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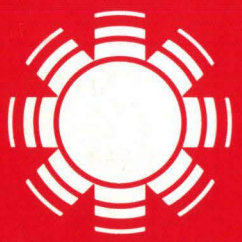
Legal Impediments to the Commercialization of Large-Scale Biomass-Fueled Industries and Power Plants

Kathleen Benjamin



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LEGAL IMPEDIMENTS TO THE COMMERCIALIZATION OF LARGE-SCALE BIOMASS-FUELED INDUSTRIES AND POWERPLANTS

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FOREWORD

This paper on the Fuel Use Act of 1978 and its relationship to environmental and land use statutes was prepared by the Solar Energy Research Institute (SERI) to fulfill, in part, SERI's solar information dissemination function. The paper is part of the Community and Consumer Branch Law Program, which is in turn part of the overall program of the Planning Applications and Impacts Division. The function of the SERI Law Program is to identify and analyze significant legal issues affecting the development of solar technologies.

This paper was written as part of the Law Program's 1979 Summer Law Intern Program. The Program provided an opportunity for law students to research and address topics relating to law's impact on solar energy. The 1979 Program resulted in eight papers that discussed primary legal issues that are, or will be, generated by the commercialization of solar technologies.

The author of this paper, Kathleen Benjamin, was a law student at Loyola Law School at Los Angeles while she was participating in the Program. She is now a second-year student at the Loyola Law School. The Law Program is supervised by Jan G. Laitos, SERI Senior Legal Specialist.

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SUMMARY

The Powerplant and Industrial Fuel Use Act (FUA) is one of the five statutes enacted under the National Energy Act of 1978. FUA attempts to foster greater use of alternate fuels such as biomass as primary energy sources by requiring that new and existing electric powerplants and major fuel-burning installations (MFBIs) use as their primary energy source fuels other than natural gas or petroleum. FUA applies to electric powerplants and MFBIs having a capability of consuming any fuel or mixture thereof at a fuel heat input rate of 100 million Btu per hour or greater. Two or more electric generating plants located at the same site, having an aggregate design capability of consuming any fuel or mixture thereof at a fuel heat input rate of 250 million Btu per hour or greater are also subject to FUA.

In addition to requiring that new and existing electric powerplants and MFBIs use alternate fuels as primary energy sources in lieu of natural gas or petroleum, FUA requires that such use be consistent with applicable environmental requirements such as those imposed by the Clean Air Act, the Federal Water Pollution Control Act, the Solid Waste Disposal Act, the National Environmental Policy Act, the Coastal Zone Management Act, and the Wilderness Act. The use of alternate fuels must also be in accordance with land use laws such as the Federal Land Policy and Management Act. In many cases, compliance with these environmental and land use statutes will be particularly burdensome for facilities using biomass as an alternate fuel. Consequently, facilities that otherwise would use biomass as a primary energy source may decide to use other alternate fuels instead.

The Clean Air Act (CAA) provides for the promulgation of national ambient air quality standards (NAAQS), and the setting of new source performance standards (NSPS). NAAQS indicate maximum allowable levels of specified pollutants. NSPS limit emissions from new or modified stationary sources of pollutants. NAAQS and NSPS established pursuant to the CAA may discourage the use of biomass as a primary energy source in facilities converting to the use of alternate fuels pursuant to FUA. Biomass conversion processes such as direct combustion cause emissions of particulates and sulfur oxides, both of which are pollutants subject to NAAQS. The biomass facilities themselves would be subject to NSPS insofar as they would be either newly constructed, or existing but emitting pollutants such as particulates and sulfur oxides of a kind or in an amount not emitted previously, when the facilities were fueled by conventional fuels such as natural gas or petroleum. Biomass facilities fired by wood and bark residues may be subject to even more stringent NSPS if proposed NSPS become final.

The Federal Water Pollution Control Act (FWPCA) establishes a system for regulating the discharge of pollutants into navigable waters. Although the sediment and nutrients in the stream runoff from logging operations have not been subject to effluent limitations in a strict or standardized manner, the effluents from the more intensive agricultural and silvicultural practices associated with energy farms might be subject to more rigorous regulation.

The Solid Waste Disposal Act, which is now known as the Resource Conservation and Recovery Act (RCRA), regulates the collection, transportation, separation, disposal, and recovery of solid wastes. RCRA does not impose any requirements that biomass facilities would be unable to meet. RCRA may, however, make it difficult for biomass facilities such as those powered by municipal solid wastes (MSW) to obtain a supply of fuel. By encouraging federal, state, and local governments as well as private enterprises to

recover the solid wastes generated by their operations before these wastes enter the MSW stream, RCRA creates competing interests for solid wastes and diminishes the supply of solid wastes available to MSW-fueled biomass facilities.

The National Environmental Policy Act (NEPA) provides that all federal agencies proposing major federal actions which would significantly affect the quality of the human environment must prepare an environmental impact statement (EIS). The EIS must assess the environmental impact of the proposed action and must contain a detailed statement of any unavoidable adverse environmental impacts should the proposed action be taken, alternatives to the proposed action, local short-term uses of the environment in relationship to long-term productivity, and any irreversible and irretrievable commitments of resources which would result from the proposed action. The time and money involved in preparing an EIS, and the possibility of lengthy and costly litigation challenging the adequacy of the EIS, may discourage federal agencies from becoming involved in the development of large-scale biomass-fueled facilities.

The Coastal Zone Management Act (CZMA) authorizes states to establish comprehensive management programs for the nation's land and water resources located within the coastal zone. The geographical limit of the coastal zone varies from state to state, but generally extends from a seaward boundary to a few miles inland in each coastal state. Both terrestrial and aquatic energy farms located near a coastline may therefore be subject to state regulation. A state's CZM plan may expressly prohibit such land and water uses within the coastal zone. Or, a state may impose lengthy and costly permitting procedures which discourage the development of such facilities.

The Wilderness Act establishes the National Wilderness Preservation System. The system is composed of public lands designated by Congress for preservation and protection as wilderness areas. A wilderness classification prohibits certain land uses, such as private logging operations, that are allowed on other public lands. The Wilderness Act therefore may prevent the development of wood-fueled facilities that otherwise would rely on a timber supply that is growing on public lands.

The Federal Land Policy and Management Act (FLPMA) establishes a comprehensive land use policy regarding public lands. The FLPMA declares that the public lands are to be retained by the Federal Government for the people unless it is in the national interest to sell, exchange, or otherwise dispose of such lands. It is not clear whether the sale or other disposition of public lands for the purpose of a biomass facility such as an energy farm would be in the national interest for the purposes of the FLPMA. Therefore, the FLPMA may discourage and even prevent prospective developers of biomass energy farms from purchasing or otherwise acquiring the large amounts of public lands that the establishment of energy farms would require.

These federal environmental and land use statutes are examined in this paper in terms of their potential impact on facilities converting to the use of biomass pursuant to FUA. The legal barriers and economic disincentives which these laws present to facilities converting to the use of biomass are also discussed.

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INTRODUCTION

The threat of an oil embargo, the steadily increasing costs of imported oil, the dwindling supplies of domestic oil, the rapid escalation of crude oil and gasoline prices, and the spot gasoline shortages that have resulted in long lines at service stations have each played a part in focusing national attention on the development of alternative energy sources.

Energy from the sun has been one of the alternative energy sources given a significant amount of attention because of its potential to meet a substantial portion of the United States' future energy needs. President Carter said in a 1979 speech that solar energy will supply 20% of the United States' energy needs by the year 2000 [1]. By the year 2020, 25% of the solar component of the United States' energy supply is expected to come from biomass [2].

Biomass is organic matter such as trees, crops, manure, algae, seaweed, and the organic component of municipal solid waste [3]. Energy from the sun is captured and stored by biomass through the process of photosynthesis [4]. This stored energy can be released from biomass by burning the biomass itself as a fuel or by converting the biomass to some other usable energy form [5].

Although large-scale biomass-fueled facilities will not contribute significantly to the solar energy supply until 2020 [6], biomass already is being used by private industries and municipal utilities to supply a portion of their energy needs [7]. Wood and bark residue-fired boilers are used by many lumber and pulp mills to produce electricity and industrial process steam [8]. The organic component of municipal solid waste is used by some municipalities to produce electricity [9].

The further development of large-scale biomass-fueled facilities in the near term may depend on federal policy with respect to such facilities. Federal policy presently seems to both encourage and discourage large-scale biomass applications. The Powerplant and Industrial Fuel Use Act (FUA) [10], one of the five statutes that comprise the National Energy Act of 1978 [11], requires that new and existing electric powerplants and major fuel-burning installations (MFBIs) use alternate fuels such as biomass as primary energy sources, in lieu of natural gas or petroleum [12]. FUA therefore seems to encourage facilities to convert to the use of biomass and other alternate fuels. However, FUA also requires that conversions to the use of alternate fuels be in accordance with applicable environmental requirements [13] such as the Clean Air Act, the Federal Water Pollution Control Act, the Solid Waste Disposal Act, and the National Environmental Policy Act [14], as well as the Wilderness Act and the Coastal Zone Management Act. The use of alternate fuels must also be in accordance with land use laws such as the Federal Land Policy and Management Act [15]. Compliance with these and other applicable laws may be so burdensome, particularly for biomass-fueled facilities, that facilities that otherwise would convert to the use of biomass pursuant to FUA will instead convert to the use of other alternate fuels.

The use of an alternate fuel such as biomass is more environmentally benign than the use of an alternate fossil fuel such as coal [16]. However, the use of biomass does have adverse environmental impacts not associated with the use of conventional fuels such as natural gas or petroleum [17]. A federal policy that encourages the use of biomass and

other alternate fuels while requiring that existing environmental conditions be maintained is therefore in conflict with itself, and will not bring about the desired result of decreased dependence on conventional fossil fuels and increased use of alternate fuels such as biomass.

This paper examines FUA and the various laws with which facilities converting to the use of alternate fuels pursuant to FUA will have to comply. The paper also discusses the legal barriers and economic disincentives which these laws present to facilities that otherwise would convert to the use of biomass. Section 2.0 provides a brief overview of the biomass technologies to which these laws will apply. Section 3.0 describes FUA. Section 4.0 examines environmental laws with which facilities converting to the use of biomass pursuant to FUA will have to comply. Section 5.0 discusses federal land-use laws that may also affect these facilities. Section 6.0 reviews these environmental and federal land-use laws with respect to their potentially adverse effect on the large scale application of biomass technologies.

SECTION 2.0

AN OVERVIEW OF BIOMASS TECHNOLOGIES

Biomass is a generic term for organic material such as algae, seaweed, crops, trees, and manure [18]. Biomass captures and stores energy from the sun through the process of photosynthesis [19]. The energy stored in biomass can be released in a usable form through various thermochemical and biological conversion processes [20]. Most biomass comes from municipal and industrial wastes and silvicultural and agricultural residues [21]. In the future, some biomass may be grown on "energy farms" [22].

The following subsections briefly describe the various sources of biomass and the conversion technologies applicable to each, in decreasing order of their near-term commercial feasibility.

2.1 MUNICIPAL WASTES

Municipal solid wastes (MSW) are one source of biomass. Substantial concentrations of municipal solid wastes are found in densely populated urban areas. Municipalities can convert the organic portion of these solid wastes into usable fuels such as methane gas, through the processes of pyrolysis and anaerobic digestion. Pyrolysis is a thermochemical conversion process in which biomass is heated in the absence of oxygen to produce energy. Anaerobic digestion is a biological conversion process in which biomass is turned into usable energy through a process of controlled decay, again in the absence of oxygen.

2.2 INDUSTRIAL WASTES

Industrial wastes from lumber and pulp mills, agricultural operations, and food processing plants are another source of biomass.

2.2.1 Lumber and Pulp Mills

The manufacture of wood and pulp products generates waste by-products that include scrap lumber, bark, wood shavings, sawdust, paper pulp, and sander dust [24]. These waste by-products can be converted into usable energy forms through the processes of direct combustion, gasification, and pyrolysis. Direct combustion, gasification, and pyrolysis are all thermochemical processes in which biomass is heated to produce energy in a usable form. In pyrolysis, the biomass is heated in the absence of oxygen; in gasification, the biomass is heated in limited amounts of oxygen; in direct combustion, the biomass is simply burned [25]. Forty-five percent of the energy needed by the wood and pulp industry currently is provided by wood waste fuels [26].

2.2.2 Agricultural and Food Processing Operations

The harvesting and processing of certain foods such as corn, rice, sugar, fruit, and nuts also produce waste by-products that can be used as sources of energy [27]. Many growers and processors already use corncobs, rice hulls, sugarcane bagasse, fruit pits, and walnut shells in direct combustion systems to produce energy in the form of electricity and steam [28].

Hawaii's sugar industry has been burning sugarcane bagasse for a number of years to produce electricity and industrial process steam [29]. The Pepeekeo Mill of the Hilo Coast Processing Company burns sugarcane bagasse and other operational by-products including residual leaf trash to produce process steam and electricity. The company uses the process steam in its plant, and sells the electricity to the Hawaiian Electric Light Company in quantities sufficient to supply 20% of the island of Hawaii's electrical needs [30].

Another Hawaiian sugar refinery, the Oahu Sugar Company, uses sugarcane bagasse for a cogeneration process. The company burns sugarcane bagasse to produce both high and low pressure steam. The high pressure steam is used to run large electric turbogenerators. The low pressure steam is used for various industrial heat processes [31].

Tri-Valley Growers, a fruit canner located in Modesto, Calif., burns the pits from the peaches it cans to supply approximately one-sixth of the cannery's total energy demand. The peach pits are collected during the canning process and stored for several years at a landfill site to dry. The pits are then transported back to the plant and put into disintegrators, where they are ground to 0.05 particulate size. The ground peach pits are then burned in a direct combustion system to produce electricity and steam [32].

The Lindsay Olive Company, another food processor, burns the wet pits of the olives it cans in a fluidized bed combustion system that supplies approximately one-third of the plant's industrial process steam [33].

Diamond Sunsweet Incorporated of Stockton, Calif., a nut processor, plans to use walnut shells in a direct fired boiler for cogeneration. The boiler, which will be fueled by the 25 to 35 thousand tons of walnut shells Diamond Sunsweet produces each year, is now under construction and is scheduled to be in operation in October or November of 1980 [34].

2.3 SILVICULTURAL AND AGRICULTURAL RESIDUES

Silvicultural and agricultural residues are yet another source of biomass. In the near term, the highest percentage of biomass resources will come from the residues of silvicultural and agricultural operations [35].

2.3.1 Silvicultural Residues

Forest harvesting operations leave residues such as noncommercial timber, slash [36], and roots [37]. Slash is the woody material left in the forest after trees have been cut, and amounts to approximately one-third of the total wood removed in silvicultural operations, while stumps and roots amount to another one-third [38]. These plentiful residues can be converted to usable energy in the form of steam, electricity, and heat through such processes as direct combustion, gasification, and pyrolysis [39].

2.3.2 Agricultural Residues

Agricultural harvesting operations leave crop residues such as corn stalks and the straw from rice, wheat, barley, and oats [40]. These residues can either be used in a direct combustion system or converted to a secondary fuel that can then be burned to produce energy [41].

The manure from cattle, swine, sheep and poultry feedlots is another agricultural residue that is considered to be a particularly promising energy source [42]. Of the estimated 36 million dry tons of manure generated each year by feedlot operations, 26 million tons, or approximately 72%, is considered readily collectible [43]. Once collected, the manure can be converted to a secondary fuel such as methane gas through the process of anaerobic digestion [44].

2.4 ENERGY FARMS

Energy farms could be still another source of biomass. Energy farms would utilize silvicultural, agricultural, or aquacultural processes specifically designed to produce biomass as an energy resource. Biomass cultivated for use as an energy resource has been defined as fuel crops [45]. Biomass from energy farms is presently under study in the United States [46]. Very few energy farms or plantations are expected to be operational by the year 2000 [47], but the possibility of energy farms is currently a major issue in the development of fuels from biomass. For this reason, the terrestrial and aquatic applications of energy farming are discussed in this section.

2.4.1 Terrestrial Energy Farms

Terrestrial energy farms would develop from either silvicultural or agricultural activities. Instead of cultivating crops for their food or fiber content, crops would be grown expressly for their use as an energy resource.

2.4.1.1 Silvicultural Energy Farms

Silviculture has received a high priority in research and development efforts in the energy farm area. Short-rotation trees seem particularly well suited to the energy farm approach to biomass energy resource development [48]. Tree species would be more densely planted and cultivation would be more intensive than in conventional silvicultural operations [49]. Specially designed harvesting equipment would be used to convert whole trees into wood chips [50]. Biomass yields resulting from energy farm silvicultural operations would be much higher than those obtained from conventional, long-rotation, low-management forestry operations.

2.4.1.2 Agricultural Energy Farms

Conventional crops that already have been studied for their energy farm potential are sugarcane, sugar beets, sweet sorghum [51], cassava, sunflowers, kenaf, forage grasses, and corn [52]. Unconventional crops that have received similar consideration are cattails, weeds, desert plants [53], Euphorbia lathrus, and Euphorbia tirncalli [54]. The use of whole plant communities as well as the simultaneous cultivation of several different crops has been suggested [55]. Fuel crops could be harvested and converted to either methane, through the process of anaerobic digestion, or ethanol, through the process of fermentation [56].

2.4.2 Aquatic Energy Farms

Aquatic biomass species include giant kelp, sargassum, seagrasses, water hyacinths, hydrilla and blue-green algae [57]. These plants could be harvested and transported to facilities for conversion to methane through anaerobic digestion [58].

The cultivation of aquatic biomass as an alternative energy source is receiving significant attention. Microscopic algae currently are being grown in large ponds to produce oxygen for sewage treatment [59]. DOE presently has an Ocean Farm Project under which a demonstration marine farm system should be in operation by 1985 [60]. Land-based as well as open ocean energy farms are also being considered for the cultivation of aquatic biomass [61].

SECTION 3.0

THE POWERPLANT AND INDUSTRIAL FUEL USE ACT

The Powerplant and Industrial Fuel Use Act is one of the five statutes enacted under the National Energy Act of 1978. FUA attempts to foster greater use of alternate fuels such as biomass as primary energy sources [62] by providing that:

- natural gas or petroleum shall not be used as a primary energy source in any new electric powerplant [63];
- no new electric powerplant shall be constructed without the capability to use coal or any other alternate fuel as a primary energy source [64];
- natural gas or petroleum shall not be used as a primary energy source in any new major fuel-burning installation consisting of a boiler [65];
- natural gas shall not be used as a primary energy source in an existing electric powerplant on or after January 1, 1990 [66];
- natural gas shall not be used as a primary energy source in an existing electric powerplant before January 1, 1990 unless such powerplant used natural gas as a primary energy source during 1977 [67];
- natural gas shall not be used as a primary energy source in an existing electric powerplant before 1990 in greater proportions than the average proportion of natural gas used from 1974 through 1976 or, if the powerplant began operations after January 1, 1974, the average proportion of natural gas used during the first two years of operation [68].

3.1 BIOMASS FACILITIES COVERED BY THE FUEL USE ACT

FUA applies to electric powerplants and major fuel-burning installations having a capability of consuming any fuel or mixture thereof at a fuel heat input rate of 100 million Btu per hour or greater [69]. Two or more electric generating plants located at the same site, having an aggregate design capability of consuming any fuel or mixture thereof at a fuel heat input rate of 250 million Btu per hour or greater, are also subject to FUA [70].

Whether a biomass-fueled facility is covered by FUA therefore depends on the facility's fuel heat input rate, i.e., the Btu value of the particular biomass fuel burned. The Btu value of biomass may vary considerably due to variations in the moisture content of the particular biomass resource [71]. Generally, biomass that has a high moisture content has a lower Btu value than biomass that has a low moisture content. For example, wood waste that has a relatively high moisture content of 50% has an average Btu value of only 8 million Btu/ton, whereas wood waste that has a relatively low moisture content of 10% has a much higher average Btu value of 16 million Btu/ton [72]. A wood-waste fueled facility that would burn 10 tons of wood waste with only a 10% moisture content every hour would have an average fuel heat input rate of 160 million Btu/hour and would therefore be subject to FUA, whereas a facility that would burn the same volume of wood waste with a high, 50% moisture content every hour would have an average fuel heat input rate of only 80 million Btu/hour and would therefore not be subject to FUA [73]. Not being subject to FUA would be to the advantage of a biomass-fueled facility since the facility could then burn natural gas or petroleum if its supply of biomass were either low or temporarily unavailable.

Many wood-waste-fueled facilities already in use by members of the pulp and paper and allied forest industries have a fuel heat input rate of less than 100 million Btu/hour and therefore are not covered by FUA [74]. However, there is no guarantee that such facilities will continue to be exempt from FUA. Technological improvements in electric powerplants and major fuel-burning installations may reduce the capabilities at which conversions to biomass and other alternate fuels become financially feasible.

3.2 COAL AS THE PREFERRED ALTERNATE FUEL

FUA requires new and existing electric powerplants and major fuel-burning installations to use "coal and other alternate fuels" [75] as primary energy sources, in lieu of natural gas or petroleum. "Alternate fuels" is defined as including biomass [76]. However, it is coal that is specifically mentioned and emphasized throughout the Act as a legislatively preferred alternate fuel.

The FUA Environmental Impact Statement (EIS) prepared by the Department of Energy (DOE) indicates an administrative preference for the use of coal as an alternate fuel. In the EIS, DOE states that "[c]oal...is to be the overwhelming alternate fuel choice" [77], and proceeds to base practically its entire analysis of the environmental impacts of FUA on conversions to coal use, devoting very little attention to assessing the possible effects of conversions to biomass use.

A demonstrated preference for coal on the part of both legislative and administrative policy makers could inhibit the commercialization of other alternate fuels such as biomass under FUA. Biomass probably is the one solar application that can compete directly with coal, since many of the same technologies, such as conversion through direct combustion, are applicable to each [78]. However, where biomass is not considered on a par with coal for special legislative treatment, subsequent legislative enactments may impede the commercialization of biomass while encouraging the use of coal. Such a result would adversely affect the cost competitiveness of biomass in relation to coal as an alternative energy fuel. This inequality between the two fuels already exists with respect to the Clean Air Act, which is discussed in the following section.

SECTION 4.0

APPLICABLE ENVIRONMENTAL REQUIREMENTS

In addition to requiring that new and existing electric powerplants and MFBIs use alternate fuels as primary energy sources in lieu of natural gas or petroleum, FUA requires that such use be consistent with applicable environmental requirements such as those imposed by the Clean Air Act, the Federal Water Pollution Control Act, the Solid Waste Disposal Act, and the National Environmental Policy Act. In many cases, compliance with these environmental laws will be particularly burdensome for facilities using biomass as an alternate fuel pursuant to FUA. Consequently, facilities that otherwise would use biomass as a primary energy source may decide to use other alternate fuels instead.

In the following subsections, federal environmental laws are examined to determine how and to what extent these laws may limit or impede the development of large-scale biomass-fueled industries and powerplants.

4.1 THE CLEAN AIR ACT

The Clean Air Act (CAA) [79] was enacted in 1955 and amended in 1966, 1967, 1970, and, most recently, in 1977. According to the Clean Air Act Amendments of 1977 (CAAA), one purpose of the legislation is to protect and enhance the quality of the nation's air resources so as to promote the public health and welfare and the productive capabilities of the populace [80]. The CAA directs the Administrator of the Environmental Protection Agency (EPA) to establish national ambient air quality standards (NAAQS) that indicate maximum allowable levels of specified pollutants [81]. Each state is then required to develop a state implementation plan (SIP) to ensure attainment of the NAAQS within the state [82]. NAAQS establish minimum standards for pollutant emissions. A state in its SIP may impose more stringent standards [83]. How NAAQS or more stringent state standards are to be met is left to the discretion of state and local governments and their designated pollution control agencies [84]. States may establish either fuel type regulations, which specify the types of fuels that may be used, or emissions limit regulations, which specify maximum allowable levels of pollutant emissions [85].

In addition to directing the EPA Administrator to establish NAAQS to control ambient air quality, the CAA requires the EPA Administrator to promulgate New Source Performance Standards (NSPS) to limit emissions from new stationary sources of pollutants [86].

NAAQS and NSPS established pursuant to the CAA may discourage the use of biomass as a primary energy source in facilities converting to alternate fuels pursuant to FUA. Biomass conversion processes such as direct combustion cause the emissions of particulates and sulfur oxides [87], both of which are pollutants subject to NAAQS [88]. The biomass facilities themselves would be subject to NSPS insofar as they would be either newly constructed or existing but emitting pollutants such as particulates and sulfur oxides of a kind or in an amount not emitted previously, when the facilities were fueled by conventional fuels such as natural gas or petroleum [89]. In the following subsections, provisions of the CAA, and NAAQS and NSPS promulgated thereunder, are discussed as potential barriers to the development of large-scale biomass facilities.

4.1.1 Exemption from Clean Air Act New Source Performance Standards for ESECA-Ordered Coal Conversions

Although facilities converting to the use of biomass pursuant to FUA would have to comply strictly with CAAA requirements, it appears that facilities converting to coal will be treated more leniently. In some instances, energy facilities converting to coal use may not have to comply with otherwise applicable NSPS. Since pollution control equipment necessary to comply with air quality emissions standards may amount to 20% of the capital construction costs for an electric powerplant or MFBI [90], preferential treatment accorded to coal use under the CAAA may adversely affect the cost competitiveness of a comparable biomass fueled facility.

NSPS promulgated pursuant to the CAAA apply only to new facilities or facilities that have been modified [91]. A conversion from the use of conventional fuels such as natural gas or petroleum to the use of an alternate fuel such as biomass would be deemed to be a modification insofar as it would increase the amount of pollutants emitted or result in the emissions of pollutants not previously emitted [92]. Air pollutant emissions would be higher, for example, where a powerplant or MFBI converts from using natural gas to using wood wastes [93]. Particulate emissions would be higher where a facility converts from burning petroleum to burning wood wastes [94]. These newly converted biomass facilities would have to comply with any applicable NSPS, since under the CAAA the conversions would be modifications to which all NSPS would be applicable.

Unlike conversions to biomass, a conversion to coal may not trigger the applicability of NSPS. According to the CAAA, a conversion to coal ordered under Section 2 of the Energy Supply and Environmental Coordination Act of 1974 (ESECA) or an amendment thereto is not deemed to be a modification for the purposes of the CAAA [95]. A facility converting to coal by reason of an ESECA order [96] is, for all express purposes, an existing facility and therefore not subject to NSPS [97].

It is not thoroughly evident, but it is possible that a facility that converts to coal rather than biomass use pursuant to FUA may also qualify for preferential treatment under the CAAA. FUA's alternative energy use requirements set forth in Title II for new facilities and in Title III for existing facilities do not apply to powerplants and MFBIs that have been issued prohibition orders pursuant to the ESECA [98]. Where an ESECA prohibition order was pending on the effective date of FUA, the owner of the facility subject to the order had the option of being covered by Title II or III of FUA (whichever was applicable), instead of Section 2 of the ESECA [99]. Since Titles II and III of FUA, unlike Section 2 of the ESECA, allow the use of biomass and other alternate fuels in addition to coal, an owner electing to be covered under Title II or III gains the advantage of being able to convert to biomass if he so desires. On the other hand, an owner of an existing facility subject to an ESECA order who elects to be covered under FUA may lose the advantage of not having to comply with NSPS under the CAAA, since the pertinent CAAA provisions apply specifically to conversions pursuant to the ESECA.

It is unclear whether the election of Title II or III of FUA would be a conversion under Section 2 of the ESECA. If it were, a facility converting to coal under FUA could retain the benefits extended to ESECA-ordered coal conversions under the CAAA. The pertinent question is whether or not a facility subject to a prohibition order under the ESECA that elects to be covered by the applicable title of FUA may use biomass as a primary energy source and still be exempt from NSPS promulgated pursuant to the CAAA. The question posed is not merely academic. It may be technically and economically feasible for facilities previously required to burn coal under the ESECA to burn MSW, wood residues, or some other biomass resource at their disposal. An answer to the question posed

is not evident from the legislation. Also unclear is whether such a facility could still qualify for the CAAA exemption if it mixed coal with MSW, wood residues, or some other biomass fuel.

Clarification of the applicability of the CAAA exemption to facilities subject to an ESECA order and electing to be covered instead by FUA is necessary. If such facilities remain exempt from otherwise applicable NSPS even if they use an alternate fuel such as biomass instead of coal, the use of biomass rather than coal may be encouraged. The costs of pollution control equipment that would have had to be installed to control emissions from the use of biomass in accordance with otherwise applicable NSPS could be avoided.

On the other hand, if facilities subject to an ESECA order that elect to be covered instead by FUA thereby lose their exemption from otherwise applicable NSPS, the use of coal rather than biomass or other alternate fuels may be encouraged. Such facilities may have to be retrofitted with costly pollution control equipment to comply with NSPS. Retrofitting could in some cases cost 25% more than installation at the time of construction. These costs would be avoided by converting to coal rather than biomass.

An owner desiring to convert to biomass use who wishes to avoid costly retrofitting may reduce the incidence of air pollution emissions by converting the biomass to a secondary fuel instead of using the biomass in a direct combustion process. As 10% to 20% of the capital costs associated with direct combustion is for emissions control technology, the costs of modification may be reduced [100]. Since fermentation and gasification produce cleaner fuels, associated emissions control costs are relatively small [101]. However, direct combustion has the highest energy efficiency [102]. Costs saved in emissions control technology may be lost due to a decrease in net energy efficiency, making it more difficult for biomass facilities to compete with similar coal facilities which are exempt from NSPS.

4.1.2 Administration Preferences for Coal Use

The preference shown coal development is not limited to legislative exemptions from otherwise applicable NSPS under the CAAA. Senior administrative officials have also exhibited an intent to subordinate air quality emissions standards to coal development. In a June 4, 1979 memorandum to President Carter, then Secretary of Energy James R. Schlesinger mentioned an "unavoidable conflict" between coal use and air quality. Schlesinger recommended the establishment of an independent task force to study possible changes in the CAA to promote the use of coal. Among the possible changes to be studied by the task force were "relaxation of state clean air implementation plan requirements" and "the review of the effects of the Act's nonattainment and prevention of significant deterioration provisions on coal use and utility siting. . ."[103]. The memo failed to consider or suggest that air quality standards also be relaxed with respect to biomass.

According to Senator Gary Hart, "Our energy needs and our air quality needs often conflict, and striking the right balance requires careful study"[104]. There may be conflicts between the need to commercialize biomass as an energy resource and the need to maintain air quality, but such actual or potential conflicts do not seem as severe as those arising from air quality concessions made with respect to coal. Furthermore, such concessions affect the ability of biomass energy resources to compete with coal in the highly competitive energy market.

4.1.3 Use of Conventional Fuels to Comply with State Implementation Plans

Pursuant to the CAAA, states are required to review the provisions of their implementation plans that relate to MFBIs to determine the extent to which compliance with such provisions is dependent upon MFBIs' use of petroleum products, natural gas, or coal not locally or regionally available [105]. To the degree that any MFBIs must rely upon petroleum products or natural gas to satisfy SIP requirements, they are precluded from using alternate fuels such as biomass as a primary energy source. SIPs may specify that fuels such as petroleum or natural gas be used to meet NAAQS, or may impose emissions limits so stringent that they may be met only by burning cleaner fuels such as petroleum or natural gas. SIP requirements that cannot be met unless MFBIs use petroleum or natural gas conflict with one of the purposes of FUA, which is to foster the use of alternative fuels.

The purpose of the "assurance of adequacy of SIPs" section [106] of the CAAA is for states to "consider the long-term effects of increasing fuel shortages (of natural gas or petroleum) and make allowances in the SIPs so that fuel shortages will not lead to future violations of NAAQS (National Ambient Air Quality Standards)" [107]. State reviews of SIPs are submitted to the EPA Administrator, who determines whether the plan is adequate to assure compliance with the CAA on a reliable and long-term basis. In reviewing these submittals, the Administrator is to consider actual and potential prohibitions against the use of natural gas or petroleum [108].

The relationship between the CAAA and FUA with respect to the Administrator's review becomes somewhat circular. FUA allows both temporary and permanent compliance exemptions where powerplants and MFBIs would be unable to meet environmental requirements [109]. Facilities which may otherwise convert to biomass under FUA but cannot, due to their dependence upon the use of petroleum products or natural gas to comply with SIPs, may be exempted from FUA fuel conversion requirements. The EPA Administrator reviewing state submittals for assurance of plan adequacy may determine that a revision of the SIP is not necessary as MFBIs dependent upon petroleum or natural gas for compliance would be exempted from FUA. To the degree that these facilities cannot meet environmental requirements and are therefore exempted, there is a prohibition upon their continued use of petroleum products or natural gas instead of biomass.

Unfortunately, the requirement that states review their SIPs to determine the extent of dependence on conventional fuels necessary for compliance with pollution emissions standards, although deemed important, has not been given a high priority by EPA. Consequently, no uniform national guidance standards have been set for these reviews [110]. According to EPA, detailed analytical review procedures [111] for many states were not deemed necessary, and a simple qualitative assessment was considered adequate [112]. Where detailed assessments were not done, it is wholly possible that MFBI dependence upon conventional fuels to meet SIP requirements was overlooked. Such a result is detrimental to the expanded use and development of biomass as an energy resource, as it limits the number of potential market outlets available to biomass.

4.1.4 Proposed New Source Performance Standards for Wood and Bark Residue Fired Combustion Systems

Some forest products industry plants are fueled by wood wastes generated by industry operations. Wood and bark waste fuels currently supply 1.2 quads or approximately 45% of the energy needs of the forest products industry. There are possibilities for expansion

to 2.2 quads [113]. The Environmental Protection Agency is presently considering the development of NSPS for particulate emissions from wood and bark residue fired combustion systems [114]. The potential result is that prospective users of wood waste fuels may be forced, due to economic considerations, to increase their consumption of fossil fuels to meet their energy needs while complying with the proposed NSPS under consideration [115]. Such a result would be contrary to one of the goals of FUA, which is to increase the use of alternative energy resources by limiting the use of conventional fossil fuels.

Weyerhaeuser Company, a nationwide forest products firm, has written a Preliminary Issue Statement [116] concerning the application of proposed NSPS for wood waste fuels to the forest products industry. The existing and proposed standards [117] contained in the Weyerhaeuser Statement are shown in Table 4-1. As can be seen from the table, the existing standards are between 0.1 and 0.8 lb/million Btu; the proposed standards are between 0.05 and 0.8 lb/million Btu.

Table 4-1. SUMMARY OF EPA STANDARDS AFFECTING THE INDUSTRIAL USE OF WOOD AND BARK RESIDUE FUELS

Pollutant	Existing NSPS[a]	Proposed NSPS
Particulates, lb/million Btu	0.1	0.05
Opacity, %	20	20
SO_2, lb/million Btu	0.8	0.8
NO_x, lb/million Btu	0.3	0.3

[a]For wood-fueled combustors with oil capability exceeding 250 million Btu/hr or 100 T/Y of pollutant emissions. There is no federal standard for wood combustors with oil capability less than 250 million Btu/hr and not in one of the 28 PSD major source categories or with emissions less than 250 T/Y.

Source: Weyerhaeuser Company, Preliminary Issue Statement, April 18, 1979.

According to Weyerhaeuser, pursuant to the CAAA and regulations promulgated thereunder, all wood fuel combustors with capacities greater than 100 million Btu per hour [119] would have to be retrofitted with best available control technology (BACT) in order to comply with the proposed standards. Weyerhaeuser estimated that retrofitting these facilities would require an investment of $128 million [120]. However, Weyerhaeuser's estimate may be inflated since the proposed NSPS could apply only to new or modified facilities.

According to Junge [121], the installed capital costs for secondary control devices on new facilities to meet NSPS of 0.5 lb/MBtu is estimated to be between $533 million and $736 million, amounting to 6% to 8% of the total installed capital costs of such facilities [122]. In order to meet the 0.1 lb/MBtu NSPS, the average costs for secondary control devices is projected to be $1.04 billion, or 11.8% of the capital costs for new combustion facilities [123].

The Weyerhaeuser study has indicated that in order to obtain an additional 10^{15} Btu per year or 1 quad of energy from wood wastes, capital expenditures would have to be made ranging from $200 million to $600 million [124]. Two hundred million dollars represents the capital costs necessary where the particulate emissions standard is 0.5 pound per million Btu [125]. Approximately 5% of the aggregate capital expenditures or $10 million would have to be spent for emissions control technology to meet the 0.5 standard. Six hundred million dollars in capital costs will be spent if the particulate emissions standard is 0.05 pound per million Btu. Twenty percent of this amount or $120 million would have to be spent for emissions control technology [126]. The amount of capital expenditures necessary to meet a 0.05 standard is approximately 12 times the amount necessary to meet a 0.5 standard.

While the use of the best available control technology (BACT) would result in a 6.25% increase in particulate removal over the two-stage, high-efficiency mechanical collectors presently used, BACT would require 5 to 7 times more electricity and would result in only six-tenths of a percent decrease in particulate emissions for each $1 million invested [127]. Average power requirements to operate control devices to meet the 0.5 NSPS, as opposed to the 0.1 NSPS, represent an added investment by electric utilities of $162 million to install new generating capacity [128].

A decision by EPA regarding NSPS for wood-fueled powerplants or MFBIs that would require such significant capital expenditures for pollution control equipment and electrical generating capacity for its operation could be inflationary [129] and, more important, could act as a deterrent to the increased use of wood and bark residue fuels as alternative biomass energy resources [130].

The protection of human health and welfare has been the major justification for stringent NSPS [131]. Fixed carbon char, inorganic fly ash, and organic aerosols are the particulate emissions which result from wood and bark residue energy recovery facilities. There are no known human health hazards associated with these materials in the concentrations found in and around normally operating industrial facilities [132]. It would seem, therefore, that stringent restrictions on emissions limitations of the magnitude presently contemplated by EPA would be unnecessary [133].

4.1.5 Applicability of Proposed New Source Performance Standards to Smaller Wood-Waste-Fueled Facilities

The existing NSPS for wood-fueled combustors apply only where the facility has an oil capability exceeding 250 million Btu per hour or 100 tons per year of pollutant emissions [134]. The proposed NSPS presently under study would apply to all wood-fueled combustors larger than 100 million Btu per hour and therefore subject to FUA [135].

Presently, newly constructed or modified wood-waste fueled facilities with an oil capability of less than 250 million Btu per hour or emitting less than 100 tons of pollutants per year are subject to FUA but not NSPS. If the proposed NSPS are put into effect, these facilities would no longer be exempt from NSPS. Due to the dictates of FUA, it is generally expected that increased numbers of forest products industry facilities will be converting to biomass fuels, particularly wood wastes and wood residues, and therefore may be subject to FUA and the more stringent NSPS now under consideration [136]. Due to the limited or negligible health and welfare hazards associated with wood-waste-fueled facilities, the proposed NSPS may be overly restrictive and may unnecessarily discourage the use of wood-waste-fuels. Continuing to limit the applicability of NSPS to powerplants or MFBIs exceeding a fuel heat input rate of 250 million Btu per hour would

encourage the use of biomass by allowing many small potential biomass users to remain exempt from federal air quality regulations [137].

4.1.6 Economic Impact Assessment Required for Proposed New Source Performance Standards

The Administrator of EPA is required to prepare an economic impact assessment in promulgating or revising any NSPS [138]. Among the factors to be considered in the Administrator's analysis are the costs of compliance with such standard or regulation and the effects of the standard or regulation on energy use [139]. There is no requirement that the Administrator undertake a quantitative cost-benefit analysis demonstrating the benefit to ambient air conditions as measured against the cost of pollution devices to meet the proposed NSPS [140].

The costs of using BACT equipment to comply with the proposed NSPS for wood-waste-fueled plants would be included in such an analysis. In addition, the increased electric power generation necessary to operate the BACT equipment would be taken into consideration. Presently there is no requirement that the economic assessment consider impediments to the expanded use of alternative fuels that may result in the increased use of conventional fuels. To foster the spirit of FUA, the economic impact assessment might be undertaken with a view toward promoting the use of wood and bark residue fuels to reduce the use of conventional fuels.

Where a standard is being revised, as opposed to the promulgation of completely new standards, the Administrator is required only to prepare an economic assessment for those revisions which, in his judgment, are deemed to be substantial. Since the proposed NSPS under consideration for wood-waste-fueled steam generators would be a revision of existing standards, there is no guarantee that an economic impact assessment will be prepared by the EPA Administrator. Even if an economic impact assessment is prepared, the extensiveness of that assessment is a decision left to the Administrator's discretion. If an extensive economic impact assessment is not completed for the proposed NSPS affecting wood-waste-fueled steam generators, the overall costs and energy use factors may not be taken into consideration.

If the Administrator does not comply with the economic assessment requirement of the CAAA with respect to the proposed NSPS for wood-waste-fueled facilities, "[n]o legal challenge to the (standard) . . . may be based on (his) failure to comply with this section, nor may any stay or injunction of a rule be granted on this basis" [141]. While a citizen suit may be brought to compel the Administrator to perform his duty under this section of the CAAA [142], wood-waste-fueled steam generators would still have to comply with the standards as promulgated or be penalized for noncompliance [143].

4.1.7 Requirement That All New Source Performance Standards Be Met

Total pollutant emissions [144] from 100% wood-fueled systems are comparable to or less than those from systems fired by other alternative fuels such as physically cleaned coal or low sulfur Western coal [145]. Sulfur dioxide emissions for wood-waste-fueled plants are lower than all comparable petroleum or coal fired plants [146]. Unfortunately, however, facilities are not allowed trade-offs in meeting the air quality emissions standards. For example, although wood-waste-fueled plants may be well below the applicable SO_2 emissions standards, they may exceed the applicable particulate emissions standards, and a relaxation in the applicable particulate emissions standards would not be

allowed as a credit against the sulfur emissions standards. A new or modified biomass-fueled facility must always meet all applicable performance standards [147]. Meeting all of these standards increases the capital expenditures required for pollution control equipment and diminishes the incentive to build for or convert to the use of biomass.

A wood-waste-fired facility may use wood fuels for 90% of its operating period and the remaining 10% of the time rely upon fossil fuels such as petroleum [148]. Where newly constructed or modified facilities have installed control technology that would comply with the standards when wood fuels are used, the facility would also have to install control technology that would comply with the standards for the period when fossil fuels are in use [149]. The result is that the same control technology would have to be installed to meet sulfur emissions standards as though the plant were using fossil fuels all of the time and not just 10% of the time [192]. The capital expenditures necessary to install emissions control technology to meet the standards for sulfur emissions which may occur only 10% of the time, and then only during an emergency, cannot be justified as an efficient use of limited capital resources. Instead of installing the necessary technology, a forest products manufacturer will shut down the plant [150]. Plant shutdowns and startups result in increased costs and higher energy usage.

It is necessary to use "backup" or auxiliary fossil fuel systems in order to maintain production continuity at the forest products plant site [151]. When very wet fuel is delivered to the combustion chamber, fossil fuels may also be required to assist the combustion process. The use of fossil fuels is generally limited to no more than 25% of the fuel heat input of the plant over an average year [152]. If EPA does not consider the use of backup fuel in promulgating NSPS for wood-fired combustion units, prospective owners will be left with the choice of making inefficient use of limited capital resources or shutting down their plant operations.

Where the economic benefits of biomass use are marginal when compared to conventional fuels, forcing a potential owner to choose between inefficient capital expenditures and future plant shutdowns may result in a decision to use conventional fuels. Biomass commercialization cannot prosper if proposed NSPS regulations produce such adverse decisions. In addition, a decision resulting in the increased use of conventional fuels would be contrary to FUA's overall purpose of encouraging the use of alternative energy resources.

The closest EPA has come to rectifying this problem is to allow the heat input provided by wood waste or residue to be used as a diluting agent in the calculations necessary to determine sulfur dioxide emissions from combination wood-and fossil-fuel-fired generators [153]. However, this approach probably is effective only where a mixture of wood waste and fossil fuels is being burned at all times.

It is doubtful that the heat input provided by wood would be used as a diluting agent where, for two weeks to a month, a plant relies totally on fossil fuels [154]. If wood is not being used, it cannot be figured in as a diluting agent. In order to meet sulfur emissions standards during this period, BACT for fossil fuel emissions would have to be installed. This control technology would still be equivalent to the technology necessary to meet the standards had the biomass facility been using fossil fuels 100% of the time. Therefore, neither the inefficient use of capital nor shutdowns of biomass-fueled facilities is avoided by allowing wood waste to be used as a diluting agent in meeting sulfur emissions standards.

4.1.8 More Stringent New Source Performance Standards for Major Fuel-Burning Installations

Wood-waste-fueled steam generators may have to comply with even more restrictive particulate emissions standards where they meet the criteria of an electric utility steam generating unit under regulations promulgated by EPA. Electric utility steam generating units on which construction or modification commenced after September 18, 1978, would have to meet a NSPS for particulate emissions of 0.03 pound per million Btu of heat input [155]. This standard would apply only to an electric utility steam generating unit capable of burning more than 250 million Btu per hour heat input of fossil fuel [156]. Where a plant burns fossil fuel in conjunction with wood waste, MSW, or some other biomass fuel, the plant would have to meet the applicable NSPS if the plant is considered to be an electric utility steam generating unit.

A combination fossil-biomass fueled electric steam generating unit constructed to supply more than one-third of its potential electric output capacity and more than 25-MW electrical output to any utility power distribution system for sale probably would be considered an electric utility steam generating unit [157]. This basis for qualification as an electric utility steam generating unit would be of particular importance to any large-scale (greater than 75-MW) fossil-biomass fueled cogeneration facility. A 75-MW or greater MFBI could be constructed to cogenerate process steam and electricity. The excess steam and electricity produced could be sold to a utility power distribution system. If the electric power sold were to amount to more than one-third of the MFBI's total electrical output capacity, i.e., more than 25 MW, the facility would be considered an electric utility steam generating unit, and subject to the more restrictive particulate emissions standards applicable to such facilities. The result probably would be to dissuade some owners from selling excess electricity to utilities. This would be particularly true where the prices paid by utilities for excess power are relatively low [158].

For a plant generating excess power, wheeling [159] of power may be one way to circumvent the problem of the facility being defined as an electric utility steam generating unit. Insofar as wheeling of power is not mentioned in the EPA regulations, it is possible that a facility that wheels its excess power would not fall within the definition of an electric utility steam generating unit and therefore would not be subject to the more stringent particulate emissions standards applicable to such facilities. The definition is probably in need of clarification in order for the owners or potential owners of combined biomass-fossil fueled facilities to be made aware of the NSPS they will be required to meet.

A cogenerator may also petition the Secretary of Energy for a permanent exemption from the applicable provisions of FUA [160]. The Secretary may grant a permanent exemption if he finds "that economic and other benefits of cogeneration are unobtainable unless petroleum or natural gas, or both, are used in such facility" [161]. If a facility must install BACT equipment to meet standards pertaining to 100% fossil fuel use when the facility is using fossil fuels only 10% of the time, or if a facility must meet the more stringent particulate emissions standards applicable to electric utility steam generating units, cogeneration may not be economically feasible unless higher percentages of petroleum or natural gas are used. As a result, such a facility would use less biomass or possibly none at all since the facility can be exempted from FUA.

4.1.9 More Stringent State Standards Possible

A state is allowed to establish more stringent emissions limitation requirements than the NSPS established by EPA. A state may also promulgate emissions limitations more stringent than those necessary to attain or maintain NAAQS [162]. Existing and prospective owners of wood-waste-fueled industries and powerplants may find that in some states their plants are subject to more stringent limitations than those promulgated by EPA.

Although Weyerhaeuser's study encompassed only the forest products industry, proposed particulate emissions NSPS would affect any wood- or wood-waste-fired steam generator with oil capacity [163]. As discussed in the foregoing sections, the proposed change in the NSPS that would make particulate emissions standards more restrictive may have a far-reaching, adverse impact upon the development and commercialization of wood wastes and residues as alternative energy sources.

Biomass facilities other than those fueled by wood residues have not been specifically discussed in this section as presently there are no existing or proposed NSPS for such facilities. As EPA continues to add new source categories for which performance standards will be promulgated, it can be expected that other biomass-fueled facilities, such as municipal solid waste energy recovery facilities [164], will have to comply with NSPS. Plants which may use MSW, agricultural wastes, or other forms of biomass in conjunction with fossil fuels are already covered by NSPS generally applicable to fossil fueled plants [165].

4.2 THE CLEAN WATER ACT

The Federal Water Pollution Control Act (FWPCA), originally passed in 1948 and amended in 1972 and 1977, established a comprehensive regulatory scheme to achieve the following purposes:

- to eliminate the discharges of pollutants into navigable waters by 1985;
- to attain and maintain an interim goal of water quality which provides for the protection of fish, wildlife, and recreation by July 1, 1983; and
- to prohibit the discharge of toxic pollutants in toxic amounts [166].

Silvicultural and agricultural practices used on future energy plantations to produce biomass resources would result in water runoff which could pollute navigable waters [167]. Biomass energy farms, like other biomass facilities, would therefore be subject to regulations promulgated pursuant to the FWPCA. The more intensive silvicultural and agricultural operations associated with prospective biomass energy farms should be taken into consideration in promulgating regulations if these facilities are to develop.

4.2.1 Point Source Discharges

Point source [168] discharges are administered through a National Pollutant Discharge Elimination System permitting process [169]. Permits are issued either by EPA or by states to which EPA has delegated permitting authority [170]. Effluent limitations for existing facilities are obtained through water quality standards [171] or the application of the best practicable control technology currently available (BPCTA) [172]. All existing point source dischargers must apply best conventional pollutant control technology (BCPCT) by July 1, 1984 [173]. By this same date, certain identified toxic polluters must

apply the more stringent best available technology economically achievable (BATEA) [174].

Regulatory processes and procedures are similar to those promulgated pursuant to the Clean Air Act. Existing powerplants and MFBIs converting to biomass use under FUA may be subject to one or more of the FWPCA point source requirements. Where there is a significant change in the effluent emissions due to a conversion, the facility's NPDES permit may be subject to modification [175].

New sources of pollution must apply the best available demonstrated control technology (BADCT) to achieve federal NSPS [176]. Existing and potential sources of biomass energy which have been designated as categories of sources for NSPS within the FWPCA are as follows:

- pulp and pulp mills;
- paperboard, builder's paper and board mills;
- grain mills;
- canned and preserved fruits and vegetables processing plants;
- sugar processing plants;
- feedlots; and
- timber products processing plants [177].

4.2.2 Nonpoint Source Pollutants

The FWPCA also regulates nonpoint sources of pollutants [178]. Silvicultural and agricultural biomass energy farms would be affected by these regulations. The Administrator of EPA has issued information regarding "processes, procedures and methods to control pollution resulting from agricultural and silvicultural activities, including runoff from fields and crop forest lands" [179]. Sediment and nutrients in the stream runoff from logging practices have not been subject to effluent limitations in a strict or standardized manner [180]. However, the effluents from the more intensive agricultural and silvicultural practices associated with energy farms [233] might be subject to more rigorous regulation [181].

Since the Administrator's issuance of information regarding the control of pollution from silvicultural and agricultural activities is an ongoing task, federal nonpoint water pollution regulations are expected to become more restrictive as more becomes known concerning pollution control for these sources. If the intensive silvicultural and agricultural operations peculiar to biomass energy plantations are not considered in promulgating nonpoint source regulations, prospective commercial development of these facilities will be impeded by pollution standards that cannot be met by such operations [182]. If large-scale biomass-fueled MFBIs and powerplants are to develop to any significant degree, they must have a steady stream of supply that can be provided only by the development of biomass energy plantations. The unavailability of biomass will limit conversions or the building of new biomass-fueled facilities pursuant to FUA.

4.3 THE RESOURCE CONSERVATION AND RECOVERY ACT

PIFUA specifically mentions the Solid Waste Disposal Act (SWDA) as one of the federal environmental legislative acts with which MFBIs and powerplants must comply [183]. Biomass facilities should have no problem complying with the SWDA. However, the SWDA does create competing interests for recycled materials which may render the operation of municipal solid waste recovery plants energy inefficient and uneconomical. Some of the landfill regulations promulgated pursuant to the Act may also impede the development of peach-pit-fueled biomass powerplants and MFBIs. Such a result is inconsistent with the spirit of FUA, which is to foster the development of these types of biomass facilities as an alternative source of energy.

SWDA was initially enacted in 1965. It was completely revised in 1976 and became the Resource Conservation and Recovery Act (RCRA) [184]. Congress had found that municipalities were having technical, financial, and administrative problems disposing of the ever-increasing amounts of solid wastes generated within their territories [185]. Unsanitary landfills and open dumping posed potential health hazards, while various recoverable materials and energy resources were being wasted [186].

Some of the stated purposes of RCRA are as follows:

- to prohibit future open dumping on land and to require the conversion of existing open dumps to facilities which pose no threat to health or to the environment;
- to promulgate guidelines for solid waste collection, transport, separation, recovery, and disposal practices; and
- to establish a cooperative effort between federal, state, and local governments and private enterprise to recover valuable materials and energy resources from solid waste [187].

RCRA requires that federal procurement agencies, with respect to purchases or acquisitions exceeding $10,000, "procure items composed of the highest percentage of recovered materials practicable . . . " [188]. Items consisting of recovered materials may include finished products from recycled paper, iron, aluminum, tin, and glass [189]. These same materials most often end up as part of the composition of MSW [190].

Municipal solid waste resource recovery systems generally separate valuable nonorganic wastes which are sorted and then sold for reuse [191]. The recovery of scrap, from an economic viewpoint, is a crucial adjunct to any resource recovery system [192]. A policy that encourages the Federal Government to purchase materials containing high percentages of recoverable material may decrease the amount of combustible and noncombustible recyclable materials which end up in the MSW stream. Such a procurement policy increases the value of recyclable materials, providing an incentive for manufacturers or other middlemen to recover these goods before they enter the MSW stream.

Recycling drives for high quality paper are taking place in offices across the country. Much of this activity may stem from competition among paper manufacturers and suppliers servicing the Federal Government. Paper is highly combustible. Reductions in the amount of paper contained in MSW will result in a reduced fuel heat content. Paper products, which make up 53% by weight of the refuse volume, provide 71% of the heat value [193]. To obtain the same heat input rate for MSW containing a smaller percentage of paper, larger volumes of MSW would have to be burned. Larger MSW fuel volumes would require larger facilities and would involve increased costs and probably decreased energy efficiencies.

Stipulations for federal procurement practices probably make it advantageous for manufacturers and suppliers to go directly to the consumer for recoverable resources [194]. The untoward result is that less of these materials end up in MSW. Some operations which go directly to the consumer bypass the MSW resource recovery plant entirely [195]. It will be more difficult for MSW resource recovery plants to find buyers for the recovered materials if manufacturers are already obtaining sufficient supplies directly from consumers. If owners of MSW energy plants are unable to obtain buyers for their recovered materials, the economic feasibility of their operations will be impaired. Less solid waste recovery results in more waste disposal and probably higher energy use [196].

According to RCRA, federal agencies that generate heat or mechanical or electrical energy from fossil fuels in systems where recovered material may be used must use recovered material as a primary or supplemental fuel [197]. In cities where there are either large federal installations or numerous federal agencies, the possibility exists that intergovernmental recycling programs may be instituted to recover valuable noncombustible resources for sale while obtaining large volumes of paper for fuel production. Federal facilities probably supply a large portion of the paper content in MSW. Regulations which would result in a reduction in the volume of federal paper supplied to the MSW stream could severely affect the availability of high-Btu MSW for fuel input, which would adversely affect the economic viability of an MSW energy plant.

Municipal solid waste energy plants, as well as other biomass-fueled facilities, generally must dispose of the residues resulting from their operations [198]. Any disposal of solid waste on land must be done in a manner consistent with RCRA and regulations issued thereunder [199]. Such regulations require that solid waste be disposed of in sanitary landfills [200]. Due to the volume reduction in disposable wastes that occurs in MSW recovery operations, these regulations are not expected to pose any problem for MSW plants. A problem may arise, however, for biomass plants that use peach pits for fuel. The peach pits must dry at a landfill site for several years before they can be burned as a fuel [201]. Cover material such as soil must be used to cover landfill sites. In certain specified instances, the cover material must be a foot deep. These types of cover requirements could inhibit the drying process necessary to prepare the peach pits for use as a fuel. If the peach pits cannot be dried sufficiently, they cannot be burned as a fuel. Consequently, food processing facilities that otherwise would convert to the use of biomass resources such as peach pits pursuant to FUA may be unable to do so.

4.4 THE NATIONAL ENVIRONMENTAL POLICY ACT

FUA expressly mentions the National Environmental Policy Act (NEPA) as one piece of federal environmental legislation with which facilities converting to alternative energy sources must comply [202]. Compliance may be costly and time-consuming, and often is challenged and must be proven in lengthy litigation. The time and money involved in complying with NEPA may discourage facilities from converting to biomass fuels.

NEPA was enacted in 1969 [203] for the purposes of:

- declaring a national policy which will encourage productive and enjoyable harmony between man and his environment;
- promoting efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; and
- enriching the understanding of the ecological systems and natural resources important to the nation [204].

NEPA requires that all federal agencies proposing major federal actions which significantly affect the quality of the human environment prepare an environmental impact statement (EIS) [205]. The EIS must assess the environmental impact of the proposed action and contain a detailed statement of any unavoidable adverse environmental impacts should the proposed action be taken, alternatives to the proposed action, local short-term uses of the environment in relationship to long-term productivity, and any irreversible and irretrievable commitments of resources which would result from the proposed action [206].

The purpose of the EIS requirement is for federal decision makers to undertake a careful and detailed analysis of the environmental consequences of their proposed actions. Where federal agencies are involved in the development of large-scale, biomass-fueled facilities that could significantly affect the environment, an EIS is required. For example, an EIS must be prepared by DOE in connection with its sponsorship of the Fuels from Biomass Program, a federal program to foster the research, development, and commercialization of biomass [207].

The preparation of an EIS often requires a year or more, depending upon the scope and complexity of the proposed action. While the EIS is being prepared, the proposed action, such as a facility's conversion to biomass, may not be taken. The proposed action may be further delayed by litigation challenging the adequacy of the EIS [208]. Such challenges by individuals or organizations opposing a proposed action have become relatively common, due in part to liberal judicial interpretations of standing requirements [209]. For example, recent litigation involving the adequacy of an EIS for the lifting of the moratorium on the coal leasing program delayed the lifting of the moratorium for six years [210].

Large-scale, biomass-fueled industries and powerplants are thought to be more environmentally benign than those that burn fossil fuels since the air quality impacts of biomass facilities are less of a health hazard than those of fossil-fueled facilities. FUA evinces a national policy dictating the use of biomass and other alternative fuels as primary energy sources. Neither of these attributes renders biomass facilities immune from NEPA litigation or its concomitant delays in project commencement and increased project costs.

Where the economic feasibility of obtaining fuels from some biomass applications is already in question, long-term and costly environmental litigation will render these facilities less feasible. Large-scale biomass plants which may be economically viable, or marginally so, may be rendered unworkable or impractical [211].

4.5 THE COASTAL ZONE MANAGEMENT ACT

The Coastal Zone Management Act (CZMA) was enacted in 1972 [212] and amended in 1976 [213]. The CZMA authorizes grants to the states to establish comprehensive management programs for the nation's land and water resources located within the coastal zone [214]. The geographical limit of the coastal zone varies from state to state, but generally extends from a seaward boundary to a few miles inland in each coastal state. The objective of the CZMA is the preservation, protection, development, restoration, and enhancement of the nation's coastal resources [215].

State CZM plans, which must be approved by the Secretary of Commerce, define the geographical limits of the coastal zone, permissible land and water uses, and the priorities of those uses [216]. The 1976 CZMA amendments added a new CZM plan element

that requires states to plan specifically for energy facilities likely to locate in or significantly affect the coastal zone [217]. The states must also establish effective enforcement schemes [218].

The "consistency clause" [219] of the CZMA is applicable to biomass-fueled industries and powerplants in regard to federal requirements under the Act. Once a state's CZM plan is approved, any federal agency which supports or conducts activities such as biomass plants or aquaculture energy farms in the coastal zone of the affected state must conduct those activities, to the maximum extent practicable, in a manner consistent with the state plan [220].

After the Secretary gives final approval to a state CZM plan, applicants for federal licenses and permits to conduct activities affecting land or water use in the coastal zone must certify to the pertinent federal agency that the proposed activity complies with the state's plan and will be conducted in a manner consistent with that plan [221]. No federal permit or license can be issued until the state notifies the federal agency that it concurs with the applicant's certification. According to the CZMA, a state's concurrence may be conclusively presumed if the state fails to act within six months.

Permitting processes are usually long and burdensome for the permit applicant. A state is directed to notify the federal agency of its concurrence or objection at the earliest time practicable [222]; however, a state may delay the federal permitting process for affected biomass-fueled industries and powerplants for a period of up to six months merely by failing to act for that time. The federal permitting process, already wrought with frustrations for the applicant, is thereby further delayed. Such delays may discourage fledgling biomass facilities whose economic feasibility is already marginal.

4.6 THE WILDERNESS ACT

The Wilderness Act (WA) [223], enacted in 1964, established the National Wilderness Preservation System [224]. The purpose of the Act is to preserve and protect designated public lands in their natural condition, securing for the present and future generations of Americans the benefits of enduring wilderness resources [225].

Those planning biomass-fueled industries or powerplants near national forests may wish to enter into contracts with the Forest Service for the cutting and sale of timber [226]. Where the proposed timber sale is on land untrammeled by man and adjacent to a primitive area that provides access to the timber, the land may meet the minimum suitability requirements for a wilderness classification [227]. If so, the proposed timber sale would have to be forestalled until the President and Congress made a determination as to whether the land should be classified as a wilderness area [228]. The planning and development of the biomass facility might have to be halted until a supply of timber could be assured. Generally, commercial enterprises, permanent roads, temporary roads, motor vehicles, motorized equipment, motorboats, aircraft landings, and other forms of mechanical transport are prohibited in designated wilderness areas [229]. If Congress and the President were to determine that land should be classified as a wilderness area, and there was no other supply of timber available in the area, the biomass project would probably have to be cancelled.

Within wilderness areas, the President may authorize the establishment and maintenance of power projects, transmission lines, and other facilities deemed to be necessary in the public interest, including the road construction and development essential to the maintenance of such facilities. To date, some projects and facilities have in this way been

established in wilderness areas. However, at present, unless there is a severe energy emergency, it is doubtful that any biomass facility would be established within a wilderness area or that exceptions would be granted to allow the removal of timber therefrom for the purpose of facilitating biomass development.

The Bureau of Land Management currently is reevaluating many roadless public land areas for possible designation as wilderness areas. The public lands designated as wilderness areas may therefore be increased in the near future, making even less of the public lands available for use in developing biomass facilities.

SECTION 5.0

FEDERAL LAND-USE LEGISLATION: THE FEDERAL LAND POLICY AND MANAGEMENT ACT

Large-scale terrestrial biomass energy plantations are presently under study [230]. However, commercial development probably will not occur until after the turn of the century [231]. Due to the large areas of land and amounts of water required for the production of energy crops from silvicultural and agricultural energy farms [232], federal land-use laws will apply to and may restrict the development of these facilities.

One-third or 1.1 million square miles of the nation's land is owned by the Federal Government. Approximately 66% of the public lands is controlled by the Bureau of Land Management, while another 25% is controlled by the Forest Service. Control of the majority of public lands remaining is divided among nine other federal agencies [233].

The Federal Land Policy and Management Act (FLPMA) governs the administration of the public lands. The discussion which follows addresses how the implementation of provisions contained in FLPMA may impede the development of large-scale, biomass-fueled industries and powerplants attempting to comply with FUA.

The Federal Land Policy and Management Act [234] was enacted in 1976. The FLPMA essentially establishes a comprehensive land use policy regarding affected public lands [235]. The Act renders the sale and disposal of public land more restrictive and creates a policy reversal whereby the public lands are retained by the Federal Government unless it is in the national interest to sell, exchange, or otherwise dispose of them [236]. Other pertinent policies set forth in the FLPMA are:

- the establishment of a federal-state land-use planning process for the present and future use of public lands;
- judicial review of land-use decisions;
- the establishment of uniform procedures for the disposal or exchange of any public lands.

Studies have indicated the most suitable geographical areas for large-scale energy plantations are the Southwest, Southeast, and the Northeast [237]. While studies have selected the Southeast and Northeast regions primarily for their annual rainfall or soil characteristics [238], the Southwest has been selected primarily due to the availability of public lands [239].

A prospective owner or operator, wishing to purchase public lands for the development of a terrestrial biomass energy farm, would have to make the purchase in compliance with the applicable provisions of the FLPMA. Public land may be sold only where, as a result of a detailed land-use planning process, it has been determined that the following disposal criteria have been met:

- the tract of land is difficult or uneconomical to manage as part of the public lands and is unsuitable for other federal management;
- the tract of land is no longer required for the specific purpose for which it was acquired; or

- sale of the tract will serve important public objectives which cannot be achieved on private lands and which outweigh other public objectives [240].

Community expansion and economic development are specifically mentioned as important public objectives. These stated public objectives are not meant to be all-inclusive, but no other public objectives are specifically enumerated. Whether or not the development of energy crops could be considered an important public objective, such as economic development, is not yet known.

Unfortunately, no regulations have been promulgated pursuant to the sales [241] section of the FLPMA [242]. It would be highly speculative to predict whether such regulations will enumerate types of facilities or specify criteria which will have to be met in order to determine whether an important public objective would be served by a sale for the purpose of an energy farm [243]. If regulations were promulgated specifying that alternative energy development will serve important public objectives, then biomass energy plantations probably would have little difficulty qualifying for land sales under the rules.

If specific criteria must be met, the prospective owner of a biomass energy plantation has a burden of proof that would go beyond establishing that the facility serves an important public objective. When national energy interests are balanced against the many competing local interests in the tract of land involved, the prospective purchaser may find it difficult to sustain his burden of proof. Although the development of alternative energy resources such as biomass may generally be an important public objective, it may not be with respect to a particular plant. In addition, each prospective owner of a biomass facility would have to spend time, energy, and money to prove an important public objective would be met, every time he wished to purchase public land for such a facility. Had the legislative language of the FLPMA specified that the development of renewable sources of energy was an important public objective, one would not have to speculate about the rules to be promulgated. However, if the legislators did not specifically consider alternative energy resources such as biomass, the administrators also might not consider it in promulgating the rules.

Assuming land is designated for sale, if it is over 2500 acres, the Secretary of Interior must submit notice of the designation to the Senate and House of Representatives [244]. Biomass energy farms are expected to require more than 2500 acres in order to be economically feasible, and therefore sales for the purpose of biomass resource development will require Congressional approval. If Congress adopts a resolution disapproving the designation for sale, the sale will not be consummated. Therefore, while FUA expressly encourages the use of biomass as an alternative energy resource, Congress may discourage biomass development by disapproving the designation of public lands for sale for use as an energy plantation.

Although energy plantation development is not expected to take place until the somewhat distant future, if biomass will not be available in sufficient quantities due to the unavailability of land on which to produce it, prospective owners of MFBIs and powerplants will be somewhat hesitant about converting to biomass use pursuant to FUA.

Another section of the FLPMA may be particularly prohibitive with respect to the production of agricultural crops for energy use. The Secretary of Interior determines the size of the tracts of public lands to be sold based upon land-use capabilities and the development requirements of the land. Where the tract is sold chiefly for agriculture, "its size shall be no larger than necessary to support a family-sized farm" [245]. The term agriculture is not defined within the FLPMA. One dictionary definition of agricul-

ture is "the cultivation of the ground to raise food; husbandry; farming" [246]. It has also been defined as the "cultivation of crops and the raising of livestock; farming" [247]. Under the first definition, energy plantations would not be considered agriculture since the cultivation of the ground would not be for the purpose of raising food. However, the second definition does not refer to the purpose for which the crops are cultivated. Therefore, under this definition, and possibly under the FLPMA, energy plantations could be considered agriculture. If this is indeed the case, a tract of land sold under the FLPMA for the development of an agricultural energy plantation may be limited to the size of a family farm [248]. As energy plantations would require extremely large tracts of land to be economically feasible operations, if their size were to be limited to that of a family farm, their development on public lands would be unalterably impeded. Again, without the development of energy plantations, it is doubtful that biomass energy resources will be available in sufficient quantities to justify conversions to biomass by MFBIs and powerplants pursuant to FUA.

SECTION 6.0

CONCLUSION

The Powerplant and Industrial Fuel Use Act theoretically fosters the development of biomass-fueled facilities by requiring that major fuel-burning installations and electric powerplants use alternate fuels such as biomass as a primary energy source. However, facilities converting to biomass use pursuant to FUA will have to comply with certain federal, state, and local environmental and land-use laws that may, in fact, impede the large-scale commercialization of biomass technologies.

The new source performance standards presently under consideration for air emissions from wood-waste-fueled facilities may be overly restrictive. As proposed, these standards may create a disincentive for expanded use of wood wastes and residues as a fuel in the forest products industry and by prospective powerplants. Considering NSPS for wood-waste-fired facilities in relation to their oil capability does not give full recognition to the less hazardous emissions produced by the burning of wood wastes as compared to conventional fuels. Such recognition would help to promote biomass conversions pursuant to FUA as opposed to discouraging these conversions.

Federal policy which fosters and facilitates the recovery of recyclable materials, removing them from the MSW stream, works a hardship upon the economic feasibility and viability of MSW energy plants. MSW plants are dependent upon the sale of materials recovered from the waste stream for their profit margin. Powerplants and MFBIs considering conversions pursuant to FUA will not convert to MSW as an energy resource if MSW plants cannot be operated profitably. New MSW recovery plants will not be built if the resource will not be available in sufficient amounts for efficient energy production. Due to recycling activities, prospective MSW energy plants stand to lose a substantial percentage of highly combustible paper products from the waste stream, and therefore probably will be energy inefficient and will not continue to be built.

With no limits upon the length of environmental litigation under NEPA, prospective biomass facilities may be delayed or even cancelled. Examining these facilities based upon their particular environmental benefits and the development of viable alternative energy fuels may warrant considering placing durational limits on NEPA litigation with respect to these facilities.

If prospective terrestrial energy plantations are precluded from being situated on public lands, or required to undertake extensive qualifying procedures, their commercialization will be severely impeded. The absence of energy farms may adversely affect the future availability of biomass for fuel use, and may therefore discourage conversions to biomass use pursuant to FUA.

The study and analysis undertaken in this report does not purport to be an exhaustive examination of all federal legislation and regulations which may adversely affect the development of large-scale, biomass-fueled industries and powerplants. This study has merely considered some of the major barriers to large-scale biomass commercialization. There are other federal laws with which biomass facilities will have to comply, as well as an entire layer of state laws and local ordinances. Some of these requirements undoubtedly will pose similar, or, in some cases, entirely different impediments to the development of large-scale, biomass-fueled facilities.

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9. Daniel; "Garbage: A Fuel for the Future," Reader's Digest (December 1977), reprint.
10. 42 U.S.C.A. §§8301 et seq.
11. The National Energy Conservation Policy Act, Public Utilities Regulatory Policies Act, Natural Gas Policy Act, Powerplant and Industrial Fuel Use Act, and the Energy Tax Act of 1978 comprise the National Energy Act.
12. Id. §§8311, 8312, 8341, 8342.
13. Id. §8301(b).
14. Id. §8302(a)(17)(B).
15. Id. §8302(a)(17)(A).
16. See generally E. H. Hall, et al.; Comparison of Fossil and Wood Fuels (1976), EPA Report No. EPA-600/2-76-056, NTIS No. PB 251-622; and U.S. Department of Energy, Final Environmental Impact Statement for the Fuel Use Act (April 1979), DOE/EIS-0038.
17. Id.
18. Solar Program Assessment, supra note 3.
19. Solar Energy Research Institute, supra note 4.
20. Id.
21. Id.
22. See generally J. A. Alich, et al.; An Evaluation of the Use of Agricultural Residues as an Energy Feedstock, Vols. I-II (1977); and D. J. Salo, et al.; Design of a Pilot Silvicultural Biomass Farm at the Savannah River Plant (1979), ERDA #EG-77-C-01-4104.
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26. Weyerhaeuser Company, Preliminary Issue Statement: Revised Air Emissions Standards for Wood Waste Fuels (April 18, 1979).
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28. Id.
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30. Id.
31. Id.
32. Solar Energy Research Institute, supra note 4.
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50. Royal College, supra note 38.
51. E. Lipinsky, supra note 46.
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53. Solar Program Assessment, supra note 3.

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56. Council on Environmental Quality, supra note 6.

57. P. Seligman; Ocean Food and Energy Farm Project, Subtask Five (1976), ERDA/USN 1027-5.

58. Id.

59. Id.

60. Solar Program Assessment, supra note 3.

61. Id.

62. 42 U.S.C.A. §8301(b)(3).

63. Id. §8311(1).

64. Id. §8311(2).

65. Id. §8312(a).

66. Id. §8341(a)(1).

67. Id. §8341(a)(2).

68. Id. §8341(a)(3).

69. Id. §§8302(a)(7)(A)(i), (10)(A)(i).

70. Id. §§8302(a)(7)(A)(ii), (10)(A)(ii).

71. See generally SERI, supra note 7.

72. York-Shipley Inc.; "Solid Waste Converter," Conference on Wood Chips for Fuel and Energy, Potsdam, NY (January 11, 1978). Sponsored by Black River-St. Lawrence Resource Conservation and Development Project, et al.; under auspice of Legislative Commission on Energy Systems.

73. Mark Bagdon; "Wood's Role in the National Energy Plan," Conference on Wood Chips, supra note 72. It is conceivable that this difference in Btu value based upon moisture content could affect whether an individual plant would or would not be governed by PIFUA. In actuality, the amount of fuel input volume probably would be increased to maintain the hourly Btu heat input value thus preserving boiler efficiency and the desired level of boiler output.

74. The largest model of one manufacturer has a fuel heat input rate of only 90 million Btu per hour. York-Shipley, supra note 72.

75. 42 U.S.C.A. §8301(b)(3).

76. 42 U.S.C.A. §8302(a)(b)(A).

77. U.S. Department of Energy, Final Environmental Impact Statement for the Fuel Use Act (April 1979), DOE/EIS-0038.

78. See generally E.H. Hall, et al.; Comparison of Fossil and Wood Fuels (1976), EPA Report No. EPA-600/2-76-056, NTIS No. PB 251-622.

79. 42 U.S.C.A. §7401 et seq.

80. Id.

81. 42 U.S.C.A. §7409. Unless otherwise stated, CAA refers to the Clean Air Act inclusive of amendments.

82. 42 U.S.C.A. §7410.

83. S.J. Williamson; Fundamentals of Air Pollution 389 (1973).

84. Indiana and Michigan Electric Co. v. Environmental Protection Agency, 509 F 2d 839 (7th Cir. 1975).

85. Draft memorandum to: Director, Air and Hazardous Materials Division, Regions I, II-X and Director, Environmental Programs Division, Region II, from: Walter C. Barber, Director, Office of Air Quality Planning and Standards, subject: Clean Air Act Amendments—Assurance of Plan Adequacy; undated (attachment to memorandum dated January 23, 1978; to: same as foregoing, et al. from: Richard G. Rhoades, Director, Control Programs Development Division).

86. S.J. Williamson, supra note 83. "The term 'new source' means any stationary source the construction or modification of which is commenced after the publication of regulations (or, if earlier, proposed regulations) prescribing a standard of performance..." 42 U.S.C. §7411(a)(2).

87. Hewett, C.E.; High, C.J.; Environmental Aspects of Wood Energy Conversion (1979).

88. 42 U.S.C.A. §7473.

89. 42 U.S.C.A. §7411.

90. R. Hodam; Final Report on Energy from Biological Processes Task IXB: Agricultural Wastes (1979). D.C. Junge; The Impact of New Source Performance Standards for Wood and Bark Residue Fired Combustion Systems and Recommendations for Specific Standards (1979), indicates the percentage of installed capital costs for completely new facilities to burn 1 quad of wood would range from 67% to 12% depending upon the applicable NSPS.

91. 42 U.S.C.A. §7411.

92. Id.

93. DOE, supra note 77.

94. E.H. Hall, supra note 78.

95. 42 U.S.C.A. §7411(a)(8).

96. Under the Energy Supply and Environmental Coordination Act of 1974, the Federal Energy Administrator could, by order, prohibit any powerplant or MFBI from burning natural gas or petroleum products if it has the capability and necessary plant equipment to burn coal. Pub. L. 93-319 §2(a)(1) and (2). The FEA Administrator's authority to issue orders under the ESECA expired as of December 31, 1978, but such rule or order may take effect at any time prior to January 1, 1985. 15 U.S.C. §792(f)(1)(19).

97. "Section 111 [U.S.C.A. 42 §7411] applies only to sources constructed or modified after the effective date of the standard and does not contemplate retrofitting a preexisting facility." People of the State of California v. Dept. of Navy, 431 F. Supp. 1271 (N.D. Cal. 1977).

98. PIFUA §762(b).

99. Id.

100. R. Hodam, supra note 90.

101. Solar Program Assessment, supra note 3.

102. Council On Environmental Quality, supra note 6.

103. Letter from U.S. Senator Gary Hart to President Carter (July 2, 1979).

104. Id.

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108. 42 U.S.C. §7424(b)(1).

109. PIFUA §211(a)(3), 212(a)(1)(C), 31(a)(3), 312(a)(1)(C).

110. Memorandum from: Walter C. Barber, Director, Office of Air Quality Planning and Standards, EPA; to: Director, Air and Hazardous Materials Division, Regions I, III-X and Director, Environmental Programs Division, Region II (July 31, 1978).

111. Detailed procedures expressed in W.C. Barber memorandum, supra note 107.

112. W.C. Barber, supra note 110.

113. Weyerhaeuser Company, supra note 8.

114. Personal communication with Robert L. Jamison, Director of Energy Management, Weyerhaeuser Company (July, 1979).

115. D. Junge; The Impact of New Source Performance Standards for Wood and Bark Residue Fired Combustion Systems and Recommendations for Specific Standards (1979).

116. Weyerhaeuser Company, supra note 8.

117. The proposed NSPS are presently under study by EPA at Research Triangle, North Carolina. They are expected to be officially proposed (e.g., published in the Federal Register) in late 1980. The target data for finalization would be mid-1981. R.L. Jamison, supra note 114.

118. D. Junge, supra note 115.

119. Presently, standards apply only to wood facilities having capacities greater than 250 million Btu/hr. Therefore, smaller facilities would have to comply with the proposed NSPS if the standards are promulgated in their present form. Id.

120. Although Weyerhaeuser based its cost estimates upon retrofitting facilities, it should be noted that NSPS would only apply to newly constructed or modified facilities.

121. D. Junge, supra note 115.

122. Id. at 3.

123. Id. The effectiveness and a rough estimate of collector costs to control particulate emissions from wood fueled power generation are summarized below:

Table A

	Collection Efficiency Percent[a]	Installed Cost $1,000[a]	Annualized Cost $1,000[a]
Cyclone scrubber	99.9	422-633	192-264
Wet scrubber	99.8	480-752	800-1040
Electrostatic precipitator[b]	98.7	672-848	12-144
Fabric Filter	99.9	752-1040	240-288

[a]Figures are based on 50-MW wood-fueled powerplant excluding cost of fans, directing, etc.
[b]Not based on proven performance of ESP on wood-fueled boilers.

Source: E.H. Hall, et al.; Comparison of Fossil and Wood Fuels, 1976.

124. R.L. Jamison, supra note 114.

125. Id.

126. Weyerhaeuser Company, supra note 8.

127. Id.

128. Id. The additional electric power necessary is expected to be met by the utility industry through added capital expenditures as opposed to cogeneration by the forest products industry. Jamison, supra note 114.

129. D. Junge, supra note 115.

130. Id., at 3.

131. Id., at 4.

132. S.J. Williamson, supra note 83.

133. D. Junge, supra note 115, at 4.

134. Weyerhaeuser Company, supra note 8.

135. Id.

136. See Note Table 4.1.

137. D. Junge, supra note 115, at 4.

138. 42 U.S.C. §7617(a)(1) and (b).

139. 42 U.S.C. §7617(c)(1) and (5).

140. Portland Cement Assoc. v. Ruckelshaus, 486 F. 2d 375.

141. H.R. Rep. No. 564 387 (1973). 95th Cong., 3d Sess. 179 (1979). See also 42 U.S.C. §7617(e).

142. 42 U.S.C. §7617(f). In fact, a citizen's suit is the sole method for enforcement of the Administrator's duty to prepare an economic impact assessment.

143. 42 U.S.C. §7420(a)(2)(ii).

144. Total pollution emissions included nitrogen oxide, sulfur dioxide, carbon monoxide, particulates, and total organics.

145. E.H. Hall, supra note 78.

146. Id.

147. D. Harvey; Environmental Engineer, Permits Branch, Environmental Protection Agency, San Francisco, California (August 1979).

148. Weyerhaeuser presently operates plants which should have this type of wood waste to fossil fuel ratio.

149. R. Jamison, supra note 114. D. Harvey, supra note 29.

150. R. Jamison, supra note 114.

151. D. Junge, supra note 115.

152. Id.

153. 44 F.R. 33612; Indiana and Michigan Electric Co. v. Environmental Protection Agency, 509 F. 2d 839 (7th Cir. 1975).

154. D. Harvey, supra note 147.

155. 40 CFR Part 60 §60.42a, 44 F.R. 33612, 33614.

156. "Any change to an existing fossil fueled fired steam generating unit to accommodate the use of combustible materials, other than fossil fuel, shall not bring that unit under the applicability of this subpart." 40 CFR Part 60 §6040(c). Id. "Any change to an existing steam generating unit originally designed to fire gases or liquid fossil fuels to accommodate the use of any other fuel (fossil or non-fossil) shall not bring that unit under the applicability of this subpart." 40 CFR Part 60 §6040(d), Id.

157. Steam supplied to a steam distribution system for steam electric generation that would produce electricity for sale is also considered in determining the electrical energy output of the affected facility. 40 CFR 60.41a; 44 F.R. 33612, 33613.

158. The Louisiana Pacific Corporation, a forest products firm in Samoa, Calif., received approximately $550,000 (after deduction penalties) for excess provision sold to Pacific Gas & Electric (PG&E) and paid PG&E $1.5 million for approximately the same amount of power. E. Taylor, "Louisiana Pacific Corporation Case History," Biomass Energy Conversion Workshop for Industrial Executives (April 9-10, 1979), sponsored by SERI; Claremont, California.

159. Wheeling of power is the concept of putting power into a grid system at one point and driving it off at another point. Id.

160. PIFUA §§212(c), 312(c).

161. Id.

162. Williamson, supra note 83.

163. 44 F.R. 3491, 3492.

164. The municipal solid waste facility in Hempstead, N. Y., which has the capacity to burn 2000 tons of MSW per day generating 50 MW of electricity, is presently being studied by EPA as a basis to establish NSPS for these biomass facilities. Currently the Hempstead resources recovery facility is operating well below the applicable ambient air quality standards. Personal communication with Arnold Bornstein, Public Relations Director (August, 1979).

165. 44 F.R. 3491, 3492.

166. 33 U.S.C. §1251 (West 1978).

167. Council on Environmental Quality, supra note 6.

168. "A point source is an individual, identifiable emitter of pollution, such as a plant stack. A nonpoint source is a group of pollution emitters, such as an urban area, or an area of pollution emitting material, such as a coal mine." DOE, supra note 77.

169. 33 U.S.C. §1342.

170. Id.

171. 33 U.S.C. §1311(b)(1)(C) and §1313.

172. 33 U.S.C. §1311(b)(1)(A).

173. 33 U.S.C. §1311(b)(2)(E).

174. 33 U.S.C. §1311(b)(2)(A).

175. 33 U.S.C. §1316(a)(1).

176. 33 U.S.C. §1316(b)(1)(A).

177. 33 U.S.C. §1342(a) and (b).

178. 33 U.S.C. §1314(8).

179. Id.

180. E.H. Hall, supra note 78.

181. J.A. Alich, supra note 22.

182. Energy usage to meet water pollution control standards is not small. Electric powerplants' energy demands to meet the standards are higher than other industries primarily due to thermal discharge control as opposed to biological or chemical waste water treatment. EPA is required to promulgate standards for steam-electric powerplants. Many existing and proposed powerplants will have to provide off-stream cooling. This results in an energy penalty due to reduced efficiency and increased operating requirements. The 1980 energy penalty for electric powerplants has been estimated at 50 thousand barrels per day of oil. Biomass fueled powerplants will probably suffer energy penalties also. Cynwin; "Energy Impacts of Water Pollution Control." W.J. Jewell, ed.; Energy, Agriculture and Waste Mangement (1975).

183. PIFUA §103(a)(17)(B).

184. Pub. L. 94-580, October 21, 1976.

185. 42 U.S.C.A. §6901(a)(3).

186. 42 U.S.C.A. §6901(b), (c) and (d).

187. 42 U.S.C.A. §6902.

188. 42. U.S.C.A. §6962(a) and (b).

189. J. Daniel, supra note 9.

190. C. Bielicki; "The Economics of Recovering Recyclable Materials from Urban Wastes," Symposium Papers: Clean Fuels from Biomass and Wastes (January 25-27, 1977), Orlando, FL: Sponsored by Institute of Gas Technology.

191. Bornstein, supra note 164.

192. Daniel, supra note 9.

193. Council on Environmental Quality, supra note 6.

194. One such case is Reynolds Aluminum. Daniel, supra note 9.

195. Reynolds is also purchasing recyclable aluminum from at least one MSW resource recovery plant. Bornstein, supra note 164.

196. 42 U.S.C. §6962(c)(1)(B).

197. 40 CFR §241.180 et seq.

198. Borenstein, supra note 164.

199. 40 CFR §241.180 et seq.

200. Id.

201. Stubbe, "Tri-Valley Growers," SERI, supra note 7.

202. PIFUA §103(a)(17)(B).

203. Pub. L. 91-190 §2, January 1, 1970, 83 Stat. 352. See also 42 U.S.C. §4321. et seq. (West 1977).

204. 42 U.S.C.A. §4321 (West 1977).

205. 42 U.S.C.A. §4332 (West 1977).

206. 42 U.S.C.A. §4332 (c) (West 1977).

207. The Programmatic EIS for the Fuels from Biomass Program is in the process of being prepared and should be available sometime in September 1979. Personal communication with Ron Lwose, Environmental Division, DOE (August 1979).

208. The statistics in the Council on Environmental Quality's Ninth Annual Report—1978 at 407-409 are illustrative. As of Dec. 31, 1977, 938 NEPA cases had been filed against federal agencies. In 202 cases, projects were delayed by injunctions granted under NEPA. In 92 of these cases, projects were delayed for more than one year. Sixty projects were cancelled following an injunction under NEPA, although the reasons given for abandonment varied considerably. Id., note 9.

209. Litigation under NEPA has been facilitated by the courts' liberal interpretation of who has standing to sue an agency for inadequate compliance with the statute. The oft-recited formula is that a plaintiff must allege (1) that the challenged administrative action will cause him injury in fact and (2) that the injury is to an interest arguably within the zone of interests protected by NEPA. In practice, these requirements are easily met. In United States v. Students Challenging

Regulatory Agency Procedures (SCRAP), 412 U.S. 669 (1973), the Supreme Court found standing under NEPA despite what the Court acknowledged to be an "attenuated line of causation": namely, that an ICC-approved railroad rate increase would cause increased use of nonrecyclable goods as compared to recyclable goods, thus resulting in more refuse being discarded in the national parks, forests, streams, and other resources in the Washington, D.C., area enjoyed by plaintiffs and in the need to consume more natural resources, some of which might be extracted from the Washington area. Injury to aesthetic, conservational, and recreational interests clearly suffices to confer standing. Id. at 686-687; Sierra Club v. Morton, 405 U.S. 727, 733 (1972). At least one recent case suggests that injury to "informational interest"—i.e., the public's right to know—also confers standing under NEPA. Natural Resources Defense Council v. SEC, 432 F. Supp. 1190, 1197 (D.D.C. 1977). The lesson of these cases is that an individual aggrieved by an agency project, whether for environmentally sound or purely selfish reasons, will find it easy to win standing to sue the agency for inadequate compliance with NEPA. Well-documented and careful compliance with the statute must then become the agency's defense.

An illustration of the potential for delay, for good or ill, in a NEPA lawsuit is the coal leasing moratorium. The Department of Interior has been trying since 1974 to lift a moratorium it imposed in 1970 on regular coal leasing of federal lands. A 1975 EIS was rejected in NRDC v. Hughes, 437 F. Supp. 981 (D.D.C. 1977), modified, 474 F. Supp. 147 (D.D.C. 1978), to permit limited leasing in special circumstances. More than four years after its first draft EIS, Interior issued a new draft EIS in December 1978. A final EIS and a decision by the Secretary of Interior are expected in mid- to late-1979, and the Interior Department's Bureau of Land Management is apparently gearing up "to be ready for a possible coal lease sale in mid-1980," 10 years after the moratorium began. K. Markey; "Coal Leasing Controversy Climaxes," Not Man Apart, Vol. 9, No. 3, at 8; Feb.-March 1979.

210. Phillips, supra note 209.

211. There is some indication that the Administration may be working on procedures that could condense the longevity of environmental litigation into a shorter time frame.

212. Pub. L. 92-583, 16 U.S.C.A. 16 §1451 et seq.

213. Pub. L. 94-370.

214. 16 U.S.C.A. §1454.

215. 16 U.S.C.A. §1452.

216. 16 U.S.C.A. §1454.

217. 16 U.S.C.A. §1454(b)(8) (West 1978).

218. Id.

219. 16 U.S.C.A. §1456(c)(1) (West).

220. Supra note 212.

221. 16 U.S.C.A. §1456(c)(3)(A).

222. Id.

223. Pub. L. 88-577, 16 U.S.C. §1131 et seq.

224. 16 U.S.C. §1131.

225. Id.

226. See generally D. Salo, supra note 22, also K. Hillhouse, Legal and Institutional Perspectives of Solar Energy in Colorado (1977), PB-279994.

227. Parker v. United States, 309 F. Supp. 593 (D. Colo. 1970), aff'd 448 F. 2d 793; cert. denied 92 S. Ct. 1252, 405 U.S. 989, 31 L. Ed. 2d 455.

228. Id.

229. 16 U.S.C.A. §1133(d)(4).

230. D.J. Salo, supra note 22.

231. Id.

232. K. Hillhouse, supra note 226.

233. Council On Environmental Quality, supra note 6.

234. Pub. L. 94-579.

235. Public lands refers to land or an interest in land owned by the U.S. and administered by the Secretary of Interior through the Bureau of Land Management. FLPMA §103(e).

236. FLPMA §102(a)(1).

237. D.J. Salo, supra note 22.

238. Id.

239. K. Hillhouse, supra note 226. The Bureau of Land Management basically controls land in eleven western states: Arizona, California, Colorado, Idaho, Montana, Nebraska, New Mexico, Oregon, Utah, Washington, and Wyoming. Colorado State Office, BLM.

240. FLPMA §203(a).

241. FLPMA §203.

242. Personal communication with Andres Senti, Real Estate Specialist, Colorado State Office of the Bureau of Land Management (August, 1979).

243. I was unable to have anyone within the Washington Office of BLM venture a guess as to when the regulations for the sales section of FLPMA would be promulgated, much less what the regulations would contain. (FLPMA was enacted on October 16, 1976. Therefore, almost three years have elapsed and regulations are still not available.)

244. FLPMA §203(c).

245. FLPMA §203(e).

246. The New American Webster (The Webster).

247. American Heritage Dictionary of the English Language (paperback ed.).

248. Under the Homestead Laws, a family sized farm was defined as 160 acres and was subsequently increased to 340 acres. The size limitation of a family farm is presently based on economics. Senti, supra note 303.

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