barbara Buchner, *The Dynamics of the Climate Negotiations* 27-29 (Climate Change Policy 2005).

atmosphere is permanent.[80] For these reasons, the use of forestry and other land use projects in meeting emissions targets has been controversial.[81] However, the United States and other economies with high energy-intensity and population growth, Australia and Canada, have pushed for a maximum of flexibility in achieving emissions reductions. The United States, specifically, has insisted on the inclusion of sinks from forestry and other land use projects.[82]

In 2007, 17% of the U.S. offset supply was generated from forestry and other land use projects.[83] This includes 52 forestry projects that produced about 7% of the total U.S. supply.[84] The Clean Energy Jobs and American Power Act considers awarding offset credits for: "projects involving afforestation or reforestation of acreage not forested as of January 1, 2009"; "forest management resulting in an increase in forest carbon stores, including harvested wood products"; "agricultural, grassland, and rangeland sequestration and management practices"; and, "changes in carbon stocks attributed to land use change and forestry activities."[85] Moreover, H.R. 2454 gives financial incentives to farmers and ranchers to plant trees.[86] According to an EPA analysis of H.R. 2454, about 18 million acres of new trees would be planted by 2020.[87] With the implementation of a U.S. cap-and-trade program, afforestation efforts would be even greater than those carried out by the Civilian Conservation Corps between 1933 and 1942, which planted 3 billion trees.[88]

IV. Plug-in and Other Advanced Technology Vehicles

Transportation is one of the largest sources of GHG emissions. In California, it is the largest source.[89] Cap and trade and related measures are taking steps to decrease emissions in this sector by encouraging the production and purchasing of plug-in and other advanced technology vehicles.

A. *Auction Revenue Will Be Allocated to Plug-in and Other Advanced Technology Vehicles*

Fuel providers are compliance entities in the proposed U.S. cap-and-trade program,[90] California's cap-and-trade program,[91] and New Zealand's cap-and-trade program.[92] Within these programs, auction revenue may be allocated to plug-in and other advanced technology vehicles. For example, under H.R. 2454, the U.S. cap-and-trade program contains significant incentives for automakers to produce plug-in and other advanced technology vehicles. In the beginning of the program, 3% of allowances would be allocated to the automotive sector to provide grants to refit or establish plants to build plug-ins and other advanced vehicles. Depending on the price of allowances, this allocation could end up being worth billions of dollars each year.[93]

B. *Consumers Will Switch to Plug-in and Other Advanced Technology Vehicles Because of Increased Fuel Costs*

Because fuel providers will have to purchase allowances in certain cap-and-trade programs, in these programs, their costs will increase and these costs will be passed on to consumers who will have to pay more for gasoline at the pump. Facing increased costs in gasoline, consumers will be incentivized to purchase plug-in and other advance technology vehicles. This trend was demonstrated in the 1980s, for instance, when consumers responded to high gasoline prices by driving smaller, more fuel-efficient cars.[94]

A study conducted by the Center for the Study of Energy Markets postulates that this trend may not be incredibly strong, especially with today's consumers, who may be less likely to curb their gas consumption with increased fuel prices than consumers in earlier decades. This could be because incomes have grown and consumers are now less sensitive to price increases because gasoline consumption is a smaller share of their budget. The study, however, looks at short-run rather than long-run gasoline price increases, and acknowledges that consumers may respond to higher gasoline prices in the long run by purchasing more fuel-efficient vehicles.[95]

C. *Low-Carbon Fuel Standards Will Encourage the Production of Alternative Energy Vehicles*

Additionally, programs aimed at reducing the carbon intensity of transportation fuels, such as a low-carbon fuel standard (LCFS), will encourage the production of alternative energy vehicles. The California Air Resources Board developed an LCFS that requires fuel providers to track the average life-cycle GHG intensity of their products, including production, transportation, storage, and fuel use,[96] and reduce the aver-

80. Carbon stored in tree biomass can be preserved to avoid release of the gas into the atmosphere. When a forest is eventually harvested, some carbon is immediately released into the atmosphere, and later more is released into the atmosphere as the wood products decompose. Short-lived products, such as paper, release carbon quickly, and long-lived products, such as housing lumber, release carbon more slowly. U.S. EPA, *supra* note 75, at 2-4.
81. Buchner, *supra* note 80, at 29.
82. Buchner, *supra* note 80, at 24-25.
83. U.S. GAO, *supra* note 40, at 14.
84. U.S. GAO, *supra* note 40, at 16.
85. Clean Energy Jobs and American Power Act, 111th Cong. §733 (2009).
86. H.R. 2454, 111th Cong. §205 (2009).
87. Traci Watson, Climate Plan Calls for Forest Expansion, USA Today, Aug.19, 2009).
88. *Id.*
89. Climate Change Scoping Plan 46 (California Air Resources Board, Dec. 2008).
90. H.R. 2454, 111th Cong. (2009).
91. Preliminary Draft Regulation for a California Cap-and-Trade Program, §95820 (California Air Resources Board 2009).
92. Climate Change (Liquid Fossil Fuels) Regulations 2008, 2008/356.
93. Holt & Whitney, *supra* note 50, at 3.
94. Jim Wells, Energy Markets: Gasoline Price Trends (U.S. GAO 2005).
95. *See generally* Jonathan E. Hughes et al., Evidence of a Shift in the Short-Run Price Elasticity of Gasoline Demand (Center for the Study of Energy Markets, Working Paper, 2006).
96. Alexander E. Farrell & Daniel Sperling, A Low-Carbon Fuel Standard for California 7 (Univ. Cal., Davis 2007).

age life-cycle GHG intensity of transportation fuels they sell in California by at least 10% by 2020.[97]

Following California's lead, the EU, several other U.S. states, and some Canadian provinces are developing LCFS proposals.[98] The U.K. has also introduced the U.K. Renewable Transport Fuel Obligation Programme, which includes reporting requirements and methodologies for calculating life-cycle GHG emissions and requires fuel providers to ensure biofuels constitute 2.5% of total road transport fuels in 2008-2009, 3.75% in 2009-2010, and 5% after 2009-2010.[99]

It is unclear how LCFS and other programs aimed at reducing the carbon intensity of transportation fuels will fit into a cap-and-trade program. A study prepared by the Center for the Study of Energy Markets recommended that California's LCFS should be kept separate from California's cap-and-trade program for at least the first 10 years to ensure innovation and investment in low global warming-intensive fuel technologies.[100] However, whether these standards are directly incorporated into a cap-and-trade program or whether they are supplemental as part of a larger climate change legislative package, they will certainly encourage the production of alternative energy vehicles.

VI. Legal and Nonlegal Consulting

Because of the introduction of cap-and-trade programs and related measures, a plethora of legal and nonlegal consulting agencies will be advising companies and government agencies on climate change.

A. Numerous Regulatory, Corporate Securities, and Project Finance Legal Positions Will Be Created

There will be an enormous need for regulatory attorneys to advise their clients on complying with cap-and-trade programs and related climate change measures. There are a growing number of regulations on climate change, and there is already extensive case law on climate change.[101] In the landmark case, *Massachusetts v. EPA*, for the first time, the U.S. Supreme Court officially acknowledged climate change. According to the Court:

> A well-documented rise in global temperature has coincided with a significant increase in the concentration of carbon dioxide in the atmosphere. Respected scientists believe the two trends are related. For when carbon dioxide is released into the atmosphere, it acts like the ceiling of a greenhouse, trapping solar energy and retarding the escape of reflected heat.[102]

There are also cases that shed light on whether a project emitting GHGs is required to complete an environmental impact statement (EIS) under the National Environmental Protection Act (NEPA)[103] or under a similar impact statement under a state law, such as the California Environmental Quality Act (CEQA).[104] NEPA requires government agencies to prepare an EIS when a project has "significant" environmental impacts. According to NEPA, "all agencies of the Federal Government shall . . . include in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on the environmental impact of the proposed action."[105] Although a single project will likely only have a small impact on global warming, when separate projects pursued by an agency have cumulative impacts, NEPA requires an agency to assess the impacts on a cumulative basis.[106] Additionally, federal financial assistance can federalize state and local proj-

97. *See* Exec. Order No. S-01-07 (Jan. 18, 2007), *available at* http://gov.ca.gov/executive-order/5172/
> WHEREAS California's dependence on a single type of transportation fuel whose price is highly volatile imperils our economic security, endangers our jobs, and jeopardizes our industries; and WHEREAS diversification of the sources of transportation fuel will help protect our jobs and economy from the consequences of oil price shocks; and WHEREAS alternative fuels can provide economic development opportunities and reduce emissions of greenhouse gases, criteria pollutants, and toxic air contaminants. NOW, THEREFORE, I, ARNOLD SCHWARZENEGGER, Governor of the State of California, by virtue of the power invested in me by the Constitution and statutes of the State of California, do hereby order effective immediately: 1. That a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020 ("2020 Target"). 2. That a Low Carbon Fuel Standard ("LCFS") for transportation fuels be established for California.

AB 32 gives the California Air Resources Board the authority to implement market-based environmental programs. "The state board may include in the regulations adopted pursuant to Section 38562 the use of market-based compliance mechanisms to comply with the regulations." Assembly Bill No. 32, Chapter 488, §38570(a) (2006); *See also* Climate Change Scoping Plan 46-47 (California Air Resources Board, Dec. 2008) (providing background information on California's LCFS).

98. Mary D. Nichols, California's Climate Change Program: Lessons for the Nation, 27 UCLA J. Envtl. L. & Pol'y 185, 205 (2009) (Mary D. Nichols currently serves as the chairman of the California Air Resources Board and previously served as the Assistant Administrator of Air and Radiation for EPA.)
99. Farrell & Sperling, *supra* note 97, at 9.
100. Farrell & Sperling, *supra* note 97, at 51-52.
101. *See generally* Michael B. Gerrard & J. Cullen Howe, Climate Change Litigation in the U.S. (Dec. 29, 2009) *available at* http://www.arnoldporter.com/resources/documents/ClimateChangeLitigationChart.pdf#page=1&view=fit (providing an excellent outline of climate change litigation in the United States).
102. Massachusetts v. EPA, 549 U.S. 497, 504-05, 37 ELR 20075 (2007); *id.* at 521 (*Massachusetts* commenced when a citizen suit was brought by a group of states, local governments, and environmental and scientific organizations urging EPA to regulate GHG emissions from new motor vehicles under the Clean Air Act and EPA refused to do so. The Court held that EPA's refusal to regulate GHG emissions presented a risk of harm to Massachusetts that was "actual" and "imminent.").
103. 42 U.S.C. §§4321-4370f, ELR Stat. NEPA §§2-209.
104. *See, e.g.*, Friends of the Earth v. Watson, 2005 WL 2035596, 35 ELR 20179 (N.D. Cal. 2005); Border Power Plant Working v. Dep't of Energy, 260 F. Supp. 2d 997 (S.D. Cal. 2003); *see also* Michael B. Gerrard, Global Climate Change and U.S. Law 215-19 (ABA 2007) (summarizing NEPA global warming case law); CEQA and other state environmental laws are patterned after NEPA. *See* California Department of Transportation v. City of South Lake Tahoe, 466 F. Supp. 527, 539 (E.D. Cal. 1978).
105. 42 U.S.C. §4332.
106. Gerrard, *supra* note 105, at 217 (citing 33 U.S.C. §1362(6)).

ects, bringing them under NEPA,[107] and a federal law can federalize private development.[108]

Major international law firms are already positioning themselves for the transition to a low-emissions global economy. On a webpage dedicated to climate change, Arnold & Porter explains:

> As the significance and complexity of the global climate change issue and the responses to it grow, we work with clients to evaluate how their businesses may be affected by climate change, including current and impending regulation, and to decide what consequent business actions and legal positions they should consider or take.[109]

Other international law firms are similarly positioning themselves. For example, Baker & McKenzie released a client alert explaining how RGGI will affect their clients.[110]

In addition to advising their clients on the law, regulatory attorneys will be needed to help their clients work with government agencies. Specifically, they will be needed to help their clients report GHG emissions to agencies such as EPA and the California Air Resources Board.[111] Attorneys will be needed to negotiate initial allowance allocations and to walk their clients through the development and approval of offset projects.[112] Attorneys will also be needed to represent their clients before the Federal Energy Regulatory Commission[113] and the California Public Utilities Commission[114] in case of a dispute.

Rapidly expanding carbon markets will also require numerous corporate attorneys to advise and assist their clients with purchasing, trading, and selling allowances and allowance derivatives. Corporate attorneys will also be needed to work with government agencies, such as the Securities and Exchange Commission[115] and the Commodities Futures Trading Commission.[116]

The increased use of RECs and other incentives for renewable energy will also lead to the development of more renewable energy projects and a greater need for project finance attorneys, who play a major role in the development of these projects. Project financing allows for the financing of infrastructure through non-recourse loans that are repaid with cash flows from the project. Project financing involves a number of parties, such as project developers, investors, and banking institutions. Milbank is one firm, for instance, specializing in this area of the law and coordinating efforts between parties. In the last three years, the firm has completed over 140 project finance deals that have raised more than $125 billion for energy and infrastructure projects.[117]

B. Market Monitoring, Emissions Monitoring, and Other Nonlegal Consulting Positions Will Emerge

Cap and trade also requires significant monitoring and will involve nonlegal consultants to fulfill these tasks. Two areas that are already requiring consultation are the monitoring of carbon markets and GHG emissions. Currently, Potomac Economics is tasked with oversight and monitoring for RGGI. According to Potomac Economics' website, the company provides independent expert monitoring of the competitive performance and efficiency of the RGGI allowance market. First, it identifies attempts to exercise market power, collude, or in some other way manipulate prices in the auction and the secondary market. Second, it makes recommendations regarding proposed market rule changes to improve efficiency in the market. Third, it assesses whether auctions properly follow the notice auction rules and procedures. Together, these efforts encourage competition and increased confidence in the RGGI allowance market.[118]

Environmental NGOs and businesses are also working to establish standards for reporting GHG emissions. The World Resources Institute, a U.S.-based environmental NGO, and the World Business Council for Sustainable Development, a Geneva-based collection of 170 international companies, spearheaded an effort to develop internationally accepted GHG accounting and reporting standards for business and promoted their broad adoption.[119] The Greenhouse Gas Protocol Corporate Standard, which has emerged from this effort, covers the accounting and reporting of the six GHGs covered by the Kyoto Protocol: CO_2,

107. Daniel R. Mandelker, NEPA Law and Litigation §1:4 (Thomson Reuters/West, 2008).
108. *Id.*
109. Arnold & Porter LLP, Climate Change, http://www.arnoldporter.com/practices.cfm?u=ClimateChange&action=view_sub&id=459&parent_id=295 (last visited May 15, 2010).
110. New York Issues Proposed Rule Under RGGI: A First Look at Future Carbon Regulation in the U.S., Client Alert (Baker & McKenzie Dec. 2006); *see also, e.g.*, Davis Wright Tremaine LLP, Climate Change, http://www.dwt.com/Practices/Energy/ClimateChange (last visited Jan. 9, 2010); Orrick, Energy, http://www.orrick.com/practices/global/energy.asp (last visited Jan. 9, 2010); Hogan & Hartson, Climate Change, http://www.hhlaw.com/climatechange/ (last visited Jan. 9, 2010); Pillsbury, Climate Change & Sustainability Multidisciplinary Team, http://www.pillsburylaw.com/index.cfm?pageid=56&itemid=33 (last visited Jan. 9, 2010); Fulbright & Jaworski L.L.P., Climate Change, http://www.fulbright.com/climatechange (last visited Jan. 9, 2010).
111. H.R. 2764, 110th Cong. (2008). Regulation for the Mandatory Reporting of Greenhouse Gas Emissions, Subchapter 10, Article 2, §§95100 to 95133, tit. 17, California Code of Regulations.
112. *See, e.g.*, Preliminary Draft Regulation for a California Cap-and-Trade Program, §96220-96390 (California Air Resources Board 2009) (explaining the steps for the approval, registration, verification, and issuance of offset projects).
113. What FERC Does, http://www.ferc.gov/about/ferc-does.asp (last visited Dec. 21, 2009) (The Federal Energy Regulatory Commission regulates the interstate transmission of electricity, natural gas, and oil.).
114. About Us, http://www.cpuc.ca.gov/PUC/aboutus/ (last visited May 21, 2010) (The California Public Utilities Commission regulates privately owned electric, natural gas, telecommunications, water, railroad, rail transit, and passenger transportation companies.).
115. What We Do, http://www.sec.gov/about/whatwedo.shtml (last visited May 21, 2010) (The mission of the Securities and Exchange Commission is to protect investors, maintain fair, orderly, and efficient markets, and to facilitate capital formation.).
116. About the CFTC, http://www.cftc.gov/aboutthecftc/index.htm (last visited Dec. 21, 2009) (The Commodity Futures Trading Commission monitors futures markets.).
117. Milbank, Project Finance, http://www.milbank.com/en/PracticeAreas/ProjectFinance_alpha.htm (last visited May 21, 2010).
118. Potomac Economics, Emissions Allowance Market Monitoring, http://www.potomaceconomics.com/practice_areas/emissions_allowance_market_monitoring (last visited May 15, 2010).
119. Janet Ranganathan, The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard 2 (World Resource Inst. 2004).

methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride.[120]

According to the creator's of the Greenhouse Gas Protocol Corporate Standard, it was designed for the following reasons. First, it was designed to create a standardized approach for companies to prepare a GHG inventory. Second, it was designed to simplify and reduce the costs of compiling a GHG inventory. Third, it was designed to provide businesses with information that can help them manage and reduce GHG emissions. Finally, it was designed to increase consistency and transparency in GHG accounting and reporting.[121]

VII. Conclusion

Cap and trade and related measures are not just environmental efforts that will curb the effects of global warming. They also present a wide range of business opportunities that will fuel the global economy. This includes growth in the financial sector, the development of low-carbon technologies, numerous carbon capture-and-storage projects, increased production of plug-in and other advanced technology vehicles, and a plethora of legal and nonlegal consulting opportunities. Countries and companies should position themselves now in order to take full advantage of these opportunities.

120. *Id.* at 3.
121. *Id.*