Chapter 1

Introduction and Purpose and Need

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1. INTRODUCTION AND PURPOSE AND NEED

The U.S. Department of Energy (DOE or the Department) is proposing to provide federal funding to Abengoa Bioenergy Biomass of Kansas, LLC (Abengoa Bioenergy) to support the final design, construction, and startup of a *biomass*-to-ethanol and biomass-to-energy production facility (hereafter referred to as the Abengoa Biorefinery Project). If the Department decides to provide federal funding, it would negotiate an agreement with Abengoa Bioenergy to provide approximately $85 million (2008 dollars) for the final design, construction, and startup of the biorefinery, whose total anticipated cost is approximately $300 million (2008 dollars).

BIOREFINERY

Biorefineries are similar to petroleum refineries in concept; however, biorefineries use biological matter (biomass) as *feedstock* (raw materials), instead of petroleum feedstock, to produce transportation fuels (for example ethanol), industrial chemicals, and heat and power. Such transportation fuels, industrial chemicals, and heat/power are referred to as *biofuels*, *bioproducts*, and *biopower*, respectively.

An integrated biorefinery uses combinations of biomass feedstocks (for example, corn stover, wheat straw, and other nonfood crop residues) and conversion technologies to produce a variety of products, but typically biofuels.

In this EIS, the term "biorefinery" refers to the physical structures, including associated infrastructure, of the biomass-to-ethanol and biomass-to-energy production facility.

The *Biorefinery Project site* would be located adjacent to and west of the city of Hugoton, in Stevens County, Kansas (Figure 1-1). Land use in the area is primarily agricultural with cropland as the dominant use and *grassland* as the secondary use. Various grains are grown in the area, providing a diversity of biomass feedstocks and supplying food for large cattle feedlots in the vicinity.

The Biorefinery Project site, comprising approximately 810 acres (3.3 square kilometers) of row-cropped agricultural land, is within an area bordered on the south by U.S. Highway 56/Kansas State Highway 51, County Road 10 to the west, Rural Road P to the north, and Rural Road 12, which is east of the Project site along the western side of Hugoton (KDOT 2008). Grain elevators, an asphalt plant, and an industrial park are located nearby. There is an airport to the south, a golf course and agricultural land to the west, two residences to the northwest, agricultural cropland to the north, and the city of Hugoton (population approximately 3,700) to the east (Figure 1-2). The *biorefinery* would be developed on the western 385 acres (1.6 square kilometers) of the Project site (hereafter referred to as the *biorefinery area* or parcel), and the remaining 425 acres (1.7 square kilometers) would act as a *buffer* between the biorefinery and the city of Hugoton (hereafter referred to as the buffer area or parcel).

In accordance with DOE [Title 10 of the *Code of Federal Regulations* (CFR) Part 1021] and the Council on Environmental Quality regulations (40 CFR Parts 1500 through 1508) that implement the *National Environmental Policy Act* [NEPA; 42 U.S.C. 4321-4370(f)], DOE is required to evaluate the potential environmental impacts of its proposal, whether initiated by DOE or an applicant, because DOE's funding decision in this instance would constitute a major federal action. Since DOE must decide whether to use federal funds to support the Abengoa Biorefinery Project, it has prepared this *Draft Environmental Impact Statement for the Proposed Abengoa Biorefinery Project near Hugoton, Stevens County, Kansas* (DOE/EIS-0407D) (Abengoa Biorefinery Project EIS) to evaluate the potential environmental impacts of the *Proposed Action*, Action Alternative, and No-Action Alternative.

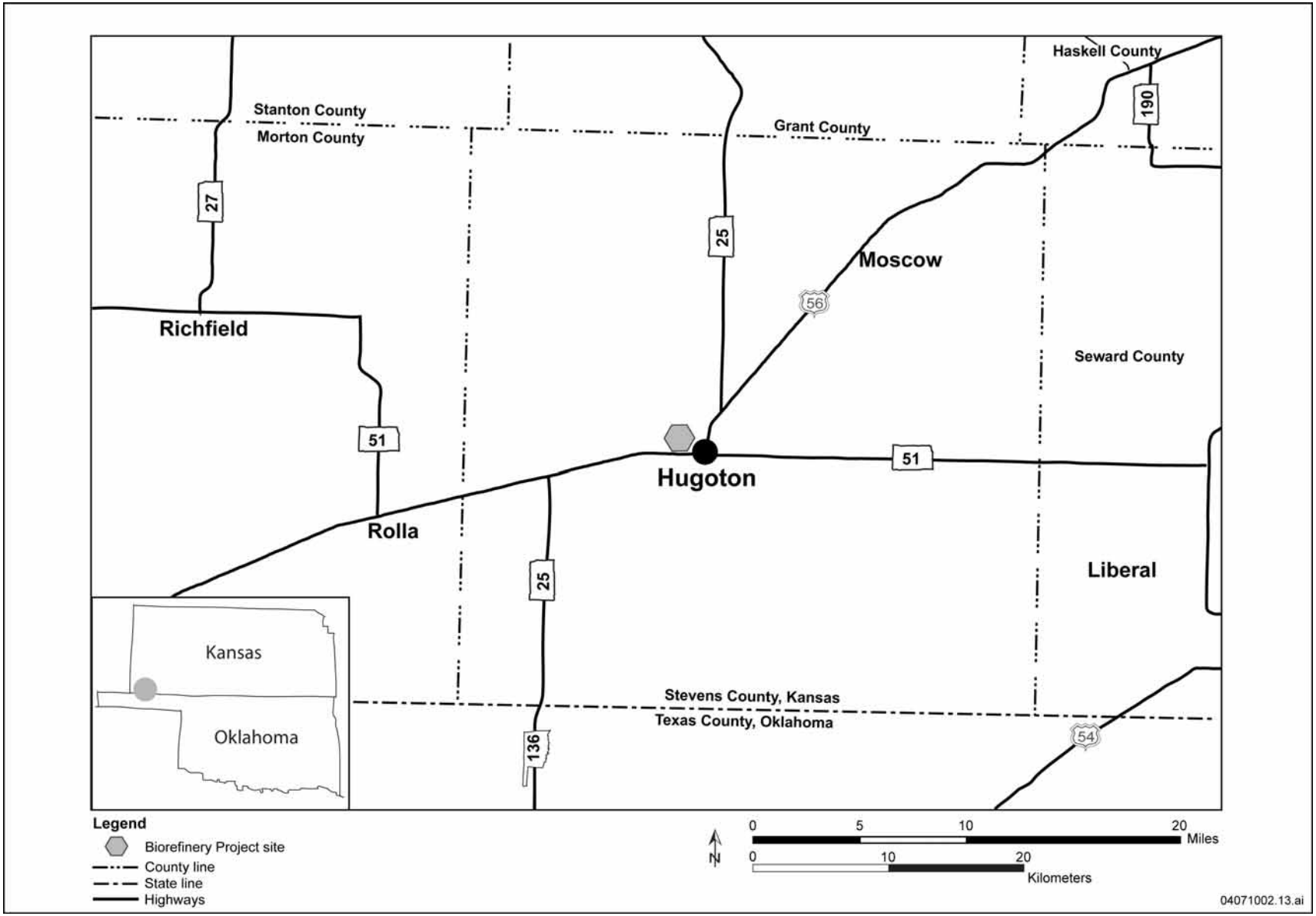

Figure 1-1. Biorefinery Project site.

Figure 1-2. Biorefinery Project site and vicinity.

1.1 Purpose and Need

The *Energy Policy Act of 2005* (EPAct 2005), Section 932, directs the Secretary of Energy to conduct a program of research, development, demonstration, and commercial application for bioenergy, including integrated biorefineries that can produce biopower, biofuels, and bioproducts. In carrying out a program to demonstrate the commercial application of integrated biorefineries, EPAct 2005 authorizes the Secretary to provide funds to biorefinery demonstration projects proposed by industry and encourages the use of such funds to demonstrate the efficacy of producing biofuels from a wide variety of *lignocellulosic feedstocks*; the commercial application of biomass technologies for a variety of uses, including the development of biofuels, bio-based *chemicals*, substitutes for petroleum-based feedstocks and products, and electricity or useful heat; and the collection and treatment of a variety of biomass feedstocks. The Department's goal in implementing Section 932 of EPAct 2005 is to demonstrate that commercial-scale integrated biorefineries that use a wide variety of lignocellulosic feedstocks can operate without direct federal subsidy after construction costs are paid, and that these biorefineries can be easily replicated.

LIGNOCELLULOSIC FEEDSTOCK

Any portion of a plant or a *byproduct* used by the conversion of organic materials to energy, including crops, trees, forest wastes, and agricultural wastes not specifically grown for food. These would include, for example, barley grain, grapeseed, rice bran and hulls, soybean matter, corn stover, and organic materials that have been segregated from municipal *solid waste*.

Lignocellulosic (cellulosic) feedstocks would not include, for example, plant-based oils intended for human consumption, such as soy, canola, sunflower and peanut oils, or foods intended for human and animal consumption, such as corn.

In his 2006 State of the Union Address, President George W. Bush introduced the Advanced Energy Initiative, which included increased funding to research advanced biofuel production processes. In early 2007, President Bush announced the "Twenty-in-Ten" Initiative, a plan to reduce gasoline consumption by 20 percent in 10 years (USDA and DOE 2008).

In response, Congress passed, and the President signed into law, the *Energy Independence and Security Act of 2007*. This Act included a Renewable Fuel Standard that requires the production of 36 billion gallons (136 billion liters) per year of biofuels by 2022, and included specific provisions for advanced biofuels, such as *cellulosic ethanol* and biomass-based diesel fuels.

In consideration of these requirements, DOE and the U.S. Department of Agriculture (USDA) published the *National Biofuels Action Plan* (USDA and DOE 2008), the purpose of which is to identify actions needed to ensure development of viable alternatives to petroleum-based fuels to meet the Renewable Fuel Standard. This Plan discusses the need to achieve improvements in the production of first- and second-generation feedstocks over the near and longer term to sustain growth in the biofuels industry. First-generation feedstocks include, for example, corn for the production of ethanol and soybeans for the production of biodiesel. Although production of these crops has been increasing, DOE and USDA also recognize the need to avoid disrupting the production of crops for human and animal consumption. The Plan also recognizes a need to enhance the production and use of second-generation feedstocks, which consist of the residues from crops and forest harvests (lignocellulosic feedstocks).

Accordingly, DOE's purpose and need is to support the development of commercial-scale, integrated biorefineries and the demonstration of the use of a wide variety of cellulosic feedstocks in the production of biofuels, bio-based chemicals, and biopower.

1.2 Background

Under EPAct 2005, Congress directed the Department to carry out a program to demonstrate the commercial application of integrated biorefineries for the production of biofuels, in particular ethanol, from lignocellulosic feedstocks. Federal funding for cellulosic ethanol production facilities is intended to further the government's goal of rendering ethanol cost-competitive with gasoline by 2012, and along with increased automobile fuel efficiency, reducing gasoline consumption in the United States by 20 percent within 10 years.

Accordingly, in February 2006, DOE issued a funding opportunity announcement for the design and construction of commercial-scale integrated biorefineries intended to demonstrate the use of a wide variety of lignocellulosic feedstocks to produce combinations of liquid transportation fuels (biofuels), bio-based chemicals, substitutes for petroleum-based feedstocks and products, and energy in the form of electricity or useful heat (biopower). In that announcement, DOE also encouraged the use of a wide variety of lignocellulosic feedstocks, but not those biomass components specifically grown for food, and encouraged the use of various technologies to collect and treat the wide variety of biomass feedstocks.

On February 28, 2007, the Department, after reviewing proposals from industry, announced the selection of six biorefinery projects for negotiation of financial assistance awards (DOE 2007). In that announcement, DOE proposed to invest up to $385 million in these projects over the next 4 years.

Abengoa Bioenergy was one of six applicants selected for negotiation of award. Abengoa proposed an innovative approach to biorefinery operations that would involve production of a biofuel and energy in the form of steam that can be used to meet energy needs and displace fossil fuels, such as coal and natural gas. The proposal also included an integrated grain-to-ethanol facility. In addition, Abengoa proposed to site the facility in Kansas to qualify for state tax credits for the construction of cellulosic ethanol facilities (*Kansas Energy Development Act of 2006*; Kansas Senate Bill 303), which would make the biorefinery a more viable commercial operation.

DOE granted an initial award of about $15 million to Abengoa Bioenergy to advance the conceptual design, initiate the process to obtain necessary permits and approvals, and support an environmental review under NEPA for the proposed biomass-to-ethanol and biomass-to-energy production facility. DOE required that Abengoa fulfill these design, regulatory compliance, and environmental review obligations prior to deciding whether to fund, in part, the construction and startup of the proposed biorefinery.

The Department initiated the environmental review process with its August 2008 "Notice of Intent to Prepare an Environmental Impact Statement and Notice of Wetlands Involvement for the Abengoa Biorefinery Project Near Hugoton, KS" (73 FR 50001, August 25, 2008) (public scoping is described in greater detail in Section 1.4). In January 2009, because of economic viability and anticipated market conditions, Abengoa Bioenergy notified DOE that it no longer was considering the construction and operation of the traditional grain-to-ethanol facility, and was proposing to modify its biomass-to-ethanol and biomass-to-energy production facility by including a steam-driven turbine to generate electricity that

would exceed the electrical demands of the proposed biorefinery (the excess electricity would be supplied to the regional power grid). In addition, Abengoa decided to solicit loan guarantees from the Department's Loan Guarantee Program pursuant to Title XVII of EPAct 2005 and from the USDA Rural Development Biorefinery Assistance Program pursuant to Section 9003 of the *Food, Conservation, and Energy Act of 2008* (the USDA Program is discussed in greater detail in Section 1.3).

Title XVII of EPAct 2005 provides broad authority to DOE to guarantee loans that support early commercial use of advanced technologies, if there is reasonable prospect of repayment of the principal and interest on the obligation by the borrower (in this instance, Abengoa Bioenergy). The Department's Loan Guarantee Program targets accelerated commercial use of new or improved technologies to help sustain economic growth, yield environmental benefits, and produce a more stable and secure energy supply. DOE published "Guidelines for the Loan Guarantee Program" (71 FR 46451, August 14, 2006) and issued a solicitation announcement in August 2006, inviting interested parties to submit project proposals that meet the Title XVII statutory requirements and also contribute to goals of the President's Advanced Energy Initiative. Since that time, the Department has published additional solicitations, and on February 26, 2009 Abengoa filed an application with DOE's Loan Guarantee Program for the proposed biorefinery.

The Department considered Abengoa Bioenergy's proposed project changes and application for a loan guarantee, and concluded that the project remains eligible for federal funding under Section 932 of EPAct 2005. On August 28, 2009, the Department determined, however, that it will not proceed with Abengoa's request for a loan guarantee.

Accordingly, the Department is now proposing to negotiate a second agreement to provide federal funding to support the final design, construction, and startup of the Abengoa Biorefinery Project. If DOE decides to provide federal funding to Abengoa, DOE will do so under the provisions of the *American Recovery and Reinvestment Act of 2009*.[1]

Based, in part, on the analyses in this Abengoa Biorefinery Project EIS, DOE will decide (1) whether to provide funding to support the final design, construction, and startup of the Biorefinery Project as proposed by Abengoa Bioenergy; (2) whether to provide funding to support the final design, construction, and startup of the Biorefinery Project for all elements of the facility as proposed by Abengoa, except for the portion dedicated to generating electricity for commercial sale (the Action Alternative); or (3) whether to provide funding for either the Proposed Action or Action Alternative, contingent on the implementation of environmental *mitigation* measures, which would be determined based on the environmental impact analysis in this EIS.

1.3 Cooperating Agency—U.S. Department of Agriculture Rural Development

The Council on Environmental Quality regulations (40 CFR 1501.6) emphasize agency cooperation early in the NEPA process and allow a lead agency (in this instance, DOE) to request the assistance of other

1. The purpose of the *American Recovery and Reinvestment Act of 2009*, which was enacted into law on February 17, 2009, is to provide federal funds for job preservation and creation, infrastructure investment, energy efficiency and science, assistance to the unemployed, and state and local fiscal stabilization. The Act is commonly known as the "Stimulus Bill."

agencies that either have jurisdiction by law or have special expertise regarding issues considered in an EIS. USDA Rural Development is a cooperating agency in the preparation of this EIS.

USDA Rural Development is an agency within the USDA. The role of Rural Development is to increase economic opportunities for rural residents and improve their quality of life by forging partnerships with rural communities; funding projects that bring housing, community facilities, utilities, and other services; and by providing technical assistance and financial backing for rural businesses and cooperatives to create jobs in rural areas. USDA Rural Development maintains general responsibility for renewable energy and energy-efficient improvements programs, one of which is the Biorefinery Assistance Program.

The purpose of the Biorefinery Assistance Program, as established by Section 9003 of the *Food, Conservation, and Energy Act of 2008* (2008 Farm Bill), is to assist in the development of new and emerging technologies for the development of advanced biofuels to:

1. Increase the energy independence of the United States;
2. Promote resource conservation, public health, and the environment;
3. Diversify markets for agricultural and forestry products and agriculture waste material; and
4. Create jobs and enhance the economic development of the rural economy.

Section 9003 of the 2008 Farm Bill is intended to assist in the development and construction of commercial-scale biorefineries and the retrofitting of existing facilities using *eligible technology* for the development of advanced biofuels. Eligible technology is (a) any technology that is being adopted in a viable commercial-scale operation of a biorefinery that produces an advanced biofuel, and (b) any technology not described in (a) that has been demonstrated to have technical and economic potential for commercial application in a biorefinery that produces an advanced biofuel.

Consistent with Congressional intent, projects where first-of-a-kind technology will be deployed at the commercial scale receive preference. To that end, the Biorefinery Assistance Program promotes the development of the first commercial-scale biorefineries that do not rely on corn kernel starch as the feedstock or standard biodiesel technology. USDA Rural Development will make guarantees available on loans for eligible projects that provide for the development, construction, and/or retrofitting of commercial biorefineries using eligible technology. Further, projects must be located in a rural area and be for either (1) the development and construction of commercial-scale biorefineries using eligible technology, or (2) the retrofitting of existing facilities, including, but not limited to, wood products facilities and sugar mills, with eligible technology.

USDA Rural Development agreed to be a cooperating agency in the preparation of this Abengoa Biorefinery Project EIS to enable Rural Development to use the environmental analyses of the EIS as part of its overall evaluation of Abengoa Bioenergy for a loan guarantee for the proposed biorefinery. Although Abengoa submitted its application for a loan guarantee to USDA Rural Development on April 29, 2009, it was not approved for funding in Fiscal Year 2009. Should Abengoa submit an application for a loan guarantee in future years, Rural Development will use this EIS as part of its evaluation of project eligibility and sufficiency and will make a determination of the relevancy of the information at that time.

1.4 National Environmental Policy Act Process

The Council on Environmental Quality and DOE regulations that implement NEPA require that DOE, as a federal agency:

- Assess the potential environmental impacts of its proposed actions,
- Identify any adverse environmental effects that cannot be avoided,
- Evaluate alternatives to the Proposed Action, including a No-Action Alternative,
- Describe the relationship between local, short-term uses of the environment and the maintenance and enhancement of long-term productivity, and
- Characterize any irreversible and irretrievable commitments of resources.

DOE must meet these requirements before a final agency decision is made to proceed with any proposed federal action that could cause significant impacts to human health or the environment. This Abengoa Biorefinery Project EIS is intended to meet DOE's regulatory requirements under NEPA, and provide DOE and other state and federal agency decisionmakers with information needed to make informed decisions in connection with the construction and startup of the Abengoa Biorefinery Project.

1.4.1 NOTICE OF INTENT AND PUBLIC SCOPING MEETING

On August 25, 2008, DOE published in the *Federal Register* its "Notice of Intent to Prepare an Environmental Impact Statement and Notice of Wetlands Involvement for the Abengoa Biorefinery Project Near Hugoton, KS" (73 FR 50001). The Department also published on September 8, 2008, a press release that was provided to eight newspapers and four radio stations in southwestern Kansas. DOE issued the notice and press release to inform the public about the Proposed Action and alternatives, announce plans to conduct a public scoping meeting, invite public participation in the scoping process, and solicit public comments for consideration in establishing the scope of the Abengoa Biorefinery Project EIS, including the range of reasonable alternatives and the potential environmental impacts to be analyzed. The public scoping period began on August 25, 2008, and ended on October 9, 2008. A public scoping meeting was held in Hugoton, Kansas, on September 10, 2008.

PUBLIC NOTICES

On September 2, 2008, DOE mailed notices of the upcoming public scoping meeting related to the Notice of Intent to more than 60 federal and state agencies, American Indian tribes, elected officials, commercial enterprises, and the public.

On May 12, 2009, DOE mailed notices of the upcoming public scoping meeting related to the amended Notice of Intent to more than 60 federal and state agencies, American Indian tribes, elected officials, commercial enterprises, and the public.

1.4.2 AMENDED NOTICE OF INTENT AND PUBLIC SCOPING MEETING

On April 29, 2009, DOE published in the *Federal Register* its "Amended Notice of Intent to Modify the Scope of the Environmental Impact Statement for the Abengoa Biorefinery Project near Hugoton, KS" (74 FR 19543). The Department also published on May 14, 2009, a press release that was provided to eight newspapers and four radio stations in southwestern Kansas. DOE issued the amended notice and press release to inform the public about changes in the Abengoa Biorefinery Project relevant to the scope of the ongoing EIS, announce plans to conduct a public scoping meeting, invite public participation in the scoping process, and solicit public comments for consideration in establishing the scope of the EIS, including the range of reasonable alternatives and the potential environmental impacts to be analyzed. The public scoping period began on April 29, 2009, and ended on May 29, 2009. A public scoping meeting was held in Hugoton, Kansas, on May 19, 2009.

1.4.3 SCOPING COMMENTS

The Department received both oral and written scoping comments. Oral comments were documented by a court reporter at the public meetings on September 10, 2008 and May 19, 2009. In response to the first scoping period, DOE received three letters and two emails. Each of the six comment documents (including transcripts from the September 10th meeting) was given a unique document number, and each was then reviewed to identify comments; comments were numbered sequentially (for example, 1, 2, 3) in the margins of each document. DOE identified 14 scoping comments and grouped them into three categories reflecting the nature of the individual comments. The comments are documented in *Summary of Public Scoping Comments for the Environmental Impact Statement for the Abengoa Biorefinery near Hugoton, Kansas* (DOE 2008).

In response to the second scoping period, DOE received two letters and produced a transcript of oral comments received during the May 19th meeting. Each of the three comment documents was reviewed, and DOE identified two new comments (the documents also reiterated comments submitted previously in response to the first scoping period).

The three categories and a summary of the comments in each category are described below.

Category 1: Support for the project

Nine Stevens County governmental and local organization representatives and members of the public voiced support for the proposed project, citing the financial benefits to the community and its residents.

Category 2: Request for specific information or analyses

- The U.S. Army Corps of Engineers requested a location map and an assessment of potential impacts to waters of the United States.

- The USDA Natural Resources Conservation Service requested analyses of biomass production and harvesting impacts to soils, surface and *groundwater* quality and quantity, *air quality*, and upland wildlife habitat. The Natural Resources Conservation Service also requested an assessment of cropping practices, cropping rotations, and crop yields regarding potential availability and removal of biomass. The Conservation Service further requested assessments of biomass removal impacts to assess any potential impacts to existing federal programs and acts including the *Conservation Reserve*

Program, Conservation Security Program, Environmental Quality Incentives Program, and the *1985 Food Security Act's* Highly Erodible Land Provision.

- The U.S. Fish and Wildlife Service requested evaluation of potential impacts to the lesser prairie-chicken, migratory birds, and stream water quality and quantity, as well as changes in landscape/native habitats from the possible conversion of native grassland to crop production. The Service requested that DOE consult with the Kansas Department of Wildlife and Parks regarding possible impacts to State-listed threatened or endangered species. The Service also recommended that new and permanent transmission lines conform to designs shown to mitigate bird collisions, specifically raptors.

- The Kansas State Historical Society, State Historic Preservation Officer requested that DOE conduct a *cultural resources* survey of a shallow *playa* basin area located within and adjacent to the Project site prior to beginning construction.

- Members of the public (one comment from two individuals) requested information relative to impacts from odor, dust, and parked train cars.

Category 3: Statements of no negative environmental impacts

The Kansas Department of Agriculture, Division of Water Resources indicated that the proposed project would not have negative environmental impacts in terms of water use, and that the potential benefits are great.

In response to the public scoping comments, the Department conducted a cultural resources survey of the playa basin area as requested by the Kansas State Historical Society, State Historic Preservation Officer, and a *wetlands* survey as requested by the U.S. Army Corps of Engineers. DOE also assessed biomass removal to estimate potential environmental impacts and analyze effects to existing federal programs and acts, including the Conservation Reserve Program, Conservation Security Program, Environmental Quality Incentives Program, and the *1985 Food Security Act's* Highly Erodible Land Provision. The Department also evaluated potential impacts to waters of the United States, as well as socioeconomic, air quality, soil, and traffic and transportation impacts in this Abengoa Biorefinery Project EIS.

Based on coordination with the U.S. Fish and Wildlife Service, potential impacts to the lesser prairie chicken were assessed, as was the potential conversion of native grasslands and *Conservation Reserve Program* lands to cropland. The Kansas Department of Wildlife and Parks also was consulted regarding possible impacts to State-listed species.

In addition to the above actions, DOE consulted with Abengoa Bioenergy regarding the status of the design of the proposed biorefinery and undertook preliminary analyses of various options for implementing the proposed project. At the time of the second public scoping period, which closed on May 19, 2009, DOE anticipated the proposed biorefinery would process up to 1,700 dry short tons (1,500 dry metric tons) of biomass per day to produce about 12 million gallons (45 million liters) of ethanol per year, *syngas* (another biofuel comprising a mixture of carbon monoxide, hydrogen, and other hydrocarbons), and about 60 megawatts of electricity. Based on a refined and optimized design, and as analyzed under the Proposed Action in this Abengoa Biorefinery Project EIS, DOE anticipates the proposed biorefinery would use up to 2,500 dry short tons (2,300 dry metric tons) of biomass per day to

produce up to 18 million gallons (68 million liters) of ethanol per year and about 92 megawatts of electricity; syngas would no longer be produced (the production of syngas is analyzed, however, under the Action Alternative).

DOE initally also considered evaluating in detail options for implementing the proposed project; these options, which were described in the Amended Notice of Intent, included onsite versus offsite storage of biomass; wet (unprotected or uncovered) versus dry (protected or covered) biomass storage; and smaller or larger boiler sizes. Initial analysis, however, of wet versus dry storage and onsite versus offsite storage did not identify any meaningful environmental differences, and, therefore, no further analysis was performed. DOE also decided to eliminate any evaluation of a range of boiler sizes in favor of including the appropriate-sized boiler(s) based upon the biorefinery designs considered under the Proposed Action and Action Alternative.

1.5 Organization of this EIS

This Abengoa Biorefinery Project EIS evaluates the potential direct, indirect, and cumulative environmental impacts of the Proposed Action, an Action Alternative, and a No-Action Alternative; Chapter 2 describes these alternatives and summarizes the potential environmental impacts. Chapter 3 describes the *affected environment* (baseline environmental conditions) for 13 resources areas (for example, air quality, cultural resources, and *hydrology*). Chapter 4 describes the potential direct and indirect environmental impacts to these resources. Chapter 5 describes the potential cumulative environmental impacts of the Proposed Action and alternatives. Chapter 6 describes potential mitigation measures to be considered relative to implementation of the Proposed Action and Action Alternative. Chapter 7 identifies unavoidable impacts associated with implementation of the Proposed Action and Action Alternative. Chapter 8 lists the regulations applicable to the construction and operation of the proposed biorefinery. Chapter 9 provides the list of preparers, Chapter 10 provides a glossary, and Chapter 11 is the document index. Appendices, which provide additional details in support of the various chapters, address biorefinery facilities and operational processes, procurement of biomass, surface and groundwater resources, wetlands, cultural resources, air quality, additional environmental data used in the analyses, details of the Department's public participation activities, *Federal Register* notices, and the EIS distribution list.

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