Denver Law Review

Volume 77 | Issue 2 Article 2

January 2021

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PROMETHEUS RE-BOUND: HOW ADOPTION OF THE KYOTO PROTOCOL ON CLIMATE CHANGE WOULD DEVASTATE THE WESTERN U.S. COAL INDUSTRY

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As it approaches the 21st century, the new millennium, and all that, the U.S. coal industry does not lack for metaphorical models drawn from Greek mythology. Confronted on all sides by acronymed ambuscaders—EPA, IRS, OSM, BLM, MSHA and others—the coal industry might well identify with Hercules in his battle with Hydra, the nine-headed monster capable of growing two new heads for each one the Titan was able to lop off. Sisyphus and his uncooperative boulder provide an apt analogy for the industry's frustration with trying to convince the average American that energy doesn't originate in a wall outlet, that, in fact, over 50% of this nation's electrical energy originates in a coal mine.[1]

In light of the current debate on global climate change and its implications for the future of the coal industry, however, the myth of Prometheus provides a most compelling metaphor. Prometheus, of course, was the Titan who stole fire from heaven and brought it down to earth, much to the displeasure of Zeus. For his audacity the Titan was exiled to Scythia where he was chained to an outcrop on Mount Caucasus. Each day a vulture would feed on his liver; each night the liver would rejuvenate itself.

There is more to the myth of Prometheus than this mere outline of the facts conveys. For example, the name "Prometheus" means "foresight," a virtuous trait that explains the Titan's motive in stealing fire from the gods in the first place. Prometheus and his brother, Epimetheus, were given the task of creating man and the animals:

> Epimetheus accordingly proceeded to bestow upon the different animals the various gifts of courage, strength, swiftness, sagacity; wings to one, claws to another, a shelly covering to a third, etc. But when man came to be provided for, who was to be superior to all other animals, Epimetheus had been so prodigal of his resources that he had nothing left to bestow upon him. In his perplexity he resorted to his brother Prometheus, who, with the aid of Minerva, went up to heaven, and lighted his torch at the chariot of the sun, and brought fire down to man. With this gift man was more than a match for all other animals.[2]

Prometheus' foresight lay in what he knew the gift of fire, i.e., energy, would provide for mankind:

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1. Not long ago at a Washington, D.C. reception, an apparently well-educated gentleman was heard to declare that coal was a primitive, outmoded and irrelevant source of energy. It was his opinion that the U.S. ought to embark on a crash program to convert from coal to a cleaner fuel such as "electricity."

2. THOMAS BULLFINCH, BULLFINCH'S MYTHOLOGY 13 (1979).

> It enabled him to make . . . tools with which to cultivate the earth; to warm his dwelling, so as to be comparatively independent of climate; and finally to introduce the arts and to coin money, the means of trade and commerce.[3]

In Aeschylus' *Prometheus Bound*, the Titan, himself, describes the impact of his action on mankind:

> [T]hey, before as babes,
> By me were roused to reason, taught to think.
> In one short word, then, learn the truth condensed,
> All arts of mortals from Prometheus spring.[4]

If, as is chemically the case, coal is nothing more than stored solar energy, i.e., the "fire" that Prometheus appropriated from the gods in order to make civilization possible, the identification of the coal industry with the mythical Titan is most appropriate. As the title of this Article suggests, however, the coal industry may be facing the same fate as Prometheus.

In December of 1997, over 160 countries, including the United States, negotiated the Kyoto Protocol, a framework for establishing mandatory limits on the emission of greenhouse gases by developed nations.[5] By the terms of the Protocol, some of those nations, designated Annex B countries,[6] would be required to meet specified greenhouse gas emission levels relative to the levels they emitted in 1990.[7] For example, the United States would be required to reduce its greenhouse gas emissions to a level 7% below 1990 levels.[8] Such reductions would have to be achieved between the years 2008 and 2012 with additional reductions thereafter subject to further negotiation.[9]

Because carbon emissions account for 83% of all U.S. greenhouse gas emissions,[10] and since more than 98% of all U.S. carbon emissions can be traced to

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3. *Id.*

4. Aeschylus, *Prometheus Bound*, *in* NINE GREEK DRAMAS 166, 182–84 (Charles W. Eliot ed., 1937).

5. *See* Kyoto Protocol to the United Nations Framework Convention on Climate Change (Mar. 18, 1998) <http://www.unfccc.de/resource/docs/convkp/kpeng.pdf> [hereinafter Protocol].

6. Countries listed in Annex B include: Australia, Austria, Belgium, Belarus, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, European Community, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, and the United States. United Nations Framework Convention on Climate Change (last modified Oct. 12, 1999) <http://www.unfccc.de/resource/conv/index.html> (hereinafter Framework). Turkey and Belarus declined to pledge reductions in their emissions pursuant to the Kyoto Protocol. OFFICE OF INTEGRATED ANALYSIS AND FORECASTING, U.S. DEPT. OF ENERGY, IMPACTS OF THE KYOTO PROTOCOL ON U.S. ENERGY MARKETS AND ECONOMIC ACTIVITY xi n.2 (1998) [hereinafter EIA IMPACT STUDY].

7. *See* Protocol, *supra* note 5, at art. 3.

8. *See* Protocol, *supra* note 5, at Annex B.

9. *See* Protocol, *supra* note 5, at art. 3.

10. *See* EIA IMPACT STUDY, *supra* note 6, at xii.

the burning of fossil fuels,[11] the production of energy from coal will undoubtedly be a principle focus of emissions reduction efforts should the United States seek to implement the dictates of the Kyoto Protocol. Indeed, both governmental and private organizations have attempted to estimate the economic impact of the Kyoto Protocol on energy production and fuel selection over the next two decades with the coal industry a primary focus of these studies.

This article will focus on the projected impact of the Kyoto Protocol on U.S. coal production in general and western U.S. coal production in particular assuming, of course, that the U.S. Senate elects to ratify the Protocol (to date, the Clinton Administration did not submitted the Protocol for ratification, and, as will be noted below, the Senate has expressed profound reservations with respect to the Protocol in its current form). The discussion will begin with a brief history of the western coal industry, followed by a summary of the evolution of the global warming theory and its acceptance by the international political community, as evidenced by the development of the Kyoto Protocol. That will be followed by an overview of various economic predictions based on the assumption of the implementation of the Kyoto Protocol. The consequential implications for the future use of coal are then discussed. Lastly, the paper will attempt to set forth the issues faced by American decision makers in weighing the pros and cons of adopting the Kyoto Protocol or any other international attempt to address the matter of global climate change.

I. THE RISE OF WESTERN COAL

The first historical record referring to coal in the New World is a map of what is now northern Illinois charted in 1673-1674 by Louis Joliet and depicting the presence of "charbon de terra."[12] Following the discovery of coal near Richmond, Virginia in 1701, an 18th century map of the upper Potomac River refers to several "cole mines" along the current West Virginia-Maryland border.[13] It is well established, however, that Native Americans utilized coal for pottery firing long before the settlers arrived.[14]

The first recorded coal use west of the Mississippi was in 1804 when the Lewis and Clark expedition stopped in present-day North Dakota to construct a blacksmith's forge fueled by lignite.[15] Contemporaneously, coal was used to heat a Spanish fur trader's outpost in what is now Montana.[16] In 1854, the Territorial Legislature of Utah offered a $1,000 reward to anyone who could discover a coal supply within 40 miles of Salt Lake City,[17] while by the early 1860's coal mined near Denver was used to heat that city's homes and businesses.[18] The true

11. *See* Office of Integrated Analysis and Forecasting, U.S. Dept. of Energy, Emissions of Greenhouse Gases in the United States 1997 15 (1998) [hereinafter EIA Emissions Report].

12. *See* Office of Coal, Nuclear, Electric and Alternate Fuels, U.S. Dept. of Energy, Coal Data: A Reference 1 (1995).

13. *See id.*

14. *See* Office of Coal, Nuclear, Electric and Alternate Fuels, U.S. Dept. of Energy, State Coal Profiles 11 (1994) [hereinafter EIA State Coal Profiles].

15. *See id.* at 67.

16. *See id.* at 59.

17. *See id.* at 91.

18. *See id.* at 23.

spur to the development of the western U.S. coal industry, however, was the establishment, expansion and maintenance of the transcontinental railway system.

Beginning in 1835, Congress began granting rights of way to railroads through public lands, a logical outgrowth of rights of way granted for canals in the earlier years of the republic.[19] In 1850, Stephen A. Douglas, of Lincoln-Douglas debate fame, championed land grants beyond traditional rights of way as an added incentive to the construction of railroads on public lands.[20] Those land grants provided readily available resources such as timber and stone for the construction of the rail lines themselves.

The opening of the west as an adjunct to railway development, however, came to full fruition with the passage of two Pacific Railroad Acts. The Act of 1862[21] incorporated the Union Pacific Railroad while the Act of 1864[22] established the Northern Pacific Railroad.[23] In addition to providing 400 foot wide rights of way to the railroads, the statutes also provided land grants of up to 20 sections of land[24] for every mile of railway constructed from Omaha to Missouri.[25] In addition, Congress withdrew up to 25 miles of land on either side of the rights of way and prohibited entry for settlement or homesteading except for those claims already established.[26]

In all, Congress granted nearly 94 million acres of public lands to the railroads themselves and nearly an additional 224 million acres to states for development of lands served by railroad expansion.[27] Of the approximately 320 million acres of total land grants, 30% or 97 million acres were located in those western states now chiefly associated with coal mining: Arizona (18.3 million acres); Colorado (8.2 million acres); Montana (20.7 million acres); New Mexico (16.2 million acres); North Dakota (13.9 million acres); Utah (9.7 million acres); and Wyoming (10.1 million acres).[28]

A condition was placed upon the railroad land grants in the initial 1862 Act, i.e., that "all mineral lands shall be excepted from the operation of this act."[29] That exception was modified in the 1864 Act, however, when Congress provided that the term "mineral lands" was not intended to include coal and iron lands.[30] Thus, Congress expressed its intent that coal and iron, like stone and

19. *See* PAUL W. GATES, PUB. LAND LAW REVIEW COMM'N, HISTORY OF PUBLIC LAND LAW DEVELOPMENT 357 (1968).

20. *See id.*

21. Pacific Railroad Act of 1862, ch. 120, 12 Stat. 489 (1862).

22. Pacific Railroad Act of 1864, ch. 217, 13 Stat. 365 (1864).

23. Subsequent legislation established the Atlantic and Pacific Railroad (Act of July 27, 1866, ch. 278, 14 Stat. 292 (1866)), and the Texas Pacific Railroad (Act of March 8, 1871, ch. 122, 16 Stat. 573 (1871)).

24. A section measures 640 acres.

25. *See* GATES, *supra* note 19, at 364.

26. *See* GATES, *supra* note 19, at 364.

27. *See* GATES, *supra* note 19, at 385.

28. *See* GATES, *supra* note 19, at 385. For purposes of this Article, discussion of "western coal" will be confined to these seven states.

29. Pacific Railroad Act of 1862, ch. 120, § 3, 12 Stat. 489, 492 (1862).

30. *See* Pacific Railroad Act of 1864, ch. 217, § 3, 13 Stat. 365, 367–68 (1864).

timber in the earlier enactments, were meant to be utilized in the construction, expansion, and maintenance of the railway system. That intent was ratified in *Northern Pacific Railway Co. v. Soderberg*,[31] when the Supreme Court acknowledged that both coal and iron were necessary materials to the construction and operation of the railroads.[32]

Contemporaneous to the passage of the initial railroad acts, Congress began addressing the sale of federal coal lands in 1864. As part of the Townsite Act of 1864, Congress provided for the public sale of coal lands pursuant to Presidential order.[33] Such lands were to be sold in tracts of "suitable legal subdivisions" for a minimum of $20 per acre.[34] Thereafter, Congress amended the 1864 Act by allowing entry onto federal lands by those persons "in the business of bona fide actual coal-mining" for purposes of purchasing tracts of up to 160 acres.[35]

The size of acquirable tracts was increased in 1873 with the passage of the Coal Lands Act, which provided that associations of four or more persons could qualify to purchase up to 640 acres of federal coal land if they could show that they had expended at least $5,000 in the development and improvement of the coal mine or mines situated on the land.[36] The 1873 Act further provided that each person or association was entitled to acquire only one tract, and that a minimum price of $20 per acre be set for lands within 15 miles of an existing railroad and $10 per acre for lands beyond the 15 mile swath.[37]

Other than the Act for the Protection of the Lives of Miners in the Territories,[38] which set rudimentary mine safety standards and provided for a coal mine inspector in each Territory, no further significant legislation affecting coal mines was passed until the first decade of this century when Congress adopted the Coal Land Acts of 1909[39] and 1910.[40] Those Acts were passed as a result of President Roosevelt's decision to withdraw federal lands that, in the judgment of the Director of the Geological Survey, contained exploitable coal deposits.[41] From mid to late 1906, the Acting Secretary of the Interior carried out Roosevelt's policy

31. 188 U.S. 526 (1903).

32. *Soderberg*, 188 U.S. at 529–30. Coal, of course, was necessary to the forging of steel to produce rails as well as a fuel for steam–powered locomotives. Thus, for example, the Union Pacific Railroad developed eight mines in Wyoming from 1869 to 1888, and by 1885 that railroad company owned or controlled most of the coal production in Colorado. Thomas E. Root, *Railroad Land Grants from Canals to Transcontinentals* 1987 A.B.A. NATL. RESOURCES SEC., MONOGRAPH SERIES NO.4 70–71.

33. *See* Pacific Railroad Act of 1864, ch. 205, 13 Stat. 343 (1864).

34. *Id.*

35. *See* Act of Mar. 3, 1865, ch. 107, 13 Stat. 529 (1865).

36. *See* Act to Provide for the Sale of the Lands of the United States Containing Coal, ch. 279, 17 Stat. 607 (1873), *superseded by* Mineral Leasing Act of 1920, ch. 85, 41 Stat. 437 (1920).

37. *See id.*

38. *See* ch. 564, 26 Stat. 1104 (1891).

39. *See* 30 U.S.C. § 81 (1994).

40. *See* 30 U.S.C. §§ 83–85 (1994).

41. *See* GATES, *supra* note 19, at 726. Roosevelt's motivation for the withdrawals is believed to have been a growing concern that the provisions of the earlier Coal Lands Acts limiting entries upon coal lands to one per person or one per association were being circumvented through the use of dummy entries, strawmen, or by the acquisition of coal lands under the pretense of acquiring them pursuant to other federal land grant programs such as the various agricultural and homesteading acts. GATES, *supra* note 19, at 726.

by issuing orders withdrawing approximately 66 million acres from coal development.[42]

Congress countered the withdrawals by allowing for entry upon coal lands for agricultural and homesteading purposes, but reserved to the U.S. government the right to prospect, mine, and remove the coal.[43] Finally, in 1920 Congress adopted a comprehensive approach to the development of coal and other resources such as oil, gas, and several nonmetallic minerals, when it passed the Mineral Leasing Act of 1920.[44] That Act provided that coal rights on federal lands would be obtainable only through a leasing system.[45] If exploitable coal reserves were known to exist on a federal parcel, rights to mine the coal would be made subject to competitive bids.[46] If, on the basis of prospecting activity on a federal parcel, a lease applicant was able to demonstrate the presence of previously undiscovered coal reserves in commercial quantities, that lease applicant would be given a preferential right to the coal.[47]

Once the railroads provided a reliable market for readily accessible coal, and federal acquisition procedures were implemented, coal production in the western states grew rapidly from the late 1800's into the early decades of this century.[48] The energy needs of the country during World War I provided an additional spur to production.[49]

A combination of factors, including oil and gas development in the Southwest and Wyoming, the rise of hydroelectric power in the Northwest, and, of course, the devastating effects of the Great Depression resulted in a sharp decline in coal production in the 1920's and 1930's.[50] The demands of World War II sparked a slight resurgence in western production in the first half of the 1940's, but only Utah, at about 7 million short tons produced annually during the 1940's, appreciably exceeded the levels it had reached in the 1920's.[51] In the aggregate, the production for the seven states addressed here totaled only about

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42. GATES, *supra* note 19, at 726.

43. *See* 30 U.S.C. § 81 (1994).

44. *See* ch. 85, 41 Stat. 437 (codified as amended at 30 U.S.C. §§ 181–263 (1994)).

45. *See id.* at § 2, 41 Stat. at 438–39; 30 U.S.C. §184(a).

46. *See id.* at § 2; 41 Stat. at 438; 30 U.S.C.§ 201(a), *repealed by* scattered sections of 30 U.S.C. §§ 181–352 (1994), subject to valid existing rights.

47. *Id.*

48. *See* DEPT. OF ENERGY, *State Coal Profiles* (visited Oct. 15, 1999) <http://www.eia.doe.gov/cneaf/coal/statepro/imagemap/usaimagemap.htm> [hereinafter EIA State Coal Profiles Website].

49. During that period Colorado led coal production in the western states producing 12 million short tons by 1920. Wyoming was a close second producing more than 9 million short tons during World War I. Utah, Montana, and New Mexico, respectively, reached 6 million, 5 million, and 4 million short tons, by 1920, while North Dakota reached production levels of 1 million short tons of lignite during the same period. While Arizona coal utilization dates back to pre–Columbian times, its production levels until the 1970's are negligible in comparison with its fellow western states. EIA STATE COAL PROFILES, *supra* note 14, at 11, 23, 59, 63, 67, 87, 91, 107. *See also* EIA State Coal Profiles Website, *supra* note 48 (illustrating through state–by–state graphs the fluctuations in production).

50. *See* EIA STATE COAL PROFILES, *supra* note 14, at 23, 59, 67, 91.

51. *See* EIA STATE COAL PROFILES, *supra* note 14, at 91.

28 million short tons in 1947.[52] Thereafter, the western coal industry experienced a further precipitous decline in production during the 1950's and early 1960's owing to the railroads' replacement of coal-fired steam locomotives with diesel-powered engines.[53]

Two momentous events in the early 1970's fostered the boom in western coal production that continues to this day: the passage of the Clean Air Act[54] in 1970 and the Arab oil embargo of 1973-1974. The Clean Air Act mandated that stationary sources, such as electricity generating power plants, reduce their emissions of identified pollutants including sulfur oxides.[55] Given the choice between installing scrubbers and shifting to lower sulfur fuel, electric utilities actively sought new fuel sources in the West where the sulfur content of the coal, on the whole, was markedly lower than the sulfur content found in the traditional coal fields of the Midwest and Appalachia.[56]

The Arab oil embargo spurred Congress to enact legislation aimed at reducing America's reliance on foreign and, in many cases, unpredictable supply lines for its ever-expanding energy needs. Through passage of the Energy Supply and Environmental Coordination Act of 1974,[57] and the Powerplant and Industrial Fuel Use Act of 1978,[58] Congress went on record as supporting a switch from oil and natural gas to coal as the preferred fuel for electricity generation. Given the circumstances of international turmoil and domestic agitation for stricter environmental controls, the slumping fortunes of western coal were ripe for rejuvenation.[59]

By the mid-1990's the sleeping giant had indeed awakened. In 1997, the combined tonnages of bituminous, subbituminous, and lignite coal in the states of Arizona, Colorado, Montana, New Mexico, North Dakota, Utah, and Wyoming equaled 446 million short tons or about half of all U.S. production.[60] Wyoming alone accounted for more than a quarter of U.S. production, at 282 million tons.[61] Thus, in a little more than a century the western coal industry increased its

52. *See* EIA State Coal Profiles Website, *supra* note 48.

53. *See* EIA STATE COAL PROFILES, *supra* note 14, at 59, 91.

54. 42 U.S.C. §§ 7401–7671 (1994).

55. *See id.* § 7403(g)(1).

56. *See* EIA STATE COAL PROFILES, *supra* note 14, at 23, 27, 31, 59.

57. *See* Pub. L. No. 93–319, § 2, 88 Stat. 246 (codified at 15 U.S.C. §§ 791–98 (1994)).

58. Pub. L. No. 95–620, 92 Stat. 3289, *repealed in part by* Act of May 21, 1987, Pub. L. No. 100–42, 101 Stat. 310 (1987).

59. One commentator noted the following:

> For more than a century, western coal was the prisoner of geography. It was present in enormous abundance, but lay too far from major markets. Railroads mined a moderate amount for their own use, but that market died with the steam locomotive. Relatively small amounts were produced for western steel mills and other industrial use.
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> . . .
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> Finally the sleeping giant of western coal is beginning to awaken. Western coal is low in sulfur content, and that automatically gives it new value in the eyes of midwestern utilities.

E.B. Leisenring, Jr., *Western Coal—The Sleeping Giant*, *in* Nineteenth Annual Proceedings of the Rocky Mountain Mineral Law Institute 1, 6–7 (1974).

60. *See* Dept. of Energy, *Coal Production by State*, (visited Nov. 19, 1999) <http://www.eia.doe.gov/cneaf/coal/html/t1p01p1.html>.

61. *See id.*

yearly output by 430 million tons.[62] Even more astounding, the recoverable reserves at currently producing mines in those states (excluding Arizona) now stand at more than 11 billion short tons.[63]

II. "GLOBAL WARMING" AND THE INTERNATIONAL RESPONSE

The Swedish Nobelist Svante August Arrhenius (1859-1927) is credited with the first articulation of the global warming theory in an Article entitled *On the Influence of Carbonic Acid in the Air Upon the Temperature of the Ground*, in which he argued that variations in the earth's temperature were owing to increases or decreases in the quantity of carbon dioxide (then, "carbonic acid") in the atmosphere.[64] Arrhenius' speculations on the absorptive qualities of atmospheric gases led to the conclusion by others that the earth is not warmed solely by the radiant energy of the sun; rather, the radiant energy reflected back by the earth's surface is absorbed by atmospheric gases which trap heat in the lower atmosphere to create the so-called greenhouse effect.[65]

Were it not for the naturally occurring greenhouse effect, scientists speculate that the average temperature of the Earth's surface would be minus 19 degrees Celsius as opposed to actual average temperature of plus 15 degrees Celsius.[66] The gases most responsible for capturing heat to create the greenhouse effect are: water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NO), and a number of man-made chemicals called halocarbons, which include chlorofluorocarbons (CFC's) and hydro chlorofluorocarbons (HCFC's).[67]

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62. *See* EIA State Coal Profiles Website, *supra* note 48.

63. *See* Energy Info. Admin., Dept. of Energy, Recoverable Coal Reserves at Producing Mines by State (visited Nov. 19, 1999) <http://www.eia.doe.gov/cneaf/coal/cla/html/t25p01pl.html>.

64. Svante August Arrhenius, *On the Influence of Carbonic Acid in the Air upon the Temperature of the Ground*, PHILOSOPHICAL MAG. 237 (1896), *reprinted* at the Nobel Prize Internet Archive (visited Oct. 12, 1999) <www.almaz.com/nobel/chemistry/1903a.html> with link to excerpted text located at <http://maple.lemoyne.edu/~guinta/Arrhenius.html>. The original article was an extract from a paper presented by Arrhenius to the Royal Swedish Academy of Sciences on Dec. 11, 1895.

65. *See* EIA EMISSIONS REPORT, *supra* note 11, at 1. The greenhouse effect has been explained as follows:

> [Greenhouse gases] are relatively transparent to incoming shortwave radiation, but are relatively opaque to outgoing longwave radiation. The latter radiation, which would otherwise escape to space, is trapped . . . within the lower levels of the atmosphere. The subsequent re-radiation of some of the energy back to the Earth maintains higher surface temperatures than would occur if the gases were absent.

EIA EMISSIONS REPORT, *supra* note 11, at 150.

66. *See* EIA EMISSIONS REPORT, *supra* note 11, at 1–2.

67. *See* EIA EMISSIONS REPORT, *supra* note 11, at 3–5. Water vapor's prevalence in the atmosphere (owing to the continuous process of evaporation condensation and precipitation) dwarfs that of the other greenhouse gases; it accounts for 1% of the atmosphere while carbon dioxide constitutes less than 0.04 percent. *Id.* at 2. Methane, in turn, accounts for 0.005 percent of the atmosphere, while nitrous oxide comprises 0.0009 percent. *Id.* at 1 tbl.1. The halocarbons, measured in parts per trillion versus parts per million for carbon dioxide, methane, and nitrous oxide, have been addressed elsewhere by the international community because of their potentially adverse effect

It is important to keep in mind that the vast percentage of so-called greenhouse gases occurs naturally. For example, of the 157.5 billion metric tons[68] of carbon dioxide released into the atmosphere in 1992, 150 billion metric tons were naturally produced by releases from the oceans (90 billion metric tons), aerobic decay of vegetation (30 billion metric tons), and plant and animal respiration (30 billion metric tons).[69] Accordingly, carbon dioxide attributed to human activity, or anthropogenic carbon dioxide, now amounts to about 4.5% of the total carbon dioxide released on an annual basis.[70]

The theory of global warming postulates that naturally occurring greenhouse gases are maintained in a state of equilibrium by their being absorbed and removed from the atmosphere.[71] For instance, in the carbon-cycle, carbon dioxide is absorbed by plants and through the process of photosynthesis is converted into oxygen, which is released into the atmosphere, and carbon, which becomes part of the plants' biomass.[72] According to one group of experts, the Intergovernmental Panel on Climate Change (IPCC),[73] the increased production of anthropogenic carbon dioxide since the dawn of the industrial age has upset the natural equilibrium of the carbon cycle.[74]

The IPCC was established in 1988 by the WMO and UNEP to assess the scientific, technical, and socio-economic issues associated with climate change.[75] Thereafter, in 1990, the United Nations formed the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change, the work of which culminated in the issuance of the Framework Convention on Climate Change (FCCC) adopted in May of 1992 and presented for signature in Rio de Janeiro in June of that year.[76] The United States was among the 160 nations to sign the agreement referred to as the Rio Treaty, which called for voluntary efforts to reduce emissions of carbon dioxide to 1990 levels by the year 2000.[77]

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on the ozone layer. Montreal Protocol on Substances That Deplete the Ozone Layer, Sept. 16, 1987, 26 I.L.M. 1541, 1551.

68. Unless otherwise indicated, all references to tons are to metric tons. One metric ton is equal to 1.102 short tons. EIA EMISSIONS REPORT, *supra* note 11, at 4 n.5.

69. *See id.* at 2 tbl. 2, 4.

70. The anthropogenic shares of methane and nitrous oxide are more difficult to determine. In a document released in 1995, the Intergovernmental Panel on Climate Change (IPCC), an international body commissioned by the United Nations, estimated that total methane naturally emitted between 1980 and 1990 was within a range of 110–210 million metric tons, while 300–450 million tons could be attributed to human activity. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 1995: THE SCIENCE OF CLIMATE CHANGE 92–93 (1996) [hereinafter IPCC CLIMATE CHANGE 1995].

71. *See* EIA EMISSIONS REPORT, *supra* note 11, at 1–2.

72. *See* EIA EMISSIONS REPORT, *supra* note 11, at 4.

73. *See* text accompanying footnote 75.

74. IPPC CLIMATE CHANGE 1995, *supra* note 70, at 59–60. The Intergovernmental Panel on Climate Change (IPCC) has estimated that carbon dioxide levels in the atmosphere have increased 25% since the dawn of the industrial age owning to anthropogenic activities such as the use of fossil fuels for transportation, electricity generation, and heating, as well as to the removal of carbon dioxide absorbing plants through deforestation. IPPC CLIMATE CHANGE 1995, *supra* note 70, at 59. *See also infra* note 80 and accompanying text.

75. *See* EIA IMPACT STUDY, *supra* note 6, at 2.

76. *See* EIA IMPACT STUDY, *supra* note 6, at 2.

77. *See* EIA IMPACT STUDY, *supra* note 6, at xi.

Thereafter, the FCCC Committee established a Conference of the Parties (COP) to begin implementing the Rio Treaty.[78] In 1995, the COP issued what is referred to as the Berlin Mandate, directing Annex B countries to take "appropriate action" to set overall limitation and reduction targets for greenhouse gases to be implemented in the year 2000 and beyond.[79] Meanwhile, the IPCC, in 1995, issued an Assessment Report, which despite its recognition of significant scientific uncertainties, declared that the "balance of evidence suggests . . . a discernable human influence on global climate."[80] These various activities culminated in the Kyoto Protocol, which established binding emissions targets for the Annex B countries relative to their 1990 emissions levels.[81] Under the Protocol, the established emissions targets must be reached between 2008 and 2012, but demonstrable results must be shown by 2005.[82] The target levels are to be maintained through 2012 and further reductions may be instituted by the COP.[83] The Protocol does not dictate any particular means of reducing emissions but does offer options such as the enhancement of carbon sinks[84] through reforestation and other land use changes, and the encouragement of energy efficiency.[85] The Protocol also provides for emissions trading among Annex B countries, and credits for developed nations that sponsor projects for reducing emissions in developing nations.[86]

Developed countries are allowed to bank Clean Development Mechanisms (CDM) credits achieved prior to 2008 for future use, but they cannot borrow against anticipated allowances.[87] Annex B countries may also join together to create an umbrella or bubble arrangement whereby they can collectively reach their aggregate target through trade-offs among themselves.[88]

Despite the range of options, however, there are innumerable uncertainties as to how the Protocol will actually work. The parties have not yet determined whether and how to account for emissions credits owing to the enhancement of carbon sequestration through carbon sinks and other land use initiatives.[89] Likewise, no system exists for establishing emissions credits and overseeing their

78. *See* EIA IMPACT STUDY, *supra* note 6, at 2.

79. *See* EIA IMPACT STUDY, *supra* note 6, at 2.

80. IPCC CLIMATE CHANGE 1995, *supra* note 70, at 5.

81. *See* EIA IMPACT STUDY, *supra* note 6, at 3.

82. *See* EIA IMPACT STUDY, *supra* note 6, at 3.

83. *See* EIA IMPACT STUDY, *supra* note 6, at xiii.

84. *See* Framework, *supra* note 6, at art. 1. "Carbon sinks" refers to vegetation, such as forests or soil reservoirs that absorb or take up released carbon from another part of the carbon cycle.

85. EIA IMPACT STUDY, *supra* note 6, at 3–4. With respect to the last option, the Protocol establishes a Clean Development Mechanism (CDM) whereby Annex B countries can collect emissions credits for technology transfers to non–Annex B countries that provide demonstrable and long–term reductions in emissions. Such activities are to be evaluated and certified through a mechanism to be developed under the Protocol. EIA IMPACT STUDY, *supra* note 6, at 4.

86. *See* EIA IMPACT STUDY, *supra* note 6, at 4.

87. EIA IMPACT STUDY, *supra* note 6, at 4.

88. EIA IMPACT STUDY, *supra* note 6, at 4. For example, the emissions target for the European Community is 8% below its aggregate 1990 levels, as is the target for each of its members. *Id.* By mutual agreement, however, the members could reallocate their respective responsibilities to meet the umbrella target. Protocol, *supra* note 5, at art. 4.

89. *See* EIA IMPACT STUDY, *supra* note 6, at 4.

trading among developed nations.[90] Further, no system of sanctions for outright nonattainment of targets or misrepresenting efforts to achieve attainment has been developed.[91]

In its current manifestation, the Protocol exempts developing nations from any legal obligation to reduce their greenhouse gas emissions although they may "volunteer" to enter the ranks of Annex B countries through amendment of the Protocol.[92] That exemption was crucial to the acceptance of the Protocol by developing nations that argued that the imposition of emissions targets upon them would stymie their efforts to establish and expand their economies.[93] It should be noted, however, that among the exempted nations are some of America's formidable or potentially formidable trade competitors, e.g., China, India, Mexico, and Brazil.[94] Moreover, unrestrained by the dictates of the Protocol, the developing nations will account for an ever-increasing share of global greenhouse gas emissions.[95] For example, in 1990 the developing nations emitted 25% of global carbon emissions.[96] By 2015, that percentage will rise to more than 50% of the global target anticipated by the Protocol.[97]

III. ECONOMIC IMPACTS OF THE KYOTO PROTOCOL

There is no want of opinion on the impacts of America's implementation of the Kyoto Protocol. The Clinton Administration released three prominent and significantly conflicting scenarios: one by the President's Council of Economic Advisors (CEA);[98] one by the Energy Information Administration (EIA) within the Department of Energy;[99] and a third, also emanating from the Department of Energy, known as the Five Lab Study.[100] Several private sector studies have also been issued, five of which have been selected by the EIA in its own study for purposes of comparison with its projections on economic impact: the WEFA Study,[101] the CRA Study,[102] the MIT Study,[103] the EPRI Study,[104] and the DRI Study.[105]

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90. *See* EIA IMPACT STUDY, *supra* note 6, at xi.

91. *See* EIA IMPACT STUDY, *supra* note 6, at 4.

92. *See* EIA IMPACT STUDY, *supra* note 6, at 4.

93. *See* EIA IMPACT STUDY, *supra* note 6, at 4.

94. *See* Global Warming: The High Cost of the Kyoto Protocol, National and State Impacts, WHARTON ECONOMETRICS FORECASTING ASSOCIATES 10 (hereinafter WEFA).

95. *See id.* at 14.

96. *See id.* This percentage is a close approximation.

97. *See id.*

98. *Administration Economic Analysis: Meeting the Challenge of Climate Change at a Reasonable Cost*, 148 DAILY REP. FOR EXECUTIVES (BNA) T-1 (July 31, 1998). The CEA scenario is also summarized in testimony presented by Dr. Janet Yellen, CEA Chairman, given before the House Commerce Committee's Subcommittee on Energy and Power on March 4, 1998.

99. EIA IMPACT STUDY, *supra* note 6.

100. Dept. of Energy, Interlaboratory Working Group on Energy-Efficient and Low-Carbon Technologies, Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy Technologies by 2010 and Beyond 1.1 (1997).

101. WEFA, *supra* note 94.

102. EIA IMPACT STUDY, *supra* note 6, at 137. Paul M. Bernstein and W. David Montgomery of Charles River Associates are acknowledged as contributors to the comparison study. No formal

The EIA study is, by far, the most comprehensive analysis of the effects of the Kyoto Protocol and will, therefore, serve as the principle analytical source for this discussion.[106] The merits and demerits of the global warming theory are beyond the scope of this Article. So are also the persuasiveness or lack thereof exhibited by the various economic studies that have been produced in the wake of the Kyoto Protocol. The purpose of this Article is to lay before the reader the range of potential impacts thus far identified by the EIA with respect to the use of coal, including western coal, if this country adopts the Kyoto Protocol as currently structured. That said, reference to other studies will be made as appropriate.

IV. THE EIA STUDY

At the behest of the U.S. House of Representatives Committee on Science, the EIA, in October of 1998, issued its study entitled *Impacts of the Kyoto Protocol on U.S. Energy Markets and Economic Activity.*[107] The Committee requested that the EIA consider several possible scenarios involving various potential levels of carbon reduction by the United States in response to the Kyoto Protocol focusing on "U.S. energy use and prices and the economy in the 2008–2012 time frame," i.e., the time frame within which the Protocol directs the developed nations to reach their initial emissions targets.[108]

In preparing its analysis, EIA utilized its National Energy Modeling System (NEMS), a comprehensive integrated computer model capable of simulating all elements of energy supply and demand within the context of the nation's macroeconomy.[109] The NEMS is used to produce EIA's annual American Energy Outlooks that set forth year-by-year projections for U.S. energy production and consumption through the year 2020.[110] The report includes a projection, called the "reference case," which plots the energy-use horizon on the assumption that all existing laws and regulations will be fully implemented, and that no new relevant laws or regulations will be passed during the period under review.[111] The reference case can then serve as a baseline for comparing scenarios that incorporate significant regulatory or policy changes.[112]

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title is given to the CRA Study beyond that acknowledgment. EIA IMPACT STUDY, *supra* note 6, at 137 & n.91.

103. Henry D. Jacoby et al., CO_2 Emissions Limits: Economic Adjustments and the Distribution of Burdens, 1997 ENERGY J. 31.

104. Alan Manne & Richard Richels, *On Stabilizing CO_2 Concentrations—Cost-Effective Emission Reduction Strategies*, 2 ENVTL. MODELING & ASSESSMENT 251–65 (1997).

105. Standard and Poor's DRI, The Impact of Meeting the Kyoto Protocol on Energy Markets and the Economy (1998).

106. EIA IMPACT STUDY, *supra* note 6.

107. EIA IMPACT STUDY, *supra* note 6.

108. EIA IMPACT STUDY, *supra* note 6, at iii.

109. *See* EIA IMPACT STUDY, *supra* note 6, at 6.

110. *See* EIA IMPACT STUDY, *supra* note 6, at 6.

111. *See* EIA IMPACT STUDY, *supra* note 6, at 8.

112. *See* EIA IMPACT STUDY, *supra* note 6, at 6.

Against the reference case, EIA posits six scenarios involving different reduction targets for carbon emissions.[113] The six cases, in reverse order of stringency, are: 1990 + 24% carbon emissions; 1990 + 14% carbon emissions; 1990 + 9% carbon emissions; 1990 carbon emissions; 1990 – 3% carbon emissions; and 1990 – 7% carbon emissions.[114]

The EIA study then determines the costs of achieving each target level. This determination is made by first establishing a "carbon price" and then applying it to the cost of energy.[115] EIA defines a "carbon price" as "the marginal cost of reducing carbon emissions to the specified level or, conversely, the value of consuming the last metric ton of carbon," and likens it to the price that could be established through a carbon emissions permit system.[116] The carbon price in this case, i.e., the price per ton of carbon emissions, is then applied to each of the energy fuels at its point of consumption relative to its carbon content.[117]

In order to arrive at the carbon price for each case, EIA makes certain assumptions, which, while not shared by other analysts, are at least consistent throughout the various scenarios. For example, EIA assumes that carbon sinks and other carbon sequestration activities by the U.S. would result in the absorption of 3% of America's carbon emissions.[118] Second, because the final contours of an international system for trading carbon emissions permits are too uncertain, EIA assumes the creation of an intra-U.S. trading system for auctioning of carbon emissions permits, and assumes that the price achieved through that system would be the same as that achieved through an international system.[119] Third, EIA does not assume that the United States would receive credits for technology transfer programs entered into with developing nations under the CDM provisions of the Protocol.[120] Lastly, EIA does not assume that new nuclear plants would come on line but it does assume that all currently operating units would continue to operate through 2020.[121]

As for the time frames for achieving the emissions targets, EIA's analysis conforms to the expectations of the Protocol: demonstrable steps toward compliance by 2005; attainment of the reduction targets between 2008 and 2012; and, maintenance of the target levels until 2020 or until further reductions are negotiated pursuant to international agreements.[122] Given those assumptions, the EIA

113. *See* EIA IMPACT STUDY, *supra* note 6, at 10.

114. EIA IMPACT STUDY, *supra* note 6, at 10–11. The study concentrates on three of the six scenarios, the 1990 + 24% case, the 1990 + 9% case, and the 1990 – 3% case. EIA IMPACT STUDY, *supra* note 6, at 11. For comparison purposes, the reference case, i.e., business as usual with no mandated reductions, would amount to 1990 + 33% carbon emissions, or 1791 million tons. EIA IMPACT STUDY, *supra* note 6, at 10.

115. EIA IMPACT STUDY, *supra* note 6, at 11.

116. EIA IMPACT STUDY, *supra* note 6, at 12.

117. EIA IMPACT STUDY, *supra* note 6, at 11. The higher the carbon content of a given fuel, the higher the carbon emissions and, in turn, the carbon price. Among its fossil competitors, coal produces the highest carbon emissions, natural gas the lowest, and oil somewhere in between. Nuclear power, hydropower, and other renewables produce no carbon emissions and carry no carbon prices. EIA IMPACT STUDY, *supra* note 6, at 11.

118. *See* EIA IMPACT STUDY, *supra* note 6, at 9.

119. *See* EIA IMPACT STUDY, *supra* note 6, at 13.

120. *See* EIA IMPACT STUDY, *supra* note 6, at 5.

121. *See* EIA IMPACT STUDY, *supra* note 6, at 25.

122. *See* EIA IMPACT STUDY, *supra* note 6, at xiii.

study estimates the carbon price for each case (expressed in 1996 dollars per ton of carbon emissions) as follows:[123]

	2010	**2020**
1990 + 24%	$ 67.00	$ 99.00
1990 + 14%	129.00	123.00
1990 + 9%	163.00	141.00
1990	254.00	200.00
1990 – 3%	294.00	240.00
1990 – 7%	348.00	305.00

With these carbon prices established, EIA proceeds to analyze their effect on the marketability of each energy fuel under each scenario.[124] First, the marketability of coal is severely if not fatally eroded because coal combustion produces more carbon emissions than any of its competitors.[125] No matter how efficient the industry becomes in producing, transporting, and utilizing its product, absent a method for recovering carbon emissions, coal will be saddled with a "carbon tax" that would overwhelm whatever productivity gains it might achieve over the next two decades.[126]

The average delivered price per ton of coal, reflecting the costs of production, transportation, and its "carbon price" for each scenario is shown in the following chart:

123. EIA IMPACT STUDY, *supra* note 6, at xv–xvi tbl. ES1 & tbl. ES2.
124. *See* EIA IMPACT STUDY, *supra* note 6, at 12.
125. *See* EIA IMPACT STUDY, *supra* note 6, at xvi & xix fig. ES9.
126. EIA IMPACT STUDY, *supra* note 6, at xv–xvi.

Coal Prices to Electricity Generators (1996 Dollars/Short-ton)[127]

	2005	2010	2020
Reference Case	23.37	22.20	19.56
1990 + 24%	25.96	57.03	71.95
1990+ 14%	49.51	90.53	85.72
1990 + 9%	64.24	109.56	95.33
1990	69.51	162.69	129.43
1990 - 3%	74.07	185.47	156.60
1990 - 7%	79.18	214.75	197.61

While the relative prices of other fossil fuels also increase in relation to the reference case because they, too, must absorb a carbon price add-on, they do not increase as dramatically as the price of coal owing to their relatively lower carbon content.[128] For example, in the 1990 + 9% case, the average price for delivered coal (base price plus carbon price premium) to electricity generating plants increases 346 to 368 percent over the reference case in the 2008–2012 period, while the price of natural gas increases only 64 to 74 percent, and the price of oil increases only 25 to 29 percent.[129]

Beyond the competitive disadvantage coal would experience vis-à-vis other fossil fuels, it would suffer in comparison with nuclear power and renewable fuels as they would not be subject to any carbon price premium. Consequently, under the 1990 + 9% case, coal's market share in the electricity generating sector falls from nearly 20 quadrillion BTUs to about 5 quadrillion BTUs between 2005 and 2020.[130] Conversely, the 15 quadrillion BTU gap is filled by (in de-

127. *See* EIA IMPACT STUDY, *supra* note 6, at 202–203 tbl. B16. The delivered price per short ton in 1996 is set at $26.45.

128. *See* EIA IMPACT STUDY, *supra* note 6, at 22.

129. *See* EIA IMPACT STUDY, *supra* note 6, at 22.

130. *See* EIA IMPACT STUDY, *supra* note 6, at 29 fig. 22.

scending order of market share) natural gas, nuclear power, hydroelectric power, renewables, and oil.[131]

As coal's competitiveness declines, its annual production also declines, as shown in this chart:

U.S. Coal Production (in Millions of Tons)[132]

	2005	**2010**	**2020**
Reference Case	1,242	1,287	1,376
1990 + 24%	1,182	1,032	805
1990 + 14%	1,090	785	538
1990 + 9%	989	624	405
1990	946	418	207
1990 - 3%	924	369	172
1990 - 7%	867	313	144

A consequence of the decline in production will be a steady and substantial decline in coal mine employment as shown in this chart:

131. *See* EIA IMPACT STUDY, *supra* note 6, at 29 fig. 22.
132. *See* EIA IMPACT STUDY, *supra* note 6, at 202–03 tbl. B16.

Coal Mining Jobs[133]

	2005	2010	2020
Reference Case	75,000	68,519	60,000
1990 + 24%	75,000	58,223	40,000
1990 + 14%	75,000	50,224	37,500
1990 + 9%	75,000	42,531	25,000
1990	75,000	32,053	15,000
1990 - 3%	75,000	29,187	12,500
1990 - 7%	75,000	25,486	11,000

The EIA analysis treats coal as a heterogeneous commodity and distinguishes among ranks, e.g., bituminous, subbituminous and lignite, by BTU output, or by sulfur dioxide and ash content.[134] This treatment makes it somewhat difficult to extrapolate specific consequences for western coal across the various scenarios. EIA does, however, speculate that because, for the most part, western coal must be transported significantly greater distances than its eastern counterpart, it will suffer the disadvantage of having to absorb both its own carbon price as well as that associated with transportation, i.e., the carbon price of fuel for diesel locomotives, barges, and trucks.[135]

Moreover, given the precipitous downturn in demand for coal, EIA anticipates that investment in coal, if there is any, will be in rejuvenating existing older mines rather than in initiating new ones.[136] Because most new mining has

133. *See* EIA IMPACT STUDY, *supra* note 6, at 114 tbl. 23, fig. 109. Coal mine employment as of 1996 is set at 83,462. EIA IMPACT STUDY, *supra* note 6, at 114 tbl. 23, fig. 109. The figures in column "2005" and "2020" are close approximations.

134. *See* EIA IMPACT STUDY, *supra* note 6, at 110.

135. *See* EIA IMPACT STUDY, *supra* note 6, at 110–12.

136. *See* EIA IMPACT STUDY, *supra* note 6, 22–23.

been originating in the West, EIA believes that the West will suffer accordingly.[137]

On the basis of these opinions EIA projects selective consequences specific to western coal in terms of percentage share of U.S. production and coal mine employment, as shown in the following two charts:

Western Coal's Percentage Share of U.S. Production[138]

	1996	**2010**	**2020**
Reference Case	47%	57%	62%
1990 + 24%	47%	54%	45%
1990 + 9%	47%	39%	32%
190 – 3%	47%	28%	19%

137. *See* EIA IMPACT STUDY, *supra* note 6, at xviii.

138. *See* EIA IMPACT STUDY, *supra* note 6, at 112 fig. 106. The figures listed are close approximations.

Western Coal Mining Jobs In 2010[139]

	Reference Case	1990+ 24%	1990 + 9%	1990 - 3%	1990 - 7%
Powder River Basin	5,013	3,827	1,829	844	673
Other West	5,693	4,785	2,254	941	895
Total	10,706	8,612	4,083	1,785	1,568

V. COAL'S DIFFICULTIES BEYOND THE EIA PROJECTIONS

The dire predictions in the EIA study, substantially supported by other analyses undertaken by the private sector, ought to be sufficient cause for the coal industry to dread the imposition of the Kyoto Protocol. Unfortunately, the situation may actually be worse.

First, the emissions target specified for the United States in the Protocol, 7% below the 1990 emissions level,[140] is increasingly irrelevant. U.S. carbon emissions from the combustion of energy fuels reached 1,463 million metric tons in 1996, or 8.7% higher than the 1,346 million tons emitted in 1990.[141] The actual percentage reduction needed to reach the Protocol target is therefore increasing as the United States approaches 2008 to 2012, the period during which we are ostensibly expected to meet the 1990 – 7% target.[142] Thus, in 1996, the percentage reduction needed to meet the Protocol target rose to 15.7 % (7% + 8.7%) and that number continues to climb in a growing economy.[143] For example, EIA's

139. *See* EIA IMPACT STUDY, *supra* note 6, at 114 tbl. 23. "Powder River Basin" includes Wyoming, Montana, and North Dakota, while "Other West" includes Colorado, Utah, Arizona, New Mexico, Alaska and Washington (Alaska's and Washington's shares are negligible). *See* EIA IMPACT STUDY, *supra* note 6, at 114 tbl. 23.

140. *See* EIA IMPACT STUDY, *supra* note 6, at 9.

141. *See* EIA IMPACT STUDY, *supra* note 6, at xii & 208 tbl. B19.

142. *See* EIA IMPACT STUDY, *supra* note 6, at xiii.

143. This phenomenon is noted by the EIA:

> AE095 [the EIA's American Energy Outlook issued in 1995] projected that energy-related carbon emissions would reach 1,471 million metric tons in 2000, a level nearly reached in 1996 when emissions were 1,436 million metric tons. Each subsequent AEO has raised the estimate of carbon emissions, primarily because of

American Energy Outlook in 2000, AEO 2000, states that carbon emissions in the year 2000 are expected to reach 1,552 million metric tons, or 15% above the 1990 level, thereby raising the target to 22% (7% + 15%).[144]

Second, in response to the establishment of the FCCC, the Clinton administration launched the Climate Change Action Plan (CCAP).[145] The CCAP offered several dozen proposals for the reduction of greenhouse gases including voluntary programs, economic incentives, research and development, energy efficiency initiatives, and land use programs.[146] The plan purported to reduce total net emissions of greenhouse gases to their 1990 levels by the year 2000.[147] The CCAP fell short of the mark. For example, instead of achieving a reduction of 95 million tons of emissions through CCAP initiatives by 2000, as the plan projected, EIA estimates that the initiatives might only achieve a reduction of 36 million tons of emissions, and then, not until the year 2010.[148]

Likewise, the EIA discounts other claims of the CCAP on the evidence that certain voluntary programs have proven less successful than anticipated, funding for certain CCAP program has been less than requested, and U.S. economic growth (and therefore, energy demand) has been higher than that expected by the plan's sponsors.[149] The net results of the CCAP show that the Clinton Administration's assumptions regarding the success of domestic actions to reduce carbon emissions were overly optimistic. Indeed, assuming U.S. acceptance of the Protocol, the shortcomings of the CCAP presage an increase in the stringency of measures necessary to reach emissions targets as the implementation period draws near.[150]

Third, fundamental uncertainties regarding the likelihood and efficacy of an international emissions trading system seriously undermine the more optimistic predictions relating to meeting the Protocol targets, and doing so in a relatively painless way. The Protocol itself declares that emissions trading arrangements must be subsidiary to concrete programs for reducing carbon emissions.[151] Moreover, those Annex B countries that may potentially have emissions allocations to trade, principally the former Soviet bloc countries, may choose, instead, to bank their credits against future emissions on the belief that their economies

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lower price projections that encourage energy use and reduce the penetration of renewable sources of energy.

EIA IMPACT STUDY, *supra* note 6, at 9.

144. *See* Energy Info. Admin., Dept. of Energy, Annual Energy Outlook 2000 With Projections to 2010 (visited Oct. 25, 2000) <http://www.eai.doe.gov/oiaf/aeo/issues.html>.

145. *See* EIA IMPACT STUDY, *supra* note 6, at 2.

146. *See* EIA IMPACT STUDY, *supra* note 6, at 2.

147. *See* EIA IMPACT STUDY, *supra* note 6, at 2..

148. *See* EIA IMPACT STUDY, *supra* note 6, at 9.

149. *See* EIA IMPACT STUDY, *supra* note 6, at 9.

150. The Administration's contention that carbon sequestration through sinks and modified land use practices is a case in point. Although the EIA refers several times to U.S. State Department and Council of Economic Advisors' claims that agriculture and land use programs and credits for greenhouse gases other than carbon dioxide may offset carbon dioxide emissions up to 4%, the EIA appears to be somewhat skeptical. "[T]he rules to account for agriculture and forestry emissions and sinks have yet to be developed and are subject to considerable uncertainty." EIA IMPACT STUDY, *supra* note 6, at 9.

151. *See* Protocol, *supra* note 5, at art. 6.

will rebound over the next several decades.[152] More fundamentally, without the experience of an international trading system as a guide, it is impossible to predict how such a system will operate as a practical matter or how it might be compromised by other geopolitical conflicts and tensions.

Similarly, the jury is definitely out as to whether and to what extent significant carbon "credits" might be obtained through technology transfers between Annex B countries and developing countries under the so-called CDM provision in the treaty.[153] Given the American public's inherent skepticism regarding the need for and utility of foreign aid expenditures, it is difficult to comprehend that taxpayers would support additional transfers of money overseas, particularly if that money is being used to finance job growth in new technologies even while U.S. jobs in fundamental industry sectors are being eliminated by cutbacks in domestic energy demand. Conversely, if CDM initiatives are undertaken by the United States in lieu of traditional foreign aid expenditures, developing nations may resent having their discretion to redistribute American largesse circumscribed.

Fourth, and perhaps most importantly, there is a certain irrationality in a system that purports to reduce "global" carbon emissions but exempts the vast majority of countries from having to participate in the enterprise. The equity argument, that the developed nations (most prominently, the United States) emit more greenhouse gases, and therefore, should be exclusively responsible for reducing them, is initially seductive but eventually falls under clear-eyed scrutiny: 1) over the life of the Protocol the emissions that developed nations eliminate will simply be replaced by those of the developing nations as their economies expand such that the campaign against global warming becomes a zero-sum game; moreover, 2) the levels of emissions produced by the developed nations merely reflect the levels of goods and services produced by those nations. In any event, the inconsistent applicability of the Protocol's mandate may serve to undermine public support in the developed countries for unilateral efforts to reduce emissions.

These four issues call into serious question whether a smooth glide path can be taken to reduce U.S. emissions to meet the Protocol's target as certain sectors in the Clinton Administration had suggested. If the options touted for achieving emissions targets do not materialize or prove to be less successful than advertised, the carbon price discussed above will increase and coal-fired energy production will become even less competitive than the EIA analyses predict.

VI. RE-BOUND OR ON THE REBOUND?

Fortunately for the coal industry, the same uncertainties that threaten its survival have also caused concern elsewhere. As a treaty, the Kyoto Protocol will not be binding on the United States until it is ratified by a two-thirds vote of the Senate.[154] That development is highly unlikely in light of the current circumstances. The Senate has by a unanimous vote[155] expressed its will not to ratify the

152. *See* EIA IMPACT STUDY, *supra* note 6, at 9.
153. *See* EIA IMPACT STUDY, *supra* note 6, at xxviii.
154. U.S. CONST. art. II, § 2.
155. *See* EIA IMPACT STUDY, *supra* note 6, at 10.

Protocol until the developing nations are required to participate in the overall effort to reduce greenhouse gases and until it can be shown that U.S. participation in the Protocol will not damage the U.S. economy.[156] Congress has further expressed reluctance to move ahead on climate change by enacting legislation calling for further study of the phenomenon of global warming and the ostensible means of controlling it.[157]

These positions firmly taken by both houses of Congress indicate strong resistance to unilateral actions on the part of the United States until fundamental questions of viability, fairness, and necessity are answered with respect to the entire climate change issue. To that end the EIA projections, outlined above, demonstrate how implementation of the Kyoto Protocol, even in the less stringent scenarios, will have a profoundly negative impact on an industry that has been a fundamentally significant factor in the growth and prosperity of the American West, indeed of the entire nation.

Returning to Prometheus, chained to that desolate crag in Scythia, we are told that the Titan eventually was unbound by Hercules, apparently because Prometheus possessed information crucial to the stability of Zeus's throne.[158] In a similar sense, coal's future rests upon its ability to provide the American public and its leaders with the information necessary to make rational choices with respect to the Kyoto Protocol and its ominous implications—not the least of which is whether the Protocol constitutes a viable and necessary response to a legitimate crisis or a blueprint for the international redistribution of wealth and opportunity on an epic scale.

Coal's challenge is a significant one, but inspiration can be taken from George Noel Gordon, Lord Byron's own salute to Prometheus:

> And, baffled as thou wert from high,
> Still, in thy patient energy
> In the endurance and repulse
> Of thine impenetrable spirit,
> Which earth and heaven could not convulse,
> A mighty lesson we inherit.[159]

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156. The Senate's position was expressed through a resolution sponsored by Senators Robert Byrd (D-WV) and Chuck Hagel (R-NE). *See* EIA IMPACT STUDY, *supra* note 6, at 10.

157. *See, e.g.*, National Climate Program Act, 15 U.S.C. §§ 2901–08 (1994); Global Change Research Act, 15 U.S.C. §§ 2921–61 (1994); and pursuant to Title XXIV of the Food and Agriculture Act of 1990, the establishment of the Global Climate Change Program within the Department of Agriculture, 7 U.S.C. §§ 6701–10 (1994) (asserting that Congress is unwilling to legislate the phenomenon of global warming without further study).

158. *See* BULLFINCH, *supra* note 2, at 18.

159. *Id.* at 19.