U.S. Department of Energy

Mountaineer Commercial Scale Carbon Capture and Storage Project

Draft Environmental Impact Statement Summary

February 2011

DOE/EIS-0445D

Office of Fossil Energy
National Energy Technology Laboratory

COVER SHEET

Responsible Federal Agency: U.S. Department of Energy (DOE)

Title: Mountaineer Commercial Scale Carbon Capture and Storage Project, Draft Environmental Impact Statement (DOE/EIS-0445D)

Location: New Haven, West Virginia, located in Mason County

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Abstract:

This Draft Environmental Impact Statement (EIS) provides information about the potential environmental impacts of the proposed Mountaineer Commercial Scale Carbon Capture and Storage (CCS) Project (Mountaineer CCS II Project) to be located in Mason County, West Virginia near the town of New Haven. American Electric Power Service Corporation (AEP) proposes to design, construct, and operate the Mountaineer CCS II Project, which would use a chilled ammonia process (CAP) technology to capture approximately 90 percent of the carbon dioxide (CO_2) from a 235-megawatt (MW) portion of AEP's existing 1,300-MW Mountaineer Plant flue gas exhaust.

The Mountaineer CCS II Project would be designed to capture 1.5 million metric tons of CO_2 per year from the plant exhaust that the facility would otherwise emit. The captured CO_2 would be compressed and conveyed via pipeline to nearby injection wells for storage in geologic formations located approximately 1.5 miles below the land surface.

DOE's Proposed Action would provide financial assistance to AEP under the Clean Coal Power Initiative (CCPI) Program to support construction and operation of AEP's Mountaineer CCS II Project. DOE proposes to provide AEP with up to $334 million of the overall project cost, which would constitute about 50 percent of the estimated total development cost, 50 percent of the capital cost of the project and 50 percent of the operational cost, during the 46-month demonstration period. This EIS also analyzes the No Action Alternative, under which DOE would not provide financial assistance for the Mountaineer CCS II Project.

Comment Period:

DOE encourages public participation in the NEPA process. Comments postmarked by April 18, 2011, will be addressed in the Final EIS, which will be used by DOE in its decision-making process for the Proposed Action. DOE will consider late comments to the extent practicable.

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ACRONYMS

Acronym	Definition
AEP	American Electric Power Service Corporation
APE	Area of Potential Effect
bgs	below ground surface
CAP	chilled ammonia process
CCPI	Clean Coal Power Initiative
CCS	carbon capture and storage
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO_2	carbon dioxide
CO_2-eq	carbon dioxide equivalent
dBA	A-weighted decibel
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FOA	funding opportunity announcement
GHG	greenhouse gas
gpd	gallons per day
gpm	gallons per minute
HEL	highly erodible land
HUD	U.S. Department of Housing and Urban Development
HVTL	high voltage transmission line
L_{eq}	continuous equivalent sound level
lbs	pounds
LLC	Limited Liability Company
LOS	level of service
mgd	million gallons per day
MW	megawatt

Acronym	Definition
MVA	monitoring, verification, and accounting
N_2	nitrogen
NEPA	National Environmental Policy Act
NH_3	ammonia
NHSWF	New Haven Sanitary Waste Facility
NHWF	New Haven Water Facility
NO_x	nitrogen oxides
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O_2	oxygen
OH	Ohio
PHEL	potentially highly erodible land
PM	particulate matter
$PM_{2.5}$	particulate matter of diameter 2.5 microns or less
ppmv	parts per million by volume
PVF	product validation facility
ROI	region of influence
ROW	right-of-way
SO_2	sulfur dioxide
SO_3	sulfur trioxide
tpy	tons per year
UIC	Underground Injection Control
U.S.	United States
USACE	U.S. Army Corps of Engineers
WV	West Virginia
WVDEP	West Virginia Department of Environmental Protection
WVSHPO	West Virginia State Historic Preservation Office
WWTP	wastewater treatment plant

GLOSSARY

Term	Definition
"A-weighted" Scale	Assigns weight to sound frequencies that are related to how sensitive the human ear is to each sound frequency. Frequencies that are less sensitive to the human ear are weighted less than those for which the ear is more sensitive. A-weighted measurements indicate the potential damage a noise might cause to hearing.
Ambient Noise	Background noise associated with a given environment. Ambient noise is typically formed as a composite of sounds from many near and far sources, with no particular dominant sound.
Amines	A group of organic compounds of nitrogen, typically derived from ammonia, with one or more of the hydrogen atoms in ammonia replaced by one or more organic functional groups. Amines include amino acids and a wide range of primary, secondary, and tertiary amines used for dyes, pharmaceuticals, and gas treatment.
Aquifer	Rock or sediment formation(s) saturated and sufficiently permeable to transmit groundwater and yielding economic quantities of water to wells or springs.
Best Management Practice	Method for preventing or reducing the pollution resulting from an activity. Best Management Practice (BMP) includes non-regulatory methods designed to minimize harm to the environment.
Carbon Dioxide	A common chemical compound, abbreviated CO_2, composed of two oxygen atoms covalently bonded to a single carbon atom. This natural greenhouse gas is also created by combustion and emitted from human activity such as the burning of fossil fuels to generate electricity and operate vehicles.
Cultural Resources	Archaeological sites, historical sites (e.g., standing structures), Native-American resources, and paleontological resources.
Decibel	Unit used to convey intensity of sound, abbreviated (dB).
Effluent	Waste stream flowing into the atmosphere, surface water, groundwater, or soil.
Endangered Species	Plants or animals that are in danger of extinction. A federal list of endangered species can be found in 50 CFR 17.11 (wildlife), 50 CFR 17.12 (plants), and 50 CFR 222.23(a) (marine organisms).
Floodplain	Flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding.
Geologic Sequestration	Process of injecting CO_2, captured from an industrial or energy-related source into deep subsurface rock formations for long-term storage.

Term	Definition
Greenhouse Gas	Gas that contributes to the greenhouse effect by absorbing infrared radiation and ultimately warming the atmosphere. Greenhouse gases include water vapor, nitrous oxide (NO_x), methane, CO_2, ozone (O_3), halogenated fluorocarbons, hydrofluorocarbons, and perfluorinated carbons.
Hazardous Waste	Waste that exhibits at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity), or that is specifically listed by the U.S. Environmental Protection Agency (EPA) as a hazardous waste. Hazardous waste is regulated under the Resource Conservation and Recovery Act (RCRA) Subtitle C.
Historic Property	Prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places.
Level of Service	Measure of traffic operation effectiveness on a particular roadway facility type, abbreviated LOS.
Low Income Population	A community that has a proportion of low-income population greater than the respective average. Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census Current Population Reports, Series P-60, Income and Poverty.
Megawatt	Unit of power equal to one million watts. A power plant with 1 megawatt (MW) of capacity operating continuously for a year could supply electricity to approximately 750 households.
Minority	Individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.
Minority Population	Identified where either the affected area's minority population exceeds 50 percent or the affected area's minority population percentage is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.
National Environmental Policy Act	Signed into law on January 1, 1970, the National Environmental Policy Act (NEPA) declared a national policy to protect the environment and created the Council on Environmental Quality (CEQ) in the Executive Office of the President. To implement the national policy, NEPA requires that environmental factors be considered when federal agencies make decisions, and that a detailed statement of environmental impacts be prepared for all major federal actions significantly affecting the human environment.
National Pollutant Discharge Elimination System	Provision of the Clean Water Act that prohibits discharge of pollutants into U.S. waters unless a special permit is issued by EPA, a state, or where delegated, a tribal government on a Native American reservation, abbreviated NPDES.

Term	Definition
Permeability	Rate at which fluids flow through the subsurface; reflects the degree to which pore space is connected.
pH	A measure of the acidity or alkalinity of a solution.
Plume Radius	Radius within which 95 percent of the sequestered gas-phase CO_2 mass occurs.
Potable Water	Water that is safe and satisfactory for drinking and cooking.
Saline Formation	Underground rock or sediment layer(s) which contains water with more than 10,000 ppm total dissolved solids (unsuitable for drinking water and often too deep to be economically pumped).
Slipstream	The portion or percentage of the flue gas exhaust that is diverted to another location for monitoring, research, or separate testing.
Surface Water	All bodies of water on the surface and open to the atmosphere, such as rivers, lakes, reservoirs, ponds, seas, and estuaries.
Underground Source of Drinking Water	Any aquifer or part of an aquifer that (1) supplies any public water system; or (2) contains a sufficient quantity of groundwater to supply a public water system, and currently supplies drinking water for human consumption or contains fewer than 10,000 milligrams per liter of total dissolved solids; and (3) is not an exempted aquifer.
Upset Condition	An unpredictable failure of process components or subsystems which leads to an overall malfunction or temporary shutdown of the power plant.
Vibration	Force that oscillates about a specified reference point. Vibration is commonly expressed in terms of frequency such as cycles per second (cps), hertz (Hz), cycles per minute (cpm), and strokes per minute (spm).
Wetland	Area inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

SUMMARY

The United States (U.S.) Department of Energy (DOE) prepared this Environmental Impact Statement (EIS) to evaluate the potential impacts associated with its Proposed Action to provide financial assistance to American Electric Power Service Corporation (AEP) under the Clean Coal Power Initiative (CCPI). DOE's Proposed Action would support construction and operation of AEP's Mountaineer Commercial Scale Carbon Capture and Storage (CCS) Project (Mountaineer CCS II Project). Congress established the CCPI Program to enable and accelerate the deployment of advanced technologies to ensure clean, reliable, and affordable electricity for the U.S. The CCPI operates a cost-shared partnership between government and industry to develop and demonstrate advanced coal-based power generation technology at the commercial scale. DOE selected the AEP Mountaineer CCS II Project for possible funding because it would best meet the CCPI's goals and objectives.

The Mountaineer CCS II Project would use a chilled ammonia process (CAP) to capture approximately 90 percent of the carbon dioxide (CO_2) from a 235-megawatt (MW) portion of AEP's existing 1,300-MW Mountaineer Plant flue gas exhaust. The project would be designed to capture 1.5 million metric tons of CO_2 per year from plant operations that the facility would otherwise emit. The captured CO_2 would be compressed and conveyed via pipeline to injection wells for geologic storage in deep saline formations, approximately 1.5 miles below the land surface.

The existing Mountaineer Plant, shown in Figure S-1, is located on a 450-acre property in Mason County, West Virginia along the Ohio River. Other AEP facilities located on the property include the Phillip Sporn Power Plant and the Little Broad Run Landfill, both of which are owned and operated by AEP. Figure S-1 also shows the potential CO_2 pipeline corridors and CO_2 injection well properties. New Haven, West Virginia is located approximately 1 mile to the northwest (i.e., down-river). The plant is in an industrial area and located next to relatively undeveloped lands with scattered residences and mining operations to the south and west.

DOE is the lead federal agency responsible for preparation of this EIS. Pursuant to the National Environmental Policy Act (NEPA) and in compliance with the Council on Environmental Quality (CEQ) implementing regulations for NEPA (40 Code of Federal Regulations [CFR] 1500 through 1508) and DOE NEPA procedures (10 CFR 1021), DOE is evaluating the associated environmental impacts as part of its decision-making process to determine whether to provide AEP with financial assistance for its proposed project.

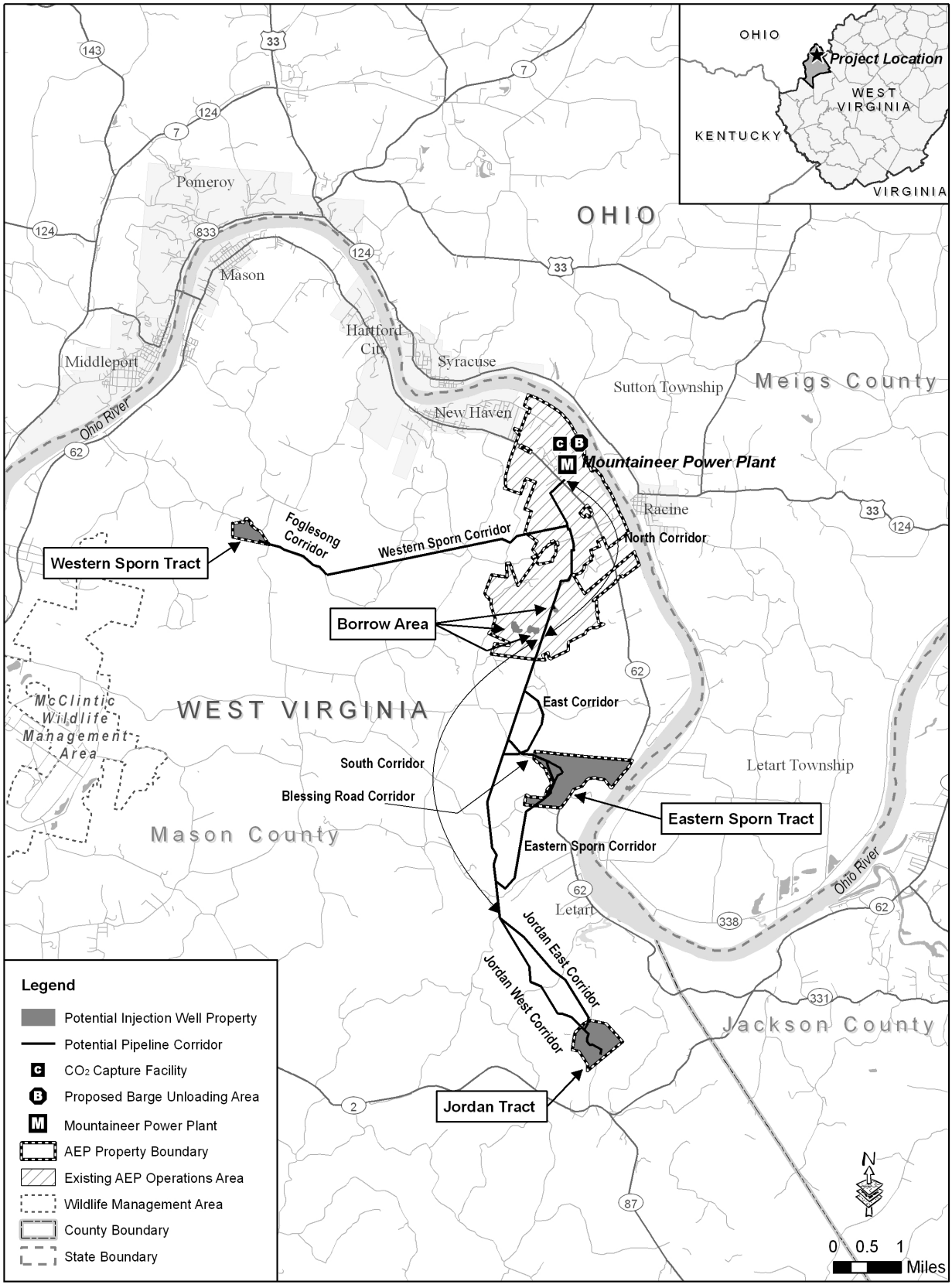

Figure S-1. General Area Map

PROPOSED AGENCY ACTION, PURPOSE AND NEED

DOE's Proposed Action would provide financial assistance to AEP under the CCPI Program to support construction and operation of AEP's Mountaineer CCS II Project. Congress established the CCPI Program to enable and accelerate the deployment of advanced technologies to ensure clean, reliable, and affordable electricity for the U.S. The CCPI operates as a cost-shared partnership between government and industry to develop and demonstrate advanced coal-based power generation technologies at the commercial scale. DOE selects projects for CCPI funding through funding opportunity announcements (FOA) that solicit project proponents to submit applications for federal cost-sharing for their demonstration projects. To date, the CCPI Program has conducted three rounds of solicitations for projects to achieve its goals.

AEP submitted an application for its proposed Mountaineer CCS II Project in response to the CCPI Round 3 solicitation. Round 3, which DOE conducted in two phases, sought projects that would demonstrate advanced coal-based electricity generating technologies that capture and sequester (or put to beneficial use) CO_2 emissions.[1] DOE selected the AEP Mountaineer CCS II Project and four other applications for possible funding pending further, more detailed consideration. DOE determined that these five projects would best meet the CCPI's goals and objectives.

AEP proposes to construct a commercial-scale CCS system at its 1,300 MW Mountaineer Power Plant and other AEP-owned properties located near New Haven, West Virginia. DOE proposes to provide AEP with up to $334 million of the overall project cost. This funding would constitute about 50 percent of the estimated total project cost.

As part of the Mountaineer CCS II Project, AEP would construct a CO_2 capture facility using Alstom's CAP at the Mountaineer Plant. Alstom's CAP is a proprietary process for removing CO_2 from combustion flue gas emissions. The capture facility would process a slipstream of approximately 18 percent of the total Mountaineer Plant's flue gas flow, equivalent in quantity to the flue gas emissions from a 235-MW power plant. Each year, approximately 1.5 million metric tons of CO_2 would be captured, treated, and compressed into a highly concentrated, high-pressure form suitable for geologic storage. The processed CO_2 would be transported by pipeline (primarily underground) to injection wells to be developed on AEP properties. These properties are located within approximately 12 miles of the Mountaineer Plant in Mason County, West Virginia. The captured CO_2 would be injected into deep saline formations for permanent geologic storage.

Consistent with DOE's objectives under CCPI Round 3, the Mountaineer CCS II Project would be designed to:

- Remove approximately 90 percent of the CO_2 from the 235-MW slipstream;
- Demonstrate a commercial-scale deployment of the CAP for CO_2 capture; and
- Demonstrate the injection, permanent geologic storage, and monitoring of CO_2 in deep underground saline formations.

The *purpose* of DOE's Proposed Action under the CCPI Program is to demonstrate advanced coal-based technologies at a commercial scale that capture and geologically sequester CO_2 emissions. The principal *need* addressed by DOE's Proposed Action is to satisfy the responsibility Congress imposed on DOE to

[1] As stated in the Financial Assistance FOA for Round 3, "DOE's specific objective is to demonstrate advanced coal-based technologies that capture and sequester, or put to beneficial use, CO_2 emissions. DOE's goals are to demonstrate at commercial scale in a commercial setting, technologies that (1) can achieve a minimum of 50 percent CO_2 capture efficiency and make progress toward a target CO_2 capture efficiency of approximately 90 percent in a gas stream containing at least 10 percent CO_2 by volume, (2) make progress toward capture and sequestration goal of less than 10 percent increase in the cost of electricity for gasification systems and less than 35 percent for combustion and oxycombustion systems all as compared to current (2008) practice, and (3) capture and sequester or put to beneficial use a minimum of 300,000 tons per year of CO_2 emissions using a 30-day running average to determine if the project successfully meets the CO_2 capture efficiency and the capture and sequestration or beneficial use rate requirements of this Announcement" (NETL, 2009).

demonstrate advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the U.S. The CCPI Program selects projects with the best chance of achieving the program's objective as established by Congress: commercialization of clean coal technologies that advance efficiency, environmental performance, and cost competitiveness well beyond the level of technologies currently in commercial service.

This proposed project would help DOE, through the CCPI Program, meet its congressionally mandated mission to fund advanced clean-coal technology projects. This specifically includes those projects that have progressed beyond the research and development stage to a point of readiness for operation at a scale that, once demonstrated, can be readily implemented across the commercial sector. Post-combustion CO_2 capture offers the greatest near-term potential for reducing power sector CO_2 emissions because it can be used to retrofit existing coal-based power plants and can also be tuned for various levels of CO_2 capture, which may accelerate market acceptance (NETL, 2010a). A successful demonstration of Alstom's CAP at the Mountaineer Plant would generate technical, environmental, and financial data from the design, construction, and operation of the facility. These data would help DOE and the electric power industry determine whether the deployed technologies can be effectively and economically implemented at a commercial scale. Furthermore, the cost-shared financial assistance from DOE would reduce the risk to AEP in demonstrating this technology.

ALTERNATIVES CONSIDERED BY DOE

Section 102 of NEPA requires that agencies discuss the reasonable alternatives to the Proposed Action in an EIS. The term "reasonable alternatives" is not self defining, but rather must be determined in the context of the statutory purpose expressed by the underlying legislation. The purpose and need for a federal action determines the reasonable alternatives for the NEPA process. Any reasonable alternative to the Proposed Action must be capable of satisfying the purpose and need of the CCPI Program.

Options considered by DOE for possible CCPI funding originate as private-party (e.g., electric power industry) applications submitted to DOE in response to requirements specified in CCPI solicitations. DOE is limited to considering the application as proposed by the applicant. For example, DOE cannot consider site or technology combinations other than those included in the applications received. The applicant provides at least a 50-50 cost share and bears the primary responsibility for designing and executing the project. DOE's primary action concerning these applications is to decide which projects would receive DOE financial assistance from among the eligible applications submitted. Unlike a project initiated and operated by DOE, DOE does not have the ability to make decisions concerning the location, layout, design, or other features of the project. In other words, DOE must select from among the eligible projects submitted to DOE by the applicants; DOE cannot design its own project and compel a private entity to implement it.

DOE's decision is to either accept or reject the project as proposed by the proponent, including its proposed technology and selected sites. DOE's Proposed Action is limited to providing financial assistance in a cost-sharing arrangement to AEP's proposed Mountaineer CCS II Project, which was selected from among the projects that were submitted by applicants in response to a competitive funding opportunity. Consequently, DOE's consideration of reasonable alternatives is also limited to the technically acceptable applications and the No-Action Alternative for each selected project.

No Action Alternative

Under the No Action Alternative, DOE would not provide cost-shared funding for the proposed Mountaineer CCS II Project. In this case, the funding withheld from the Mountaineer CCS II Project may be made available for other current or future CCPI projects. In the absence of DOE cost-shared funding, AEP could still elect to construct and operate the proposed project; therefore, the DOE No Action Alternative could result in one of two potential scenarios:

- The proposed Mountaineer CCS II Project would not be built; or
- The proposed Mountaineer CCS II Project would be built by AEP without benefit of DOE cost-shared funding.

DOE assumes that if AEP proceeded with project development in the absence of DOE cost-shared funding, the project would include the features, attributes, and impacts as described for the Proposed Action. However, without DOE participation, it is possible that the project would be canceled. Therefore, for the purposes of analysis in this EIS, the DOE No Action Alternative is defined as a No-Build Alternative. This means that the project would not be built and environmental conditions would remain in the status quo (i.e., no new construction, resource utilization, or CO_2 capture and storage would occur).

Therefore, under the No Action Alternative, the project technologies (i.e., large-scale CO_2 capture and geologic storage) may not be implemented in the near term. Consequently, timely commercialization of these technologies for large-scale, coal-fired electric generation facilities would be postponed and may not be realized. This scenario would not contribute to the CCPI goals to invest in the demonstration of advanced coal-based power generation technologies that capture and sequester, or put to beneficial use, CO_2 emissions. While the No Action Alternative would not satisfy the purpose and need for the agency action, this alternative was retained to provide a comparative baseline against which to analyze the effects of the Proposed Action, as required under CEQ regulations (40 CFR 15012.14). The No Action Alternative reflects the status quo and serves as a benchmark against which the effects of the Proposed Action can be evaluated.

Alternative Project Applications Considered During the CCPI Procurement Process

DOE's options for CCPI - Round 3 funding consist of the other technically acceptable applications received in response to FOA DE-FOA-0000042, *Clean Coal Power Initiative - Round 3, Amendments 005 and 006*. DOE received 36 applications that met the minimum eligibility requirements listed in the FOA for Round 3 of the CCPI. These applications provided DOE with a range of options for meeting the objectives of Round 3 of the CCPI. DOE screened the 36 applications to evaluate potential environmental consequences of each application during DOE's initial review and made preliminary determinations regarding the level of NEPA review required. In accordance with DOE NEPA regulations (10 CFR 1021.216), DOE documented the potential environmental consequences of each application in an environmental critique and summarized the results in a publicly available synopsis. DOE considered this environmental information in the selection process.

Ultimately, DOE determined that the proposed Mountaineer CCS II Project and four other applications would best meet the goals and objectives of the CCPI Program. The proposed projects from these five applications must each complete a separate, independent, project-specific (and more detailed) NEPA analysis that would result in separate decisions. Although the five selected projects are each eligible for cost-shared funding under CCPI, there is no other relationship among them. Each of the projects is independent, and the selection and potential execution of each stand-alone project has no effect or bearing on the other projects.

Project Options Considered by the Project Proponent

AEP responded to DOE's solicitation with its application for the proposed project, which is based on a commercial scale-up of AEP's existing CAP product validation facility (PVF), constructed at the Mountaineer Plant in 2009. The PVF captures CO_2 from a 20-MW flue gas slipstream and injects the captured CO_2 into two deep geologic formations via two wells located on the Mountaineer Plant property. This PVF uses a similar process, albeit smaller in size, to the proposed project. The proposed project is

designed to demonstrate the commercial-scale operation of an integrated CCS project using Alstom's CAP process.

Because Alstom's CAP technology may result in lower energy losses compared to other methods of post-combustion CO_2 capture, AEP did not consider other CO_2 capture technologies as part of their proposed project. However, AEP plans to complete a study to evaluate the feasibility of an amine-based CO_2 capture technology. AEP entered into a cooperative agreement with China Huaneng, through which AEP, China Huaneng, DOE, and the National Energy Administration of China will perform an initial evaluation of a post-combustion, advanced amine-based CO_2 capture technology. AEP will complete a study to evaluate the feasibility of the technology for potential use at supercritical coal-fired generating units with characteristics similar to the Mountaineer Plant. The feasibility study would evaluate technical issues related to design, performance, cost, and process integration. In addition, it would consider lessons learned from the testing and deployment of this technology by others for possible application to the Mountaineer CCS Project. Results of the study may provide insight on key design and operating considerations, which could be used to evaluate development opportunities and associated risks in context with other potential CO_2 capture processes.

AEP determined the five closest properties to be the most feasible for possible injection well sites, which would also minimize potential environmental impacts. AEP eliminated the remaining properties from further consideration as these properties were located much farther from the Mountaineer Plant and presented significant challenges in securing right-of-way (ROW) agreements and regulatory approvals in a timely manner. Likewise, the greater distance would add significant cost and time to the overall project, as well as create a greater potential for environmental impacts associated with additional stream, river, and wetland crossings.

EIS SCOPING PROCESS

DOE published a Notice of Intent (NOI) to prepare an EIS in the *Federal Register* on June 7, 2010 (Federal Register Doc. 2010-13568). The NOI initially identified potential issues and areas of impact that would be addressed in the EIS. DOE published notices in local newspapers announcing the public scoping meeting location and time. DOE held a public scoping meeting on June 22, 2010 at the New Haven Elementary School in New Haven, West Virginia. This meeting was attended by seven members of the public, as well as project staff from DOE, AEP, and its other project partners.

The public scoping period ended on July 9, 2010 after a 30-day comment period. DOE received two scoping comments at the public scoping meeting. One commenter spoke at the public scoping meeting during the formal comment period. Although this commenter did not have a specific comment about the scope of the project, he spoke about the history of the AEP Mountaineer Power Plant, development and deployment of air emission control technologies, and his hope that the Mountaineer CCS II Project would be successful. One local landowner spoke with a DOE representative at the public scoping meeting, but did not wish to comment during the formal comment period or submit a comment in writing. This individual owns property adjacent to the northern boundary of AEP's property. Although the property is connected to city water, there was concern about potential impacts to drinking water wells as a result of CO_2 leaks. (Potential impacts to drinking water wells are addressed in the Groundwater section of this EIS.) DOE received no other comments during the 30-day scoping period.

Although most of the resource areas initially identified by DOE received little or no attention from the public during the scoping period, the EIS nevertheless addresses potential impacts to all resource areas identified during both internal planning and public scoping for the proposed project.

DESCRIPTION OF APPLICANT'S PROPOSED PROJECT

AEP's proposed project is designed to demonstrate the operation of an integrated CCS process at commercial scale on a coal-fired power plant. There are four primary components of the project (see Figure S-2 and Table S-1):

1. **CO_2 Capture Facility** – The facility would capture CO_2 from a 235-MW flue gas slipstream from the existing 1,300-MW coal-powered Mountaineer Plant. The facility would be designed with a target CO_2 capture rate of approximately 90 percent and built on plant property.
2. **CO_2 Pipelines** – The captured CO_2 would be transported by pipeline (primarily underground) to AEP-owned properties located within 12 miles of the Mountaineer Plant.
3. **CO_2 Injection Wells** – The captured CO_2 would be injected into geologic formations located approximately 1.5 miles below the ground surface through injection wells located on two or more AEP-owned properties.
4. **CO_2 Monitoring, Verification, and Accounting (MVA)** – A geologic monitoring program would be established and operated in accordance with the required Underground Injection Control (UIC) permit.

The CO_2 capture system proposed for the Mountaineer CCS II Project would be similar to the Alstom CAP PVF currently operating at the Mountaineer Plant, but approximately 12 times larger. As with the PVF, the process would use an ammonia-based process solution to capture CO_2 and isolate it in a form suitable for geologic storage. The existing Mountaineer Plant includes the space and infrastructure required to support the construction and operation of the CO_2 capture system.

Major new equipment required would include absorbers, regenerators, pumps, heat exchangers, and refrigeration equipment. In addition, the project would require an administration building, a control room/electrical switchgear building, warehouse and maintenance facilities, water-handling equipment, and laboratories, as well as other buildings and components under consideration, such as a compressor building, a by-product/bleed stream treatment building, an industrial wastewater treatment plant (WWTP), auxiliary power transformer bays, and power distribution buildings. Table S-2 summarizes some of the key requirements and characteristics of the project.

The project would transport captured CO_2 via pipeline to injection wells located within 12 miles of the Mountaineer Plant. The ultimate configuration of the pipeline routes would depend on which potential injection well sites would be used. Lands between the Mountaineer Plant and some of the injection well properties are not entirely owned by AEP; therefore, AEP would establish a pipeline corridor and obtain legal ROWs, setbacks, and easements as needed. AEP identified potential pipeline corridors, divided into segments to facilitate alternative routing options, from the Mountaineer Plant to the potential injection well properties (see Figure S-2).

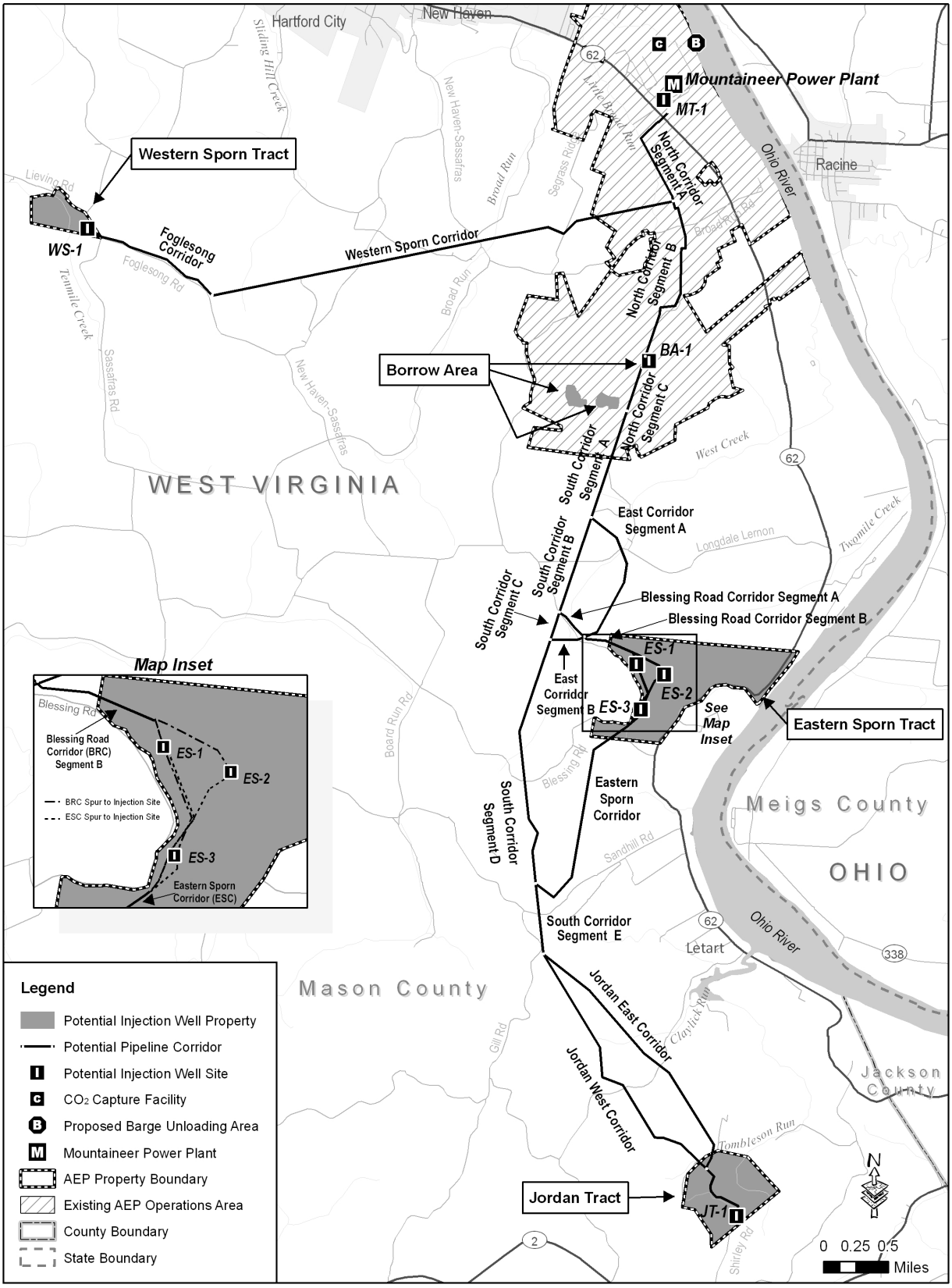

Figure S-2. Potential Project Features

Table S-1. Mountaineer CCS II Project Features

Feature	Description	Characteristics
CO_2 Capture Facility	**Location:** A capture facility would be constructed at the Mountaineer Plant. The facility would use Alstom's CAP technology to capture CO_2 from a 235-MW flue gas slipstream from the plant's 1,300-MW pulverized coal-fired electric generating unit. **CO_2 Capture Capacity:** 1.5 million metric tons of CO_2 per year	**Facility Footprint:** 500 x 1000 feet (11.5 acres), located within a 33-acre area at the Mountaineer Plant.
CO_2 Pipelines	**Routes:** Pipelines used to transport CO_2 to the injection wells would be co-located within existing road and HVTL ROWs, to the extent possible. The length of the pipeline routes vary by corridor option. The range of pipeline lengths to the following injection well properties is: (1) Mountaineer Plant (0.13 mile); (2) Borrow Area (2.24 miles); (3) Eastern Sporn Tract (5.00 to 8.65 miles); (4) Jordan Tract (9.24 to 9.68 miles); and (5) Western Sporn Tract (5.69 miles). **Operator:** AEP would own, operate, and maintain the CO_2 pipelines.	**Construction ROW Width:** 80-120 feet **Permanent ROW Width:** 50 feet
CO_2 Injection Well Properties	**Locations:** AEP anticipates that the project would require four to eight wells, located in pairs, at two to four of the following five properties: (1) Mountaineer Plant (33 acres); (2) Borrow Area (28 acres); (3) Eastern Sporn Tract (400 acres); (4) Jordan Tract (195 acres); and (5) Western Sporn Tract (70 acres). **Quantity:** Each well would be designed to inject approximately 0.5 million metric tons of CO_2 per year. The total injection rate would be 1.5 million metric tpy. **Access Roads:** Access roads would be constructed from public roads to the injection well sites.	**Construction Area:** Approximately 5 acres per injection well site **Well Depth:** Approximately 7,500 to 8,500 feet bgs **Operational Area:** 0.5 acre per site **Access Roads:** **Construction Width:** 25-30 feet **Permanent Width:** 12-15 feet
Monitoring Wells	**Locations:** The final approved UIC permit would dictate the final number of and siting requirements for monitoring wells. Characterization wells could be converted to monitoring wells in the future. For this analysis, it is estimated that AEP would construct and use one to three monitoring wells per injection well, and that the monitoring wells would be placed within approximately 1,500 to 3,000 feet of the injection wells.	**Construction Area:** Approximately 5 acres per well site **Well Depth:** Dependent upon UIC permit requirements **Operational Area:** 0.5 acre per site (may be co-located at injection well sites)

bgs = below ground surface; CO_2 = carbon dioxide; HVTL = high voltage transmission line; MW = megawatt; ROW = right-of-way; tpy = tons per year; UIC = Underground Injection Control

AEP's pipelines would follow existing, previously disturbed AEP electrical transmission line ROWs to the extent possible. The pipelines would be constructed of carbon steel and range from approximately 8 to 12 inches in nominal diameter. The pipelines would operate at a pressure of up to 3,000 pounds per square inch (psi). All pipelines would be installed below ground, except for locations where the pipeline would cross a vertical rock outcropping. The only pipeline features that would potentially be visible along the route would be: (1) minimal locations where the pipeline crosses a vertical rock outcropping; (2) pipeline location markers (primarily positioned at road and stream crossings, fence lines, or where the pipeline is above ground surface); and (3) cathodic protection test posts located on each side of all road crossings.

AEP is considering five AEP-owned properties for the location of the CO_2 injection wells (listed in descending order of preference): Mountaineer Plant, Borrow Area, Jordan Tract, Eastern Sporn Tract, and Western Sporn Tract. AEP anticipates that the project would require four to eight injection wells, located in pairs, at two to four different properties. Final design of the number and location of injection wells for the project would be determined based on results of an ongoing geologic characterization study. AEP has selected possible locations for the injection well sites on each injection property, as shown in Figure S-2: Mountaineer Plant Injection Well Site MT-1, Borrow Area Injection Well Site BA-1, Jordan Tract Injection Well Site JT-1, Eastern Sporn Tract Injection Well Sites ES-1, ES-2, and ES-3, and Western Sporn Tract Injection Well Site WS-1. Injection wells would be approximately 7,500 to 8,500 feet deep. Once injected, the CO_2 would be trapped underground by a confinement system, which includes impermeable layers of rock known as "caprock." Caprock consists of thick (hundreds or thousands of feet) layers of non-porous rock that act as caps or seals to trap the injected fluid. The CO_2 injected into these formations might extend to an estimated radius of 3 miles from each injection well site.

AEP selected the preferred locations of proposed project features, including access roads, pipelines, and injection well sites, with consideration of each location's suitability for construction and operation, and based on AEP's siting criteria. AEP would use these same siting criteria in the event that a project feature would need to be relocated, and when choosing locations for the required monitoring wells. To the extent practical, these siting criteria include the following:

- **Avoid wetlands** – Project features would avoid wetland areas.
- **Avoid streams and floodplains** – Project features would avoid streams and floodplains and minimize the number of pipeline stream crossings.
- **Avoid sensitive habitats** – Project features would avoid areas identified as sensitive habitats.
- **Avoid cultural resources** – Project features would avoid areas containing known cultural resources.
- **Proximity to public roads** – Project features would use areas with ready access to public roads to minimize the creation of new access roads.
- **Topography** – Project features would use areas that are generally flat to minimize grading requirements and erosion potential.

Table S-2. Project Requirements and Characteristics Summary

Requirement/ Characteristic	Description	Source/Provider
Potable Water	**Quantity:** During peak construction potable water usage could range from 1,500 to 45,600 gpd; during operations, up to 2,200 gpd.	**Utility Provider:** New Haven Water Facility
Process Water	**Quantity:** Construction is expected to use a total of approximately 2.5 million gallons and an additional 600,000 gallons of demineralized water for hydrotesting and system startup. Operations usage rate would be approximately 1.9 mgd.	**Source:** Mountaineer Plant's existing river water loop.
Electricity Required during Operations	**Power:** 50 – 80 MW	**Utility Provider:** Existing Mountaineer Plant
Sanitary Wastewater	**Receiving Point:** Sanitary wastewater from construction would be handled through either public utility or portable restrooms. **Quantity:** During construction, sanitary wastewater could range from 1,500 gpd to 48,000 gpd; during operations, up to 2,300 gpd.	**Utility Provider:** New Haven Sanitary Waste Facility
Industrial Wastewater	**Receiving Point:** If the WWTP is unable to handle the additional load of the project, a new industrial WWTP would be constructed. Effluent from the new WWTP would be sent to the existing plant's permitted outfall. **Quantity:** Wastewater from the flue gas cooling and cleaning process; quantity varies. Absorber building sump wastewater; quantity varies. Off-spec ammonium sulfate solution (15-35 percent by weight) would be generated by the CAP process. If the market warrants, AEP would provide an onsite treatment system to evaporate water from the solution to produce a concentrated dry ammonium sulfate product. If it can't be sold as by-product (fertilizer), it would be treated and disposed of at the AEP landfill.	**Utility Provider:** General industrial wastewater treated or reused by the Mountaineer Plant
Non-hazardous Solid Waste Generation	**Receiving Point:** There are three regional solid waste disposal facilities: Charleston Municipal Landfill (13 years remaining), Disposal Services Landfill (37 years remaining), or Allied Waste Sycamore Landfill (37 years remaining). **Quantity:** During construction, a total of 10,720 cubic yards of general garbage and construction and demolition debris. During operation, approximately 10 cubic yards per month.	**Utility Provider:** Local municipal landfills.
Dry Ammonium Sulfate By-Product Generation	**Receiving Point:** Regional agricultural interests or, should a market not be available for sale of the material, the AEP Little Broad Run landfill. **Quantity:** During operation quantity would vary (maximum 30 tons per day).	**Process:** Ammonium sulfate solution treated onsite to evaporate water to produce concentrated dry by-product.

Table S-2. Project Requirements and Characteristics Summary

<table>
<tr><th>Requirement/ Characteristic</th><th>Description</th><th>Source/Provider</th></tr>
<tr><td>Materials and Wastes Transport</td><td>Deliveries or waste shipments include reagent (aqueous and/or anhydrous ammonia), sulfuric acid, ammonium sulfate by-product, waste streams, and other miscellaneous construction equipment and service vehicles.
Material Shipment Quantity:
<table><tr><th>Chemical</th><th>Truck Shipments (per year)</th><th>Rail-car Shipments (per year)</th></tr><tr><td>Anhydrous ammonia</td><td>180</td><td>40</td></tr><tr><td>Aqueous ammonia</td><td>430</td><td>100</td></tr><tr><td>Sulfuric acid</td><td>120</td><td>40</td></tr><tr><td colspan="3">Wastes or By-Product Shipment Quantity:</td></tr><tr><td>Ammonium sulfate</td><td>730</td><td>NA</td></tr></table>Construction truck deliveries – 20 to 90 per month.
Operations truck trips – up to 14 per day (includes general waste streams and service vehicles).</td><td>Provider:
Commercial Carriers</td></tr>
<tr><td>CAP Chemical Inputs</td><td>Reagent Option 1: 100-percent anhydrous ammonia (28,739 gallons stored).
Reagent Option 2: 29-percent aqueous ammonia (54,308 gallons stored) and 100-percent anhydrous ammonia for system startup or upset conditions (28,739 gallons stored).
Refrigerant: Anhydrous ammonia (157,000 gallons stored).
Other Process Chemicals: Sulfuric acid (45,000 gallons stored); ammonium sulfate 15-35 percent by weight (150,000 gallons stored).</td><td>Source:
Commercial Markets</td></tr>
<tr><td>Flue Gas Inlet and Outlet Constituents</td><td><table><tr><th>Flue Gas Constituent</th><th>Nominal CAP Inlet</th><th>Estimated CAP Outlet</th></tr><tr><td>CO_2 (ppmv)</td><td>105,993</td><td>13,000</td></tr><tr><td>N_2 (ppmv)</td><td>680,900</td><td>813,000</td></tr><tr><td>NH_3 (ppmv)</td><td>2.0</td><td><10</td></tr><tr><td>NO_x (ppmv)</td><td>100</td><td><100</td></tr><tr><td>O_2 (ppmv)</td><td>54,900</td><td>67,000</td></tr><tr><td>PM (lbs/hour)</td><td>125</td><td><50</td></tr><tr><td>SO_2 (ppmv)</td><td>80</td><td><20</td></tr><tr><td>SO_3 (ppmv)</td><td>25</td><td><10</td></tr></table></td><td></td></tr>
</table>

CAP = chilled ammonia process; CO_2 = carbon dioxide; gpd = gallons per day; HVTL = high voltage transmission line; lbs = pounds; mgd = million gallons per day; MW = megawatt; N_2 = nitrogen; NH_3 = ammonia; NO_x = nitrogen oxides; O_2 = oxygen; PM = particulate matter; ppmv = part per million by volume; SO_2 = sulfur dioxide; SO_3 = sulfur trioxide; WWTP = wastewater treatment plant

Construction of the proposed project would likely start in January 2013 and take approximately 32 months to complete. This 32-month period includes approximately 8 months of commissioning prior to commencing commercial operations. The number of construction workers would vary during the construction period, ranging from 25 to 800 persons during the various phases of construction. During construction of the CO_2 capture facility, AEP would receive the delivery of materials via truck and via barge traffic by two methods. The first method would use an existing barge unloading platform to remove material from moored barges via a mobile crane. The second method represents an upgrade to the existing unloading capabilities and would allow for larger equipment to be unloaded through the use of a temporary mobile bridge that would span the area between the river bank and the parked barge.

The project demonstration phase would last 3 years and 10 months (46 months total) per the terms and conditions of the Cooperative Agreement between DOE and AEP. AEP would determine whether to continue operating the CCS facility after the demonstration is complete. A variety of factors could affect the possible long-term operation of the CCS facility, including potential future CO_2 legislation and regulations, process performance, and economics. For the purposes of this EIS, DOE assumed the CCS facility would continue to operate for 20 years.

The existing Mountaineer Plant currently employs 195 people. The project would require an increase of approximately 38 full-time employees divided among 4 shifts (i.e., an increase of approximately 19 percent over current conditions).

During the operational life of the Mountaineer CCS II Project, AEP would monitor the CO_2 injection process and storage integrity through the use of monitoring wells and any other methods required by the UIC permit. Monitoring can be divided into three primary types, including: (1) injection system monitoring; (2) confinement monitoring; and (3) CO_2 tracking in the injection zone. Thus, monitoring wells of varying depths would be an integral part of the MVA program. However, the final UIC permit would determine the minimum overall monitoring parameters for the proposed CO_2 storage system.

POTENTIAL OPERATING SCENARIOS

The specific manner in which AEP would ultimately implement the project depends on a combination of factors. These factors include, but are not limited to, the results of the geologic characterization study, pipeline routing constraints, UIC permitting conditions, and various cost factors. To assess the potential range of impacts that could occur from implementation of the project, several scenarios for proposed project implementation have been considered in this EIS. Section 4.1 of the EIS, Comparative Impacts of Alternatives, presents three scenarios (A, B, and C); however, this summary presents only the upper and the lower bound scenarios (A and C) (see Table S-3 for description of all three scenarios). These scenarios present combinations of pipeline corridors and injection well properties that are representative of a reasonable range of options that could be implemented. These are not intended to provide an exhaustive list of options, but rather to bracket the range of available options and illustrate reasonable and plausible combinations.

DOE evaluated each of the scenarios listed in Table S-3 in this EIS in order to assess the range of potential impacts that could occur and to properly bind the impact analyses. Assuming geologic characteristics are favorable at all locations, Scenario A would be AEP's preferred scenario and Scenario C would be AEP's least preferred scenario. This preference is based largely on cost, effort to implement, and environmental considerations. Scenario A would minimize these elements; Scenario C would maximize them. As such, Scenario C is the least preferable and considered to be the upper bound or "worst case" from an impact perspective because it would involve the greatest length of pipelines, the greatest number of required injection wells, and the greatest number of properties involved with the project. The number of injection wells on any one site would be based on the final design and could require more than two wells.

Table S-3. Proposed Project Implementation Scenarios

Injection Well Property	Alternative Route	Scenario A "Lower Bound"	Scenario B	Scenario C "Upper Bound"
		Number of Injection Wells per Property		
Mountaineer Plant (MT-1 Location)	Plant Routing	2	0	0
Borrow Area	Borrow Area Route	2	2	2
Eastern Sporn Tract	Eastern Sporn Route 1	0	2	2
	Eastern Sporn Route 2			
	Eastern Sporn Route 3			
	Eastern Sporn Route 4			
Jordan Tract	Jordan Route 1	0	2	2
	Jordan Route 2			
	Jordan Route 3			
	Jordan Route 4			
Western Sporn Tract	Western Sporn Route	0	0	2

Note: These scenarios present combinations of pipeline routes and injection well properties that are representative of a reasonable range of options that could be implemented. Scenario A represents the lower bound (least wells and shortest pipeline) for impacts related to the number of wells and length of pipeline, while Scenario C represents an upper bound (most wells and longest pipeline). These are not intended to provide an exhaustive list of options, but rather to bracket the range of available options and illustrate reasonable and plausible combinations.

CHARACTERISTICS OF THE AFFECTED ENVIRONMENT

The affected environment, also referred to as the region of influence (ROI), for the project was defined for each of 18 environmental resource areas depending on the extent of potential impacts resulting from plant and infrastructure construction and operation. The size of the ROI varies by resource depending upon the extent of potential impacts on respective resources. In general, the EIS considered the environmental setting in Mason County and portions of neighboring counties in West Virginia and Ohio as appropriate per resource area. Table S-4 summarizes the affected environment for each of the 18 resource areas. The affected environment for each of these resources is described in greater detail in Chapter 3 of the EIS.

Table S-4. Affected Environment of the Mountaineer CCS II Project

Resource	Existing Conditions
Air Quality and Climate	The location of the Mountaineer CCS II Project has been designated unclassifiable or in attainment of all National Ambient Air Quality Standards, except $PM_{2.5}$, (40 CFR 81.349). Mason County has been designated as partial nonattainment with the particulate matter (2.5 micron diameter) standard for the Graham Tax District area.
Greenhouse Gases	Emissions of CO_2 from fossil fuel combustion within the State of West Virginia totaled 116.4 million metric tons in 2007, with 85.5 million metric tons resulting from electric power generation. Currently, there are no West Virginia regulations pertaining to limits in emissions of GHGs.
Geology	Bedrock in the ROI consists of sedimentary rock sequences and alternating layers of shale, limestone, dolomite, and sandstone within the basin. An exploratory well drilled at the Mountaineer Plant found brine intervals at the Rose Run (sandstone) Formation at a depth of 7,706 to 7,822 feet bgs, and the Copper Ridge Formation at 8,150 to 8,400 feet bgs. These formations are included in the proposed injection zone. The injection zone is capped by

Table S-4. Affected Environment of the Mountaineer CCS II Project

Resource	Existing Conditions
	primary and secondary confining zones, which consist of dense and impermeable dolomite, thick shale, and limestone sequences in the bedrock column. Core tests determined that the permeability and porosity of formations in the injection zone can readily support CO_2 injection. Over 800 feet of dolomite and limestone and 1,300 feet of shale overlay the injection zone. A seismic study conducted by AEP did not identify any faults. The closest regional fault system, the Rome Trough, is approximately 25 miles to the southeast of the Mountaineer Plant. Since 1973, there have been four recorded earthquakes within a 30-mile radius of the Mountaineer Plant, all of which were at or below magnitude 3.5.
Physiography and Soils	The study area lies completely within the Central Allegheny Plateau Major Land Resource Area, a physiographic section of the larger Appalachian Plateau province. Elevations in the study area range from 500 feet above sea level along the Ohio River, to 1,260 feet at the top of Garnes Knob. The soils in the study area formed in residuum, colluvium, eolian, and alluvium materials. Prime farmland soils exist within the footprints of each of the potential pipeline corridors except the Eastern Sporn Corridor. The great majority of the soils are either mapped as HEL or PHEL throughout the study area.
Groundwater	There are three primary potable groundwater sources in the ROI: (1) the Ohio River Valley-fill aquifer, (2) Quaternary alluvium in stream valleys, and (3) sandstone units in the Pennsylvanian bedrock. The Ohio River Valley-fill aquifer is the most productive, with yields of up to 1,000 to 3,000 gpm. The Mason County Public Service District provides the majority of potable water for the county. Local drinking water is provided by the NHWF services approximately 650 households with a 150,000 gpd withdrawal from 2 wells in New Haven that are drilled to about 80 feet bgs into the Ohio River Valley-fill aquifer.
Surface Water	The project is located within the Ohio River Basin watershed. There are no surface water features within or immediately adjacent to the CO_2 capture facility; however, the Ohio River is located 1,000 feet to the east of the facility and Little Broad Run is located approximately 2,000 feet to the west of the facility. The land areas for each of the potential pipeline corridors and injection well properties include stream features, the majority of which are intermittent or ephemeral in nature.
Wetlands and Floodplains	There are no wetlands located within or adjacent to the land area proposed for the CO_2 capture facility and barge unloading area. There is a small (less than 0.1 acre) palustrine emergent wetland in the center of a depression to the southwest of the barge unloading area that accepts drainage from interior portions of the site and then discharges to the Ohio River. There are wetlands located within each of the potential pipeline corridors except for the Mountaineer Plant routing. There are wetlands located within each of the potential injection well properties except for the Mountaineer Plant. There are FEMA-mapped floodplains located at the CO_2 capture facility location; however, since the FEMA maps were published, the site has been elevated substantially for the development of the Mountaineer Plant to, in most cases, above the elevation of the base flood. The land area proposed for the upgrades to the existing barge unloading area would be located within the FEMA-mapped 100-year floodplain below the mapped base flood elevation. One of the potential pipeline corridors (i.e., the Western Sporn Corridor) would cross FEMA-mapped floodplains. The Eastern Sporn Tract and Western Sporn Tract potential injection well properties contain FEMA-mapped floodplains.
Biological Resources	The area for the proposed CO_2 capture facility includes approximately 33 acres of human altered land (grasses), which provides poor habitat quality for most wildlife species, with the exception of those species adapted to high levels of human activity and disturbance. The majority of the potential pipeline corridors consist of previously cleared HVTL ROW (classified as Ruderal Early Successional Grassland and Scrub/Shrub), which is maintained to control vegetation growth. The majority proportions of land cover types within the potential injection well properties include: Developed, Medium Density for the Mountaineer Plant and Borrow Area, and South-Central Interior Mesophytic Forest for the Eastern Sporn Tract, Jordan Tract, and Western Sporn Tract. Mason County is near the edge of the range of the federally listed-endangered Indiana bat (*Myotis sodalis*). Mist net and habitat surveys for Indiana bats in the ROI were performed and no evidence of Indiana bats was found as a result of this study.

Table S-4. Affected Environment of the Mountaineer CCS II Project

Resource	Existing Conditions
	Three federally listed-endangered aquatic species (Pink mucket pearly mussel [*Lampsilis abrupt*], Fanshell mussel [*Cyprogenia stegaria irrorata*], and Clubshell [*Pleurobema clava*]) and two federal candidate aquatic species (Sheepnose mussel [*Plethobasus cyphyus*] and Diamond darter [*Crystallaria cincotta*]) have the potential to occur within the ROI; however, a survey conducted in 2005 in the Ohio River off shore from the Mountaineer Plant did not identify any protected species.
Cultural Resources	No NRHP-listed or NRHP-eligible archaeological resources occur within a 1-mile radius of the area proposed for the CO_2 capture facility, pipeline corridors, and potential injection sites. A Phase I archaeological survey was conducted of all proposed impact areas of the project. The field survey identified one previously unrecorded cemetery and one isolated artifact in the project area. The cemetery was considered to be potentially eligible for inclusion on the NRHP, while the artifact was not. WVSHPO concurred on these eligibility determinations. The WVSHPO determined that two historic resources within the APE of the Mountaineer Plant are eligible for listing in the NRHP and there are also two historic resources that are not eligible. No NRHP-listed or NRHP-eligible historic resources occur within a 1-mile radius of any of the pipeline corridors. An architectural survey to identify resources over 50 years of age identified 13 resources within the APE of the injection well properties. The WVSHPO concurred that two of these resources are NRHP-eligible and the others are not.
Land Use and Aesthetics	Although no zoning classifications have been identified for the area, land use can be characterized as industrial. Land use in the region includes rural privately-owned properties, mining areas, and other industrial facilities, while land cover in the region consists of natural land cover (i.e., forested, riparian/floodplain and wetland), developed land/disturbed open space, agricultural land, and previously disturbed cover. The entire CO_2 capture facility site is characterized by developed open space and industrial fields associated with the plant (i.e., grassy areas). Several of the pipeline corridors run entirely along existing HVTL easements; other pipeline corridors run largely along an existing easement but include one or more short deviations. Several of the corridors, however, cross private property and would require the establishment of new ROWs.
Traffic and Transportation	Featured transportation infrastructure within the ROI includes a 20-mile corridor of State Route 62, the CSX Transportation rail line, and a nearby barge unloading area on the Ohio River. State Route 62 provides direct access to the Mountaineer Plant and to the smaller connector roads that provide access to the pipelines and injection well sites. In the ROI, State Route 62 is a paved, two-lane highway. Traffic volumes in the ROI are typical of rural areas – generally, these roadways experience relatively low traffic volumes and minor roadway congestion. During normal operations, the 2007 average daily traffic on State Route 62 ranged from 1,200 to 6,000 vehicles. One public at-grade rail crossing is located within the ROI in New Haven at Midway Drive. According to the Federal Railroad Administration, this rail crossing experiences approximately eight train pass-bys per day.
Noise	Existing dominant noise sources in the vicinity of the CO_2 capture facility mainly consist of traffic on State Route 62, operations at the existing Mountaineer Plant, rail traffic on the CSX Transportation rail line, and material handling equipment associated with the barge deliveries on the Ohio River. Noise sources along the potential pipeline corridors and potential injection well sites primarily consist of vehicular traffic as the area is located near roadways within a predominately rural area.
Materials and Waste Management	Adequate suppliers exist for construction and operational materials. Adequate disposal capacity exists in West Virginia and Ohio for solid and hazardous wastes. In addition, there are adequate hazardous waste treatment, storage, disposal, and recycling facilities within the region both within West Virginia and bordering states.
Human Health and Safety	The ROI for potential releases from the CO_2 capture facility (5 miles from the facility) includes the towns of Hartford and New Haven, West Virginia, as well as Syracuse and Racine, Ohio. New Haven and Racine are the closest towns to the Mountaineer Power plant and have populations of 1,510 and 740, respectively. Predominant winds (36 percent of the time) are from the west and southwest and are not in the direction of these towns. Wind directions

Table S-4. Affected Environment of the Mountaineer CCS II Project

Resource	Existing Conditions
	toward New Haven and Racine, occur approximately 5.4 percent and 4.5 percent of the time, respectively. Winds toward Harford and Syracuse occur approximately 6.0 and 6.1 percent of the time, respectively.
Utilities	The Mountaineer Power Plant produces its own electrical energy for operations. The NHWF provides potable water to the plant. Process water is supplied from a river water loop via the Ohio River at a rate of approximately 18.74 mgd. Sanitary wastewater is piped to the NHSWF for treatment. Industrial wastewater is treated by an onsite wastewater treatment facility prior to discharge into the Ohio River, which generates 0.14 mgd of sludge, and is disposed of at AEP's Little Broad Run Landfill adjacent to the Mountaineer Plant. The potential pipeline corridors and injection well sites do not currently contain the infrastructure for water supply, wastewater treatment, or electrical power.
Community Services	The New Haven Volunteer Fire Department and the Mason Volunteer Fire Department serve the existing Mountaineer Plant. The West Virginia portion of the ROI is served by 20 fire stations and the Ohio ROI is served by 7 fire stations. The Mason County Office of Emergency Management serves as an umbrella organization covering several agencies including, Enhanced 911, Emergency Medical Services, Local Emergency Planning Committee and overall emergency management. The ROI is served by six hospitals.
Socioeconomics	Collectively, Mason County and the 5 adjacent counties (Cabell, Jackson, Putnam, Gallia, and Meigs) have a population of approximately 258,054, which increased by 0.5 percent since 2000. Among the 6 counties, Putnam County experienced the greatest population growth since 2000 (7.9 percent), while the state population increased by 0.6 percent. The population of Mason County is approximately 25,568, down 1.5 percent since 2000. The 6 counties include approximately 118,862 housing units of which approximately 9.1 percent are vacant rental units and another 1.0 percent are otherwise vacant. The median household income in the 6 counties is nearly $5,000 less annually than the state median. The recent unemployment rate within the ROI is higher than both the state average and the national rate.
Environmental Justice	The percentage of minorities among the Mason County population (1.8 percent) is substantially lower than both the state (5.5 percent) and national (20.2 percent) averages. The low income population distribution in Mason County (18.1 percent) is slightly higher than the state average (17.4 percent) and higher than the national average (13.2 percent).

APE = area of potential effects; bgs=below ground surface; CFR = Code of Federal Regulations; CO_2 = carbon dioxide; FEMA = Federal Emergency Management Agency; gpd = gallons per day; gpm = gallons per minute; GHG=greenhouse gas; HEL = highly erodible land; HVTL = high voltage transmission line; mgd = million gallons per day; NHSWF = New Haven Sanitary Waste Facility; NHWF = New Haven Water Facility; NRHP = National Register of Historic Places; PHEL = potentially highly erodible land; $PM_{2.5}$ = particulate matter of diameter 2.5 microns or less; ROI = region of influence; ROW = right of way; WVSHPO = West Virginia State Historic Preservation Office

ENVIRONMENTAL IMPACTS

DOE evaluated the potential impacts of the Proposed Action and the No Action Alternative in relation to the baseline conditions described in Chapter 3 and summarized above. The most detailed discussion of potential impacts is provided in Chapter 3, and a detailed table summarizing the potential adverse impacts is included in Section 4.1, Comparative Impacts of Alternatives. Table S-5 summarizes the potential impacts for each of the 18 resource areas for the No Action Alternative and for both "Lower" and "Upper" Bounding Case Scenarios of the Proposed Action as outlined in Table S-3 previously.

The EIS uses the following descriptors to qualitatively characterize impacts on respective resources:

- ***Beneficial*** – Impacts would benefit the resource.
- ***Negligible*** – No apparent or measurable impacts are expected; may also be described as "none" if appropriate.
- ***Minor*** – The action would have a barely noticeable or measurable adverse impact on the resource.
- ***Moderate*** – The action would have a noticeable or measurable adverse impact on the resource. This category could include potentially significant impacts that would be reduced to a lesser degree by the implementation of mitigation measures.
- ***Substantial*** – The action would have obvious and extensive adverse effects that could result in potentially significant impacts on a resource despite mitigation measures.

Table S-5. Summary of Environmental Impacts of the Mountaineer CCS II Project

No Action	Lower Bound Scenario (A) *2 wells at Mountaineer Plant* *2 wells at Borrow Area*	Upper Bound Scenario (C) *2 wells at Borrow Area* *2 wells at Eastern Sporn Tract* *2 wells at Jordan Tract* *2 wells at Western Sporn Tract*
Air Quality and Climate		
No impacts. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their current conditions; there would be no changes to air quality.	***Minor adverse impacts.*** Construction of the CO_2 capture facility, pipeline corridors, and injection well sites would result in short-term, localized increased tailpipe and fugitive dust emissions. The CAP facility would be designed solely for the capture of CO_2 emissions. However, based on the energy and mass balance flow rate for the project, the CAP would be expected to offer the co-benefit of reducing flue gas emissions, including SO_2, SO_3 and PM, although the amount of potential reduction is not known. For the purpose of evaluating potential impacts on air quality, DOE conservatively assumed that the stack emissions of criteria pollutants from the CAP would not change from existing stack emissions. AEP ammonia concentrations could increase by 48.7 tpy; however, no regulatory standards would be exceeded. It is expected that any potential impact from a change to plume behavior from the exhaust merge would be minimal or insignificant.	***Minor adverse impacts.*** Construction impacts would be similar to the Lower Bound Scenario, though slightly higher temporary tailpipe and fugitive dust emissions during construction due to longer pipeline corridors and four additional injection wells. Operation of the project would be similar to the Lower Bound Scenario.
Greenhouse Gases		
Loss of potential benefit. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their current conditions; there would be no changes to GHG emissions. However, without the project, there would be no reduction in	***Beneficial impacts.*** Construction of the CO_2 capture facility, pipeline corridors, and injection sites, could generate GHGs amounting to approximately 37,246 metric tons of CO_2-eq. Operation of the CO_2 capture facility would result in the capture and storage of approximately 1.5 million metric tons per year of CO_2-eq. It is estimated that the total CO_2 emissions from the Mountaineer Plant would be reduced by approximately 18 percent. The potential contribution of anthropogenic GHG emissions to climate change is inherently a global cumulative	***Beneficial impacts.*** Construction impacts would be similar to the Lower Bound Scenario, though slightly higher tailpipe GHG emissions during construction due to longer pipeline corridors and four additional injection wells, amounting to approximately 69,358 metric tons of CO_2-eq. Operation of the project would be similar to the Lower Bound Scenario.

Table S-5. Summary of Environmental Impacts of the Mountaineer CCS II Project

No Action	Lower Bound Scenario (A) *2 wells at Mountaineer Plant* *2 wells at Borrow Area*	Upper Bound Scenario (C) *2 wells at Borrow Area* *2 wells at Eastern Sporn Tract* *2 wells at Jordan Tract* *2 wells at Western Sporn Tract*
GHG emissions from the Mountaineer Plant and no demonstration of advanced coal-based power generation technologies that capture and sequester CO_2 emissions.	phenomenon, and direct impacts from this project cannot be determined with current scientific methods.	
Geology		
No impacts. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their current conditions; there would be no changes to geologic resources.	***Minor adverse impacts.*** Construction of the pipeline may require some bedrock excavation. Construction of the injection well sites would result in removal of geologic media through the drilling process. This process would not be unique to the area and would not affect the availability of local geologic resources. Hydraulic stimulation would likely be required to increase injectivity; however, it is anticipated that this would not increase the potential for CO_2 vertical migration from the target formation. Operation of the CO_2 capture facility and pipeline corridors would not affect geologic resources. At the injection well sites, the potential of CO_2 migrating upward through fractures in the caprock seal is considered highly unlikely. AEP would conduct extensive studies and monitoring, in accordance with the UIC Permit, to minimize this potential long-term impact and have in place the appropriate mitigation strategies should such CO_2 migration be identified. Preliminary CO_2 plume analysis shows that the CO_2 may extend 2 miles from the Rose Run injection wells and 3 miles from the Copper Ridge wells. AEP would perform additional seismic surveys as part of the project's geologic characterization process to confirm that each site is adequately capped. Based on existing seismic surveys, it is expected that increased seismicity in the ROI due to CO_2 injection or hydraulic stimulation would be very unlikely.	***Minor adverse impacts.*** Construction impacts would be similar to the Lower Bound Scenario for the CO_2 capture facility; and similar for the pipeline corridors, though additional bedrock excavation may be required due to longer pipeline lengths. Construction of the injection wells would be similar to the Lower Bound Scenario, though additional geologic media would be removed due to development of four additional wells. Operation of the project would be similar to the Lower Bound Scenario; however, the additional wells would increase the total size of the CO_2 plume within the ROI. The plume radius would increase the surface area between the CO_2 and the caprock, but would lower the formation pressure over a greater area.

Table S-5. Summary of Environmental Impacts of the Mountaineer CCS II Project

No Action	Lower Bound Scenario (A) *2 wells at Mountaineer Plant* *2 wells at Borrow Area*	Upper Bound Scenario (C) *2 wells at Borrow Area* *2 wells at Eastern Sporn Tract* *2 wells at Jordan Tract* *2 wells at Western Sporn Tract*
Physiography and Soils		
No impacts. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to physiography and soils.	***Negligible to minor adverse impacts.*** Construction of the project would increase the potential for soil erosion and compaction, and creation of impermeable surfaces. Construction of the CO_2 capture facility would disturb 33 acres of previously disturbed urban land. Construction of the pipeline corridors would disturb sensitive or high-productivity soils: 6 acres of prime farmland, 13 acres of farmland of statewide importance, 15 acres of HEL, and 11 acres of PHEL. Construction of the injection well sites would disturb sensitive or high-productivity soils: 3.4 acres of farmland of statewide importance and 4.9 acres of HEL. Operation of the CO_2 capture facility, pipeline corridors, and injection well sites, would not be anticipated to affect soil resources.	***Negligible to moderate adverse impacts.*** Construction impacts would be similar to the Lower Bound Scenario for the CO_2 capture facility. Construction of the pipeline corridors would disturb sensitive or high productivity soils: 18 acres of prime farmland, 83 acres of farmland of statewide importance, 155 acres of HEL, and 29 acres of PHEL. Construction of the injection well sites would disturb less than an acre of prime farmland, 17.7 acres of farmland of statewide importance, 19.5 acres of HEL would not be accessible for future farming; higher potential of erosion from operational activities. Operation of the project would be similar to the Lower Bound Scenario.
Groundwater		
No impacts. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their current conditions; there would be no changes to groundwater resources.	***Negligible to minor adverse impacts.*** Construction of the CO_2 capture facility and pipeline corridors would not include onsite discharges to groundwater, and implementation of Stormwater Construction Permit conditions would minimize any potential for groundwater contamination. Construction of the injection well sites would occur in a manner so that drilling mud would not interact with local groundwater and in a manner consistent with a UIC permit. Operation of the CO_2 capture facility would require potable water for 38 new employees, which is 0.7 percent of the unused capacity of the supplying sanitary district, which uses groundwater. Operations would include implementation of a Spill Prevention, Control, and Countermeasures Plan and NPDES permit conditions, which would minimize the potential for groundwater	***Negligible to minor adverse impacts.*** Construction impacts would be similar to the Lower Bound Scenario for the CO_2 capture facility. Construction of the pipeline corridors and injection well sites would be similar to the Lower Bound Scenario, though longer pipeline lengths and four additional wells, respectively, would increase the potential for groundwater exposure to contaminants. Operation of the project would be similar to the Lower Bound Scenario, though four additional wells would increase the total size of the CO_2 plume. The CO_2 radius would increase the surface area between the CO_2 and the caprock, but would lower the formation pressure over a greater area.

Table S-5. Summary of Environmental Impacts of the Mountaineer CCS II Project

No Action	Lower Bound Scenario (A) *2 wells at Mountaineer Plant* *2 wells at Borrow Area*	Upper Bound Scenario (C) *2 wells at Borrow Area* *2 wells at Eastern Sporn Tract* *2 wells at Jordan Tract* *2 wells at Western Sporn Tract*
	contamination. Operation of the pipeline corridors would not be expected to affect groundwater. At the injection well sites, the potential of CO_2 migrating upward through fractures in the caprock seal is considered highly unlikely and extensive vertical movement to drinking water aquifers would not be expected. Based on preliminary results from the PVF injection wells, the CO_2 migration is anticipated to occur laterally, with minimal vertical migration within the target formations. As part of the UIC permit application, AEP would outline the monitoring and verification procedures, which are part of the carbon sequestration best management practices that AEP would implement.	
Surface Water		
No impacts. The potential sites and corridors would remain in their existing states and there would be no changes to surface waters.	***Negligible to minor adverse impacts.*** Construction of the CO_2 capture facility and the upgrades to the barge unloading area has the potential to cause sedimentation to the Ohio River and increase the potential for surface water contamination from materials spills. Construction of the pipeline corridors could disturb surface waters causing a decrease in water quality, increased turbidity and sedimentation during streambed disturbance, change of flow or velocity, and removal of streambank vegetation for a total of seven stream crossings. Construction of the injection well sites could increase the potential for contamination from material spills. Operation of the CO_2 capture facility would require additional process water withdrawals of 1.9 mgd from the Ohio River; would increase the potential for stormwater runoff due to increased impervious area; would increase wastewater discharge from the facility operations; and would increase the potential for contamination from materials spills. Operation of the pipeline corridors and injection well sites would not affect surface water, other than increasing the potential of material spills during maintenance.	***Negligible to moderate adverse impacts.*** Construction impacts would be similar to the Lower Bound Scenario for the CO_2 capture facility. Construction of the pipeline corridors could disturb surface waters causing a decrease in water quality, increased turbidity and sedimentation during streambed disturbance, change of flow or velocity, and removal of streambank vegetation for a maximum potential of 12 perennial, 35 intermittent, and 60 ephemeral stream/creek crossings. Construction of the injection well sites would be similar to the Lower Bound Scenario, though there would be increased potential for contamination from material spills due to four additional wells. Operations of the project would be similar to the Lower Bound Scenario.

Table S-5. Summary of Environmental Impacts of the Mountaineer CCS II Project

No Action	Lower Bound Scenario (A) *2 wells at Mountaineer Plant* *2 wells at Borrow Area*	Upper Bound Scenario (C) *2 wells at Borrow Area* *2 wells at Eastern Sporn Tract* *2 wells at Jordan Tract* *2 wells at Western Sporn Tract*
Wetlands and Floodplains		
No impacts. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no change to wetlands and floodplains.	***Minor adverse impacts.*** No wetlands exist at the CO_2 capture facility or the barge unloading area; however, both areas consist of FEMA-mapped floodplains. However, a nearby wetland area may experience sedimentation during construction of the upgrades to the barge unloading area. Construction of the CO_2 capture facility and the upgrades to the barge unloading area could increase flood elevations and redirect flood flows. Construction of pipeline corridors would disturb 5.36 acres of wetlands; no mapped floodplains would be affected. Construction activities associated with the potential injection well sites could cause sedimentation impacts to wetlands; no mapped floodplains would be affected. Operational maintenance requirements for pipeline corridors could result in permanent vegetation conversions within 2.59 acres of palustrine wetlands. No wetlands or floodplains would be affected during operations of the injection well sites.	***Minor adverse impacts.*** Construction impacts would be similar to the Lower Bound Scenario for the CO_2 capture and the barge unloading area. Construction of pipeline corridors would disturb between 6.52 and 6.73 acres of wetlands (minor impact) and 1.86 acres of mapped floodplains along Western Sporn Route. Construction activities associated with the potential injection well sites could cause sedimentation impacts to wetlands and floodplains at the Western Sporn Tract. Maintenance requirements for pipeline corridors could result in permanent vegetation conversions within 2.70 acres of palustrine wetlands.
Biological Resources		
No impacts. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their current conditions; there would be no changes to biological resources.	***Negligible to moderate adverse impacts.*** Construction of the CO_2 capture facility, would involve the disturbance of 33 acres of disturbed industrial developed open space (i.e., grassy areas), which is of low habitat quality. Construction and grading activities associated with upgrades to the barge unloading area has the potential to cause sedimentation; however, implementation of erosion and sedimentation measures would be employed during construction to reduce the potential for adverse impacts to aquatic species. Construction of the pipeline corridors would involve the disturbance of vegetation and associated wildlife habitat (0 – 12.5 acres of agricultural land, 10.4 – 36.7 acres of forest, and 13.5 – 105.1 acres of grassland and scrub/shrub) and accidental	***Negligible to moderate adverse impacts.*** Potential impacts at the CO_2 capture facility would be the same as for the Lower Bound Scenario. Potential impacts for construction of the pipeline corridors would be the same as for the Lower Bound Scenario except a greater amount of land areas would be affected (up to 32.1 acres of agricultural land, up to 99.5 acres of forest, and up to 248.4 acres of grassland and scrub/shrub). For construction of the injection well sites, 16.4 acres of forest and associated wildlife habitat would be temporarily removed; no aquatic resources are present, thus, no impacts to aquatic species would be expected. Potential impacts for operation of the pipeline corridors would be the same as for the Lower Bound Scenario except a greater

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No Action	Lower Bound Scenario (A) *2 wells at Mountaineer Plant* *2 wells at Borrow Area*	Upper Bound Scenario (C) *2 wells at Borrow Area* *2 wells at Eastern Sporn Tract* *2 wells at Jordan Tract* *2 wells at Western Sporn Tract*
	mortality of wildlife could occur due to collisions with vehicles and equipment. The potential also exists for the introduction and spread of invasive species (minor to moderate impact); habitat fragmentation, which would be minimized through the use of existing ROWs; and adverse impacts to migratory birds. Construction of the injection well sites would cause negligible impacts in terms of disturbances in previously developed land; no aquatic resources are present, thus, no impacts to aquatic species would be expected. The use of temporary piles to stabilize the barges during unloading has the potential to result in localized impacts to aquatic habitat and the potential for adverse impacts to less mobile aquatic species (e.g., mussels). Operation of the pipeline corridors would involve permanent habitat conversions (4.4 acres of forest and 5.5 acres of grassland and scrub/shrub). Impacts could also occur if a pipeline ruptured or leaked CO_2 in the form of elevated CO_2 concentrations for soil invertebrates and plant roots. Operation of the injection well sites would cause elevated pH of the underground sequestration environment, which can affect subsurface microbial communities.	amount of land areas would be affected (up to 22.5 acres of agricultural land, up to 62.4 acres of forest, and up to 160.0 acres of grassland and scrub/shrub). Potential impacts for operation of the injection well sites would be the same as for the Lower Bound Scenario except natural vegetated habitats would be permanently converted (2.1 acres of grassland and scrub/shrub and 5.2 acres of forest).
Cultural Resources		
No impacts. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to cultural resources.	***Negligible adverse impacts.*** DOE has not identified any cultural resources that would be directly impacted. Other historic resources within applicable APEs would not be expected to incur any apparent or measurable impacts as the project would not be expected to alter the setting or other aspects of integrity of these resources. The project would not introduce visual, atmospheric, or audible elements that diminish the integrity of the resource's significant historic features.	***Negligible adverse impacts.*** Potential impacts would be the same as for the Lower Bound Scenario.

Table S-5. Summary of Environmental Impacts of the Mountaineer CCS II Project

No Action	Lower Bound Scenario (A) *2 wells at Mountaineer Plant* *2 wells at Borrow Area*	Upper Bound Scenario (C) *2 wells at Borrow Area* *2 wells at Eastern Sporn Tract* *2 wells at Jordan Tract* *2 wells at Western Sporn Tract*
Land Use and Aesthetics		
No impacts. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to land use.	***Negligible to minor adverse impacts.*** Construction and operation of the project would not conflict with any designated zoning plans, and would be compatible with surrounding land uses. In addition, during construction of the CO_2 capture facility, pipeline corridors, and injection well sites, truck traffic and dust could be contributing factors for potential aesthetic impacts to residences located within 0.5 mile of the site. Operational long-term changes to land use and aesthetic value would occur from the permanent conversion of natural (forests or grasslands) or agricultural land cover to typically revegetated grass in the areas of the pipeline corridors and injection well sites (except for the 0.5 acre operational footprint around each well).	***Negligible to minor adverse impacts.*** Construction and operational impacts would be similar to the lower bound scenario for the CO_2 capture facility, and similar for the pipeline corridors and injection sites, though more land would be impacted due to longer pipeline corridors and four additional injection wells.
Traffic and Transportation		
No impacts. The site and corridors would remain in their existing states. The transportation and traffic would remain unchanged from existing conditions.	***Minor to moderate adverse impacts.*** During peak construction conditions (2014) (moderate impact), the percent increase (from No-Build to Build conditions) in total daily vehicular traffic volumes on State Route 62 would range from 12 to 74 percent; the percent increase in peak one-way hour traffic volumes would range from 62 to 396 percent. LOSs on State Route 62 would temporarily degrade one to three levels; LOSs would range from C to D. Four rail deliveries and up to 30 barge deliveries are expected during construction. The increase would be short-term and would represent a 1-percent increase above baseline volumes. During operations (minor impact), the percent increase (from No-Build to Build conditions) in total daily vehicular traffic volumes on State Route 62 would range from 1 to 5 percent; the percent increase in peak one-way hour traffic volumes would range from 4 to 25 percent. LOSs on State Route 62 would remain similar to baseline conditions (A to C). Assuming the new facility would use	***Minor to moderate adverse impacts.*** During construction (moderate impact), traffic impacts would be slightly higher than the Lower Bound Scenario. During peak construction conditions (2014), the percent increase (from No-Build to Build conditions) in total daily traffic volumes on State Route 62 would range from 13 to 83 percent; the percent increase in peak one-way hour traffic volumes would range from 69 to 441 percent. LOSs on State Route 62 would temporarily degrade one to three levels; LOSs would range from C to D. Potential impacts to rail and barge systems during construction would be the same as for the Lower Bound Scenario. Potential impacts of overall project operations would be the same as for the Lower Bound Scenario.

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No Action	Lower Bound Scenario (A) *2 wells at Mountaineer Plant* *2 wells at Borrow Area*	Upper Bound Scenario (C) *2 wells at Borrow Area* *2 wells at Eastern Sporn Tract* *2 wells at Jordan Tract* *2 wells at Western Sporn Tract*
	rail to transport aqueous ammonia and sulfuric acid (for a total of up to 140 rail shipments per year), this would contribute to approximately 3 additional rail shipments (or 6 additional train pass-bys) in any given week. Compared to the existing rail traffic volume (approximately 8 train pass-bys per day or 56 train pass-bys per week), this additional traffic represents an approximately 11 percent increase in overall rail volume.	
Noise		
No impacts. The site and corridors would remain in their existing states. The noise environment would remain unchanged from existing conditions.	***Negligible to moderate adverse impacts.*** During construction of the CO_2 capture facility, potential increases in noise levels were estimated to be in the range of 8.9 to 15 dBA. Based on one study, predicted noise levels at nearby receptors analyzed near the CO_2 capture facility have the potential to exceed the EPA guideline threshold (L_{eq} of 48.6 dBA), but within or near levels classified by HUD as "acceptable" (L_{eq} of 58.6 dBA). Depending on proximity to any required blasting along the pipeline corridor, some receptors may experience minor to moderate vibration impacts. Noise levels are projected to be between 58.0 and 54.4 dBA for 30 receptors located between 2,000 and 3,000 feet of injection well MT-1. During operation of the CO_2 capture facility, predicted noise levels at some receptors have the potential to exceed the EPA guideline, but within levels classified by HUD as "acceptable" (sound levels of 47.2 to 53.2 dBA). It is not expected that clearly discernable increases in sound levels would occur at any of the receptors. During maintenance, certain activities could temporarily increase sound levels. There are approximately 30 receptors between 2,000 and 3,000 feet of MT-1 that could experience temporary noise impacts during maintenance activities.	***Negligible to moderate adverse impacts.*** Potential impacts at the CO_2 capture facility would be the same as for the Lower Bound Scenario. Predicted noise levels for receptors located 500 feet from the pipeline construction site, without and with horizontal directional drilling, are 64 and 67 dBA, respectively (number of affected receptors per route: BA Route – 0, ES Route 1 – 1, ES Route 2 – 2, ES Route 3 – 1, ES Route 4 – 3, JT Route 1 – 4, JT Route 3 – 5, JT Route 4 – 4, and WS Route – 19). Predicted noise levels for receptors located 1,000 feet from pipeline construction sites, without and with horizontal directional drilling are 58 and 61 dBA, respectively (number of affected receptors per route: BA Route – 0, ES Route 1 – 2, ES Route 2 – 12, ES Route 3 – 5, ES Route 4 – 16, JT Route 1 – 11, JT Route 3 – 15, JT Route 4 – 15, and WS Route – 42). During construction of the injection well sites (moderate impact), sound levels could reach 70.0, 64.0, and 58.0 dBA for receptors located within 500, 1,000, and 2,000 feet of the well construction site, respectively (number of receptors within 2,000 feet or projected sound levels greater than 58.0 dBA: BA-1 – 0; ES-1, ES-2, ES-3 – 12; JT-1 – 3; and WS-1 – 39). If AEP's noise evaluation determines that ambient sound levels at a receptor would experience a change greater than 5 dBA, AEP would evaluate sound mitigation measures to reduce noise levels.

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No Action	Lower Bound Scenario (A) *2 wells at Mountaineer Plant* *2 wells at Borrow Area*	Upper Bound Scenario (C) *2 wells at Borrow Area* *2 wells at Eastern Sporn Tract* *2 wells at Jordan Tract* *2 wells at Western Sporn Tract*
		Potential impacts from noise during the operation of the pipeline corridors would be the same as for the Lower Bound Scenario.
Materials and Waste Management		
No impacts. The site and corridors would remain in their existing states. Conditions related to material use and waste generation in the ROI would remain unchanged.	***Negligible to moderate adverse impacts.*** The project materials stored in the largest quantities would be anhydrous ammonia (80,000 lbs/year) and sulfuric acid (750 to 900 lbs/hour); the chemicals required to operate the proposed project are widely available. AEP would attempt to sell dry ammonium sulfate by-product to local and regional agricultural suppliers. The project has the potential to generate small amounts of hazardous waste and municipal solid waste that would be similar to waste streams currently generated and would be collected and transported offsite for disposal in accordance with applicable regulations. The amounts would not substantially affect the capacities of disposal service.	***Negligible to moderate adverse impacts***. Construction materials and wastes would be essentially the same as the Lower Bound Scenario except an additional quantity of materials and wastes for construction and operations would be generated due to the construction of more wells and additional length of pipeline corridors.
Human Health and Safety		
No impacts. The site and corridors would remain in their existing states. Conditions related to human health and safety would remain unchanged.	***Minor adverse impacts.*** The potential for worker injuries and fatalities would be present during the construction of the CO_2 capture facility, pipeline corridors, and injections well sites. No worker fatalities would be expected. During facility operation, workers could be subject to physical and chemical hazards, which would be typical of those associated with power plant or similar facility operations. The projected number of recordable incidents per year is estimated to be 1.3, with 0.74 being lost time or restricted duty. The potential for catastrophic accidents at the CO_2 capture facility is considered to be unlikely (i.e., the potential to occur between once in 100 years and once in 10,000 years). Potential accidents or destructive acts at the CO_2 capture facility could result in the	***Minor adverse impacts***. Potential impacts related to worker injuries and fatalities would be the same as for the Lower Bound Scenario. The potential for catastrophic accidents or destructive acts at the CO_2 capture facility relating to the accidental release of ammonia would be the same as for the Lower Bound Scenario. Consequences from pipeline and injection well related CO_2 releases would be generally limited to workers or individuals with 50 to 150 feet of the release, and up to 1 individual could experience life-threatening effects, up to 1 individual could experience irreversible adverse effects, and up to 13 individuals could experience transient and reversible effects.

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No Action	Lower Bound Scenario (A) *2 wells at Mountaineer Plant* *2 wells at Borrow Area*	Upper Bound Scenario (C) *2 wells at Borrow Area* *2 wells at Eastern Sporn Tract* *2 wells at Jordan Tract* *2 wells at Western Sporn Tract*
	release of ammonia. Depending upon the worst-case accidental release scenarios of ammonia from the CO_2 capture facility, and depending upon the predominant wind directions, up to 13 individuals could experience life-threatening effects, up to 153 individuals could experience irreversible adverse effects, and up to 2,858 individuals could experience transient and reversible effects. Potential accidents or destructive acts on pipelines and injections wells could result in the release of CO_2 gases and trace compounds (e.g., ammonia). Consequences from pipeline and injection well related CO_2 releases would be generally limited to workers or individuals with 50 to 150 feet of the release, and up to one individual could experience life-threatening effects, up to one individual could experience irreversible adverse effects, and up to one individual could experience transient and reversible effects.	
Utilities		
No impacts. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to utilities.	***Negligible to minor adverse impacts.*** Construction of the CO_2 capture facility would increase potable water demand from the NHWF by 0.5 percent to 16 percent of the current unused capacity and increase sanitary wastewater treatment by the NHSWF by 0.6 percent to 19 percent of the current unused capacity. AEP estimates that the vast majority of sanitary waste needs during construction would be provided by portable restrooms. The drilling of each well would require 50,400 gallons of fresh water over a period of a month; water sources could include existing surface waters, the ash pond, or the Mountaineer Plant. If the Mountaineer Plant ultimately is used as the source, the water requirement would represent a maximum of 4 percent of the NHWF's unused capacity. Operation of the CO_2 capture facility would increase potable water demand from the NHWF by 0.7 percent of the current	***Negligible to minor adverse impacts.*** Potential impacts would be the same as for the Lower Bound Scenario, except if the Mountaineer Plant ultimately is used as the source, the water requirement would represent a maximum of 9 percent of the NHWF's unused capacity.

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No Action	Lower Bound Scenario (A) *2 wells at Mountaineer Plant* *2 wells at Borrow Area*	Upper Bound Scenario (C) *2 wells at Borrow Area* *2 wells at Eastern Sporn Tract* *2 wells at Jordan Tract* *2 wells at Western Sporn Tract*
	unused capacity and increase sanitary wastewater treatment by the NHSWF by 0.9 percent of the current unused capacity.	
Community Services		
No impacts. The area would remain in their existing states. There would be no changes in demands on community services.	***Negligible to minor adverse impacts.*** The work force for construction of the project (25 to 800 peak) is expected to be drawn from the ROI. Therefore, a large influx of construction workers relocating from outside the region is not anticipated. The influx of a smaller proportion of construction workers is not expected to substantially affect the capacities of regional law enforcement, fire protection, emergency response, health care, or school systems. DOE anticipates that a large portion of the 38 operational positions would be filled by workers already residing within the region. However, even if all 38 workers were to relocate to the region with families, they would not substantially affect the capacities of regional law enforcement, fire protection, emergency response, health care, or school systems.	***Negligible to minor adverse impacts.*** Potential impacts would be the same as for the Lower Bound Scenario.
Socioeconomics		
Loss of potential benefit. Construction of the Mountaineer CCS II Project would not occur, and there would be no changes in demographic and socioeconomic conditions within the ROI. Given the status of the economy, employment, and income, the region would lose the potential for economic	***Beneficial impacts.*** Spending and employment for the project would generally result in net beneficial impacts to socioeconomic conditions during construction. The acquisition of land for the project would not require the displacement of population or demolition of housing. A temporary increase in population caused by a slight influx of construction workers from outside the ROI (a very small portion of the 25 to 800 peak construction work force) would not have an adverse impact on population and housing. The demand on the labor force in the ROI during construction of the project would not have an adverse impact on capacity, and the project would not	***Beneficial impacts.*** Potential impacts would be the same as for the Lower Bound Scenario.

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No Action	Lower Bound Scenario (A) *2 wells at Mountaineer Plant* *2 wells at Borrow Area*	Upper Bound Scenario (C) *2 wells at Borrow Area* *2 wells at Eastern Sporn Tract* *2 wells at Jordan Tract* *2 wells at Western Sporn Tract*
stimulus desired by regional development authorities.	adversely affect incomes and the regional economy. The potential influx of as many as 38 workers for project operations would not have a substantial effect on regional population and housing.	
Environmental Justice		
Loss of potential benefit. Construction of the Mountaineer CCS II Project would not occur. There would be no environmental justice impacts related to the project. However, the region would lose the potential for economic stimulus that could benefit low income populations.	***Negligible adverse impacts.*** No disproportionately high and adverse impacts to minority and low-income populations are anticipated during construction or operation of the project.	***Negligible adverse impacts.*** Potential impacts would be the same as for the Lower Bound Scenario.

AEP = American Electric Power Service Corporation; APE = Area of Potential Effects; CAP = chilled ammonia process; CCS = carbon capture and storage; CO_2 = carbon dioxide; CO_2-eq = carbon dioxide equivalent; dBA = A-weighted decibel; DOE = U.S. Department of Energy; EPA = U.S. Environmental Protection Agency; FEMA = Federal Emergency Management Agency; GHG = greenhouse gas; HEL = highly erodible land; HUD = U.S. Department of Housing and Urban Development; lbs= pounds; Leq = equivalent sound level; LOS = level of service; mgd = million gallons per day; NHSWF = New Haven Sanitary Waste Facility; NHWF = New Haven Water Facility; NPDES= National Pollutant Discharge Elimination System; NRHP = National Register of Historic Places; PHEL = potentially highly erodible land; ROI = region of influence; ROW = right of way; tpy = tons per year; UIC = Underground Injection Control

POTENTIAL CUMULATIVE IMPACTS

DOE addressed the impacts of the Mountaineer CCS II Project incrementally when added to the reasonably foreseeable impacts of other significant known or proposed projects within the geographic area in accordance with the cumulative impact requirements of NEPA (40 CFR 1508.7). The projects described in Table S-6 are specifically included in the cumulative impacts analysis.

As a result of the cumulative impacts analysis, DOE concluded that the other potential projects in the ROI of the Mountaineer CCS II Project would have impacts on most resources that would be substantially separated by distance from the potential impacts of the project. Therefore, DOE did not identify potential impacts that would incrementally add to those of the project such that they would cause cumulative impacts significantly greater than the impacts of the Mountaineer CCS II Project and the other projects taken independently.

CONCLUSIONS

As with the development of any large industrial project, the construction and operation of the Mountaineer CCS II Project, including the CO_2 capture facility, associated infrastructure and pipelines, and injection and monitoring wells, would impact the surrounding environment. Analyses indicate the project could have beneficial impacts to regional socioeconomics and to reducing greenhouse gas emissions; the project could have moderate adverse impacts to biological resources, noise levels, traffic conditions, and materials and waste management; and could have negligible to minor adverse impacts on the remaining resource areas in the ROI.

DOE's proposed action would support the CCPI Program in demonstrating advanced coal-based technologies at a commercial scale that capture and geologically sequester CO_2 emissions. The proposed action would satisfy the responsibility Congress imposed on DOE to demonstrate advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the U.S. The CCPI Program selects projects with the best chance of achieving the program's objectives as established by Congress: commercialization of clean coal technologies that advance efficiency, environmental performance, and cost competitiveness well beyond the level of technologies currently in commercial service. DOE believes that accelerated commercial use of these new or improved technologies will help to sustain economic growth, yield environmental benefits, and produce a more stable and secure energy supply.

DOE also recognizes the controversies surrounding the continued dependence on coal by the power industry and the need to address the associated environmental and climate change challenges related to the continued use of coal. However, as the most abundant fossil fuel resource in the U.S., coal will continue to play an important role in the nation's energy supply. The Mountaineer CCS II Project would capture and geologically store up to 1.5 million metric tons per year of the CO_2 that is currently emitted by the Mountaineer Plant to the atmosphere. DOE considers the technological advancement and commercialization of CCS as an important component of maintaining energy supplies while minimizing environmental impacts associated with using fossil fuel resources.

Table S-6. Regional Projects Identified for Consideration in the Cumulative Impacts Analysis

Site	Location	Distance (Miles)	Status	Description
Yellowbush Coal Mine	Meigs County, OH	1.5	Active; Potential Future Expansion	Yellowbush Coal Mine is located in Meigs County, Ohio and operated by Gatling Ohio LLC. In January 2009, the USACE issued a Section 404 permit for the Yellowbush Mine docking facility (Meigs Point Dock) on the Ohio River. Yellowbush mine is on the Ohio Department of Natural Resources Pending Coal Application list (7/31/10).
Green Global, LLC	New Haven, WV	0	Ongoing; Permit to Construct (R13-2845) Issued from WVDEP - July 2010	Mining and quarrying of non-metallic minerals. Green Global, LLC constructed and operates a portable crushing and screening plant using water-based gravity separation to recover manganese slag.
AEP Mountaineer CCS Geologic Characterization Study	New Haven, WV	0	Ongoing; Scheduled to be completed by June 2011	As part of the characterization studies, AEP plans to initially install geologic characterization wells at the Borrow Area and the Jordan Tract in order to collect data of both caprock and target injection formations. If sufficient data is not obtained from these wells to determine injection well placement and design parameters, then additional characterization wells could be installed at one or more of the remaining injection well properties.
AEP Mountaineer CCS PVF	New Haven, WV	0	Ongoing; To be decommissioned before project is brought online	Ongoing small-scale PVF at the existing Mountaineer Plant. With implementation of the project, the PVF would be decommissioned with long-term monitoring conducted as part of the overall project and in accordance with the WVDEP UIC permit.
Broad Run Coal Mine	New Haven, WV	0	Potential Closure	Broad Run Coal Mine continues to remain inactive after April 2010 layoffs, and may be closed in the future. Current operations include at least one mobile mining unit. The underground mine is operated by Big River Mining.
American Municipal Power	Letart Falls (Meigs County), OH	5	Potential Future	Proposed 600 MW natural gas power plant announced on August 19, 2010. No natural gas pipelines in the area. Same location as cancelled 1,000 MW coal power plant. Proposed to be operational by 2014.
Byrd Dam	Gallipolis (Gallia County), OH	18	Potential Future	Proposed 48 MW hydroelectric power plant. Federal Energy Regulatory Commission license application may be submitted in 2010. The application approval process can take 2 years or more.
Mason County Airport Runway	Mason County, WV	9	Ongoing Construction	$2 million Federal Aviation Administration grant for redevelopment of runway. The Mason County Development Authority identified this project as currently underway.
Armstrong Mineral Wool Plant	Jackson County, WV	15	Ongoing Construction	Armstrong World Industries is constructing an environmentally friendly mineral wool plant on 35 acres in the Jackson County Industrial Center in Millwood, WV.

Table S-6. Regional Projects Identified for Consideration in the Cumulative Impacts Analysis

Site	Location	Distance (Miles)	Status	Description
U.S. Route 35	Putnam County, WV	30	Ongoing Construction	Approximately 14 miles of U.S. Route 35 remains to be constructed. When complete, this road will extend 35 miles from Crooked Creek (Putnam County) to Point Pleasant (Mason County).
Kenna Ridge Business Park	Jackson County, WV	21	Ongoing Construction	New business park on 64 acres in Kenna, WV.
Proposed Sewer Improvements	Leon and New Haven, WV; Gallia County, OH	0-60	Ongoing Construction / Potential Future	Various local sewer improvement projects within the ROI. Potential cumulative beneficial effect to groundwater and surface water.
Proposed Road Improvements	Gallia County, OH; Mason County, WV	15-20	Ongoing Construction / Planned	Various local West Virginia Department of Transportation and Ohio Department of Transportation road improvement projects, including widening of existing roads. Potential cumulative beneficial effect to transportation and traffic.

CCS = carbon capture and storage; LLC = Limited Liability Company; MW = megawatt; OH = Ohio; PVF = product validation facility; ROI = region of influence; UIC = Underground Injection Control; USACE = U.S. Army Corps of Engineers; WV = West Virginia; WVDEP = West Virginia Department of Environmental Protection