

Evaluation of Three Sites for the Global Nuclear Energy Partnership

T.E. Magette
EnergySolutions, LLC
6100 Chevy Chase Drive, Laurel, MD 20707

S. Turner
EnergySolutions, LLC
2345 Stevens Drive, Suite #240, Richland, WA 99354

R. Smalley
EnergySolutions, LLC
2260 Woodside Executive Court, Suite C-A9, Aiken, SC 29803

D.R. Johnson
EnergySolutions, LLC
1920 E. 17th Street, Suite 200, Idaho Falls, ID 83404

ABSTRACT

The Global Nuclear Energy Partnership (GNEP) is an initiative managed by the United States Department of Energy (DOE) to work with other nations to develop and deploy advanced nuclear recycling and reactor technologies. The purpose of this initiative is to help provide reliable, emission-free energy with less waste burden of older technologies and without making available separated plutonium that could be used by rogue states or terrorists for nuclear weapons.

In November 2006, DOE awarded multiple contracts to EnergySolutions to prepare separate siting studies to determine the possibility of hosting a Consolidated Fuel Treatment Center (CFTC) and/or an Advanced Burner Reactor (ABR) at three proposed sites: The Atomic City Site in Bingham County, Idaho; the Roswell Site in Chaves County, New Mexico, and the Barnwell Site in Barnwell County, South Carolina. EnergySolutions prepared Detailed Siting Reports (DSRs) that describe the overall character of each site and its local environment in sufficient detail to understand how it could be affected by the proposed GNEP facilities.

A comprehensive review of the potentially affected environment showed that there were no foreseeable environmental impacts or regulatory prohibitions that would prevent each of the sites from serving as an effective host for GNEP. Each site was found to be of sufficient size to locate either or both of the planned GNEP Demonstration Facilities and to have sufficient room to provide suitably sized feed buffer and interim waste product storage capability. All three sites had water rights and access to a reliable source of water to support site operations. In each case, there is strong local and state interest in and support for siting the proposed GNEP facilities.

INTRODUCTION AND BACKGROUND

The Global Nuclear Energy Partnership (GNEP) is an initiative managed by the United States Department of Energy (DOE) to work with other nations to develop and deploy advanced nuclear recycling and reactor technologies. The purpose of this initiative is to help provide reliable, emission-free energy with

less waste burden of older technologies and without making available separated plutonium that could be used by rogue states or terrorists for nuclear weapons.

The GNEP seeks to meet the growing demands for electricity, both nationally and globally, by developing a world-wide consensus on expanding the use of economical carbon-free nuclear energy. A plentiful and reliable supply of base-load energy is a cornerstone of economic growth and prosperity. There are three key facilities in the development and implementation of GNEP:

1. An advanced fuel cycle facility designed and directed by the United States National Laboratories.
2. A Consolidated Fuel Treatment Center (CFTC) capable of separating the usable components in Light Water Reactor (LWR) spent fuel from the waste products.
3. An Advanced Burner Reactor (ABR) capable of producing electricity by consuming the usable products from spent fuel.

In November 2006, DOE awarded multiple contracts to *EnergySolutions* to prepare separate siting studies to determine the suitability of three proposed sites for hosting a CFTC and/or an ABR: the Atomic City Site in Bingham County, Idaho; the Roswell Site in Chaves County in southeastern New Mexico, and the Barnwell Site in Barnwell County, South Carolina. *EnergySolutions* prepared Detailed Siting Reports (DSRs) that describe the overall character of each site and its local environment in sufficient detail to understand how it could be affected by the GNEP facilities. The DSRs were prepared in a scope and manner that would support inclusion in a *National Environmental Policy Act* (NEPA) analysis.

COMMUNITY OUTREACH

In addition to the preparation of the DSRs, *EnergySolutions* and its partners conducted community outreach activities to inform both state and local stakeholders of the purpose of the GNEP siting studies and to collect public comments.

In parallel, DOE held public scoping meetings relating to the preparation of the Programmatic Environmental Impact Statement (PEIS) at each of the geographic locations and in some instances nearby locations. Comments made at each of the PEIS meetings were taken into consideration when planning for each of the respective community outreach activities in Idaho, New Mexico and South Carolina.

Each community outreach meeting comprised of an initial “Open House” period followed by a presentation and then Question and Answer (Q&A)/comment session. The purpose of the Open House session was to provide additional information and provide the opportunity for members of the public to ask questions or give comments out of the spotlight of the meetings. Following the formal presentations, members of the *EnergySolutions* team remained to take questions from interested members of the public who sought additional information.

Items addressed at every community meeting held by *EnergySolutions* included the safe transport of nuclear materials, its temporary storage at the facility, the processes and wastes produced, the use of natural resources, the potential environmental impact and the socioeconomic effects on the regions.

DETAILED SITING REPORT

The DSR prepared for each location can be broadly described as a summary of the affected environment. Each DSR describes the environmental, physical, biological, and socioeconomic factors that could be affected by development and operation of the GNEP facilities. In addition, the suitability for siting the

CFTC and the ABR facilities were addressed by addressing resources needed to support these facilities. Data collected for the DSR from each site is included in the PEIS that DOE is preparing for the GNEP program.

Each DSR was to include data on 16 separate criteria identified by DOE. Each of these criteria is described below:

Maps of site location: The proposed construction zone for one or more facilities; current zoning classification; sites for any planned buildings and structures (both temporary and permanent); and transportation routes adjacent to the site (including improved roads), current zoning classification; utility rights-of-way; rivers; flood plains, other bodies of water; wetlands; trust lands; historic sites; archaeological sites; Native American lands; military reservations; and designated Federal, State, and local parks and natural areas.

Aquatic and riparian ecological communities

- a. Describe the fish and shellfish community in the source water body.
- b. Describe the riparian ecological community in the source water body.

Water resources that may be subject to use conflicts or quality degradation.

Critical and important terrestrial (plant and animal) habitats that may be disturbed by the proposed facilities. Critical habitats are described in 40 Code of Federal Regulation (CFR) 17.95 (fish and wildlife) and 17.96 (plants).

Threatened or endangered and special concern species identified on the site or within 10 km of the site.

Regional demography, based on the most current U.S. Census data: population by city, town, and county for those jurisdictions lying fully or partially within 80 km (50 mi) of the proposed site.

Historical, archaeological, and cultural resources: Identify any onsite or offsite historical, archaeological, and cultural properties that could be affected by the proposed facilities.

Future Projects: Describe and identify any known and reasonably foreseeable Federal and non-Federal projects and other actions in the vicinity of the site that may contribute to the cumulative environmental impacts of the proposed GNEP facilities.

Geology/Seismology: Describe proposed site locations, including geologic and seismic characteristics, surface faulting, ground motion (including peak ground acceleration and a chance of exceeding this peak), and foundation conditions.

Weather/Climatology: Describe the site weather and climatological conditions.

Hydrology/flooding: Describe the maximum probable flood, the flood source(s), and any current or planned activities that could reasonably be expected to affect the maximum probable flood.

Regulatory and Permitting: Identify local, regional, state and national regulatory and environmental permits required for this facility, including legislative or regulatory prohibitions that might prevent siting such a facility.

Construction Costs: Relative cost of heavy construction projects in the area, as compared to the RS Means U.S. 30-city average.

Storage Capability: Identify the sites storage capability for the volume of nuclear materials associated with commercial scale operations.

Other Facilities. Potential hazardous facilities and activities within 8 kilometers (5 miles) of a proposed site, and major airports within 16 kilometers (10 miles) of a proposed site should be identified.

CERCLA. In addition to the above, indicate whether or not the proposed site or any portion thereof, is on the National Priorities List or is included in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) database.

Overall Conclusion

A comprehensive review of the potentially affected environment showed that there were no foreseeable environmental impacts or regulatory prohibitions that would prevent each of the EnergySolutions proposed sites from serving as an effective host for GNEP. Each site was found to be of sufficient size to locate either or both of the planned GNEP Demonstration Facilities and to have sufficient room to provide suitably sized feed buffer and interim waste product storage capability. All three sites have existing water rights and access to a reliable source of water to support site operations. In each case, there is strong local and state interest in and support for siting the proposed GNEP facilities.

ATOMIC CITY, IDAHO

The proposed Atomic City site is privately owned and located in Bingham County; it consists of undeveloped property surrounded by undeveloped ranch land to the east, south and west and the Idaho National Laboratory (INL) site boundary to the north. The Atomic City site (Fig. 1.) contains two tracts totaling approximately 1,340 hectares (3,310 acres) including approximately 365 hectares (900 contiguous acres), which is well over the 202 hectares (500 contiguous acres) required by the DOE for both facilities. There is sufficient room to provide suitably sized feed buffer and interim waste product storage capability. The site has water rights and access to a reliable source of water from the Snake River Plain Aquifer. There is strong local and state interest in and support for siting the proposed GNEP facilities; a recent survey by Boise State University found that Idahoans approve of both locating nuclear research and a research reactor in their state.



Fig. 1. View of the Atomic City site.

Section 1, Maps — The proposed Atomic City site covers approximately 1,340 hectares (3310 acres) located in the arid high desert ranchland of east-central Idaho, in Bingham County, 74.01 kilometers (km) (46 miles) west of Idaho Falls, 51.49 km (32 miles) east of Arco, and 49.88 km (31 miles) northwest of Blackfoot. The Atomic City site is less than 3.22 km (2 miles) southwest of U.S. Highway 26. Two historical sites (a segment of the Oregon Trail and the old Salmon River Railroad – now the Union Pacific Railroad) cross the southeastern corner of the Atomic City site.

Section 2, Aquatic and Riparian Ecological Communities — The Atomic City site is situated in a remote location that has no fish or shellfish present due to a lack of surface water within or adjacent to the proposed site.

Section 3, Water Resources — The Atomic City site is located in the eastern Snake River Plain (ESRP) and lies above the Snake River Plain Aquifer, which would provide the only practical source of water for the proposed GNEP facilities. The Snake River Plain Aquifer encompasses an area of approximately 27,972 square km (10,800 square miles) bounded to the northwest and southeast by the Basin and Range Province and to the northeast by the Yellowstone Plateau. The aquifer consists primarily of a complex sequence of individual basalt flows, and the capacity of the aquifer is considered relatively high due to the fractured nature of the basalt.

Section 4, Critical and Important Terrestrial Habitats — The Atomic City site is at a remote location where human activities have the potential to disturb plant or wildlife habitat at or near the proposed site. Review of the critical and important terrestrial habitat surrounding the Atomic City site led to the conclusion that there is no designated critical habitat at the Atomic City site.

Section 5, Threatened or Endangered and Special Concern Species — Literature and field surveys were conducted to identify threatened, endangered, and species of special concern or other suitable habitat that occur within or near the Atomic City site. The following conclusions were reached based on these surveys:

- No federally listed species are present on the Atomic City site due to the absence of suitable habitat.
- The following are the two special concern species that occur at the Atomic City site:

- Sage grouse (*Centrocercus urophasianus*). The sagebrush habitat on the project area is limited to the southwest corner and the northern and western edges. Sage grouse were seen during the field survey, but the sagebrush is very fragmented and limited.
- Ferruginous hawk (*Buteo regalis*), Prairie falcon (*Falco mexicanus*), and Townsend's bigeared bat (*Plecotus townsendii*). These species may use the area for foraging, but nesting and roosting habitat is not available on site. Ferruginous hawks were seen during the field survey hunting in the vicinity of the Atomic City site.
- Additional surveys need to occur to verify the presence of the following species of concern on the Atomic City site: Western burrowing owl (*Athene cunicularia*), and the pygmy rabbit (*Brachylagus idahoensis* – shown in Fig. 2. below).



Fig. 2. The pygmy rabbit (*Brachylagus idahoensis*).

Section 6, Regional Demography — The Atomic City site is adjacent to seven populated counties within an 80-kilometer (50-mile) radius.

Section 7, Historical, Archaeological, and Cultural Resources —

- There are no off-site historical, archaeological, or cultural resources that would be affected by the proposed GNEP facilities.
- A segment of the Salmon River Railroad exists within the Atomic City site boundary.

Section 8, Future Projects —

- The INL Comprehensive Facility and Land Use Plan projects the land use of INL site facility for the next 100 years. The DOE is currently scheduled to maintain ownership for the INL lands and facilities until the year 2095 with no new plans of development at this time.
- Bingham County covers the Atomic City site to the south of the INL facility. The Bingham County Board of Commissioners has an established comprehensive plan that does not contain any projected changes to the area surrounding Atomic City for the next 20 years.

Section 9, Geology/Seismology — The Atomic City site is located on the west-central part of the ESRP, a large downwarped, basalt-filled structure that is the principal geomorphic feature in southeastern Idaho.

- A total of 35 capable faults are located within 321.8 km (200 miles) of the site. No capable faults are located within a 32.18 km (20-mile) radius, nine faults are located within 32.18 to 80 km (20

to 50 miles), 19 faults are located within 80 to 160 km (50 to 100 miles), six faults within 160 km to 241 km (100 to 150 miles), and one fault within 241 km to 321 km (150 to 200 miles).

- No capable faults are located within a 8 kilometer (five-mile) radius of the Atomic City site. The Howe section of the Lemhi fault is closest at 41 km (25.5 miles) to the north. The next closest structure is the Arco section of the Lost River fault at 45 km (28 miles) to the northwest. These faults are outside the ESRP.
- No faults have been identified in association with tension cracks and eruptive fissures within the late Pleistocene-Holocene lava fields.
- Compressive strength of the basalt ranges from approximately 211 to 1,050 kg/cm² (3,000 to 15,500 pounds per square inch).

Section 10, Weather/Climatology — The Atomic City site is at a remote location that has no site-specific meteorological data but climatological data at nine nearby National Weather Service (NWS) stations were reviewed and summarized. This information represents the best available data to support analysis of potential environmental impact of constructing and operating the proposed GNEP facilities. The following observations are based on a review of the weather and climatological conditions surrounding the Atomic City site over the most recent 30 years (1971-2000):

- Local climate is continental and semi-arid.
- Normal daily average temperature ranges from -8.8°C (16.2°F) in January to 20.6°C (69.2°F) in July.
- Normal monthly precipitation ranges from 12.44 millimeters (mm) (0.49 inch) in January to 41.4 mm (1.63 inches) in May.
- Normal monthly wind speed ranges from 15.5 km (9.0 miles) per hour in August to 19 km (11.8 miles) per hour in April.
- Average annual temperature range is -2.8 to 13.9°C (26.8 to 57.1°F).
- Average annual precipitation (as rainfall equivalent) is 224 mm (8.82 inches) per year.
- Average annual wind speed is 16.25 km (10.1 miles) per hour. Average annual prevailing wind direction is southwesterly (i.e. direction reported as 240°).
- Annual tornado probability within 2,590 square km (1,000 square miles) of the Atomic City site is 0.08 tornadoes per year.
- Idaho has no instances of hurricanes.

Section 11, Hydrology/Flooding —The Atomic City site is at a location that is remote from streams and rivers that could be sources of flooding, and the site is far from any identified flood plains.

Section 12, Regulatory and Permitting —

- No legislative or regulatory prohibitions that might prevent siting GNEP facilities at Atomic City were identified, and no processes that contained requirements capable of barring such facilities were found.
- The body of data developed uniformly indicates that needed permits and approvals will be obtainable.

Section 13, Construction Costs — Relative costs for all elements of Heavy Construction in the Atomic City area were obtained from the commercially available RS Means CostWorks 2007© database generated by Reed Construction Data. The weighted average cost factor for all elements of materials and installation in the Eastern Idaho / Pocatello area is **0.902**, indicating that this area experiences significantly lower construction costs than the 30-city average.

Section 14, Storage Capability —

- The site is 1,340 hectares (3,310 acres) and exceeds the minimum DOE size requirements for locating both the CFTC facility and the ABR facility.
- There is sufficient room to provide suitably-sized construction zones, develop adequate feed buffer and interim waste product storage capability, and site supporting storage and ancillary facilities.

Section 15, Other Facilities — There are facilities located on the INL that involve potentially hazardous materials located within 8 km (5 miles) of the Atomic City site.

- The Federal Aviation Administration (FAA) Test Facility B-27-606 and a portion of Waste Area Group (WAG) 5, the Auxiliary Reactor Area (ARA). Remediation of these sites has been completed; therefore, no hazardous constituents remain.
- Another source of hazardous materials in the area is the result of the U.S. Navy performing practice firing within the INL boundary from 1943 to 1948, but trajectories did not fall within the 8 km (5-mile) radius of the Atomic City site. There also is no record of any stray ordnance being discovered within this radius.
- There are no major airports within 16 km (10 miles) of the Atomic City site. The nearest major airport is in Idaho Falls, approximately 56 km (35 miles) to the east.

Section 16, National Priorities List /CERCLIS — A search of EPA's databases shows:

- No part of the Atomic City site appears or has ever appeared on the NPL.
- No part of the Atomic City site has appeared or has ever appeared in the CERCLIS database.

Summary

In summary, the DSR demonstrates that the Atomic City site is suitable for consideration and evaluation in the PEIS for location of the proposed GNEP fuel treatment and reactor facilities. The Atomic City site is a Greenfield site, with no significant nearby hazardous facilities, making it easily adaptable to the needs of the GNEP facilities and their infrastructure. There is nearby highway and rail access and the weighted costs of heavy construction in the region are only 90 percent of the 30-city average.

ROSWELL, NEW MEXICO

The Roswell site (Fig. 3), which is privately owned by Gandy Marley, consists of 372.6 hectares (920-acres) located in Chaves County in southeastern New Mexico. The site is currently undeveloped and is surrounded by undeveloped rangeland. The site is comprised of two contiguous parcels. The western 194.4 hectares (480-acre) parcel was previously zoned by Chaves County for industrial use by the Triassic Park Hazardous Waste Disposal Facility (HWDF). The Triassic Park HWDF permit was issued by the New Mexico Environmental Department (NMED) in March 2002. It is anticipated that the adjacent 178.2 hectares (440-acre) parcel can be zoned for industrial use as well. The Roswell site is of sufficient size to locate either or both the CFTC and the ABR. There is sufficient room to provide suitably sized feed buffer and interim waste product storage capability. The owners of this site have water rights and access to a reliable source of water from the Ogallala Aquifer.

Section 1, Maps – The Roswell site is located in the arid high desert rangeland of east-central New Mexico's Chaves County, approximately 64 km (40 miles) east of Roswell. The Roswell site is surrounded by undeveloped, private rangeland to the north, east and south and land managed by the United States Bureau of Land Management to the west.

Section 2, Aquatic and Riparian Ecological Communities – The Roswell site is situated in a remote location that has no fish or shellfish present due to a lack of surface water within or adjacent to the proposed site.



Fig. 3. View of the Roswell site.

Section 3, Water Resources – The Roswell site is situated in the Roswell Artesian Underground Water Basin (UWB), near its boundary with the Lea County UWB. The Roswell UWB is an administrative unit that includes several aquifers, including an alluvial aquifer about 56 km (35 miles) west of the site along the Pecos River, the Roswell Artesian Aquifer, local perched ground water bodies near the site, and ground water in formations beneath the site. Formations beneath the site yield little ground water and water quality is considered poor. The western boundary of the Ogallala Aquifer coincides with Mescalero Ridge about 1.6 km (1 mile) east of the site. The Ogallala is the only aquifer within 16 km (10 miles) that is known to yield large amounts of ground water, and hence it is a likely source of water for GNEP facilities. The closest major body of perennial surface water is the Pecos River, located approximately 48 km (30 miles) west of the site at its nearest point. Ephemeral surface water at the site is derived exclusively from local precipitation and snowmelt.

Section 4, Critical and Important Terrestrial (Plant and Animal) Habitats – The Roswell site is at a remote location where human activities have the potential to disturb plant or wildlife habitat at or near the proposed site. Review of the critical and important terrestrial habitat surrounding the Roswell site led to the conclusions that there is no critical habitat at the site.

Section 5, Threatened or Endangered and Special Concern Species – Literature and field surveys were conducted to identify threatened, endangered, and species of special concern or other suitable habitat that occur within or near the Roswell site. The following conclusions were reached based on these surveys:

- Of the thirty-six (36) species identified as occurring within Chaves County, suitable or marginally suitable habitat is present within or adjacent to the Roswell site for only eight (8) of these.
- Of these eight species, the only two species that have been documented within or adjacent to the Roswell site are the sand dune lizard and lesser prairie chicken.
- There is only marginal habitat for the other six species of concern (northern aplomondo falcon, baird's sparrow, western burrowing owl, black-tailed prairie dog, swift fox and Townsend big-eared bat).

Section 6, Regional Demography – The Roswell site is located in the sparsely populated arid high desert ranchland of eastern New Mexico.

Section 7, Historical, Archaeological, and Cultural Resources – A review of the most current information from existing files and field surveys of the Roswell site indicates that there are no off-site historical, archaeological, or cultural resources that would be affected by the proposed GNEP facilities.

Section 8, Future Projects – There are no cities or towns within 9.6 km (6 miles) of the site and consequently there are no plans for commercial, residential, or industrial projects. There is one industrial facility approximately 1.6 km (1-mile) north of the site, but there are no current plans for expansion or additions to the facility.

Section 9, Geology/Seismology – The Roswell site is located approximately 64 km (40 miles) east of Roswell, New Mexico in the Pecos River Valley Section of the Great Plains Physiographic Province. Terrain within this section ranges from low-lying plains to rugged canyons. There are no surface faults within or adjacent to the project site. Furthermore, no faults were identified in the underlying Triassic sediments during the most recent drilling study. There are no mapped faults located within 80 km (50 miles) of the site in any direction.

Section 10, Weather/Climatology – The Roswell site is at a remote location that has no site-specific meteorological data but climatological data at six nearby National Weather Service stations was reviewed and summarized.

- The site location has a mild, arid to semiarid, continental climate. The normal daily average temperature ranges from 3.3° C (38.0° F) in January to 27.1 ° C (80.8° F) in July; the normal precipitation ranges from 8.6 mm (0.34 inch) in January to 77.7 mm (3.06 inches) in July; and the normal wind speed ranges from 11.1 km (6.9 mile) per hour in December/January to 15.8 km (9.8 mile) per hour in April.
- Occasional extremely low temperature -30.5° C (approximately -23° F) in the winter, and high wind speed in the summer in Roswell (over 117 km (73 mile) per hour, 64 km (40 miles) west of the Roswell site), may limit construction activities at the site. Effective work planning and scheduling can mitigate the impact of those extreme weather conditions.
- New Mexico, in general, has no instances of hurricanes; the site is inland and does not border on any major coastline. Any hurricane moving over land will quickly diminish and downgrade to heavy rains.
- The likelihood of a tornado occurring within any 2,590 square km (1,000 square mile) area in New Mexico is very small. New Mexico has on average nine tornadoes per year.

Section 11, Hydrology/Flooding – The Roswell site is characterized as a sloping plain with low relief hummocky wind-blown deposits, sand ridges, and dunes. The Mescalero Ridge escarpment is one of the most prominent topographic features in the area and has approximately 321.8 km (200 feet) of relief. The site is isolated from streams and rivers that could be sources of flooding, and the site is far from identified flood plains.

Section 12, Regulatory and Permitting – National, state and regional regulatory and environmental requirements were reviewed and analyzed to identify permits, approvals, and procedures that could impose requirements on GNEP facilities developed and operated at the Roswell site, and to pinpoint any requirements that might impose barriers to siting such facilities.

Section 13, Construction Costs – Relative costs for all elements of Heavy Construction in the Roswell area were obtained from the commercially available RS Means CostWorks 2007 database generated by Reed Construction Data. The weighted average Heavy Construction index for the Roswell site is 0.891, indicating that this area experiences significantly lower construction costs than the national average.

Section 14, Storage Capability – The Roswell site is currently undeveloped with no existing facilities.

- The site is 372.6 hectares (920 acres) in size and exceeds the minimum DOE size requirements for locating both the CFTC facility and the ABR facility.
- In addition, Mr. Robert W. Marley, a principle in Gandy Marley, Inc. owns 4,750 hectares (10,000 acres) contiguous to the site. This land or portions thereof could be made available as necessary to support potential future site expansion and storage capability.

Section 15, Other Facilities – There are two existing facilities that involve potentially hazardous materials located within 8 km (5 miles) of the Roswell site. These are a surface waste management facility, owned by Gandy Marley and permitted by the New Mexico Oil Conservation division, which accepts non-hazardous oil field waste for disposal in landfill cells.

Section 16, National Priorities List /CERCLIS – A search of EPA’s databases shows:

- No part of the Roswell site appears or has ever appeared on the NPL.
- No part of the Roswell site appears or has ever appeared in CERCLIS.

Summary

The DSR demonstrates that the Roswell site is suitable for consideration and evaluation in the PEIS for location of the proposed GNEP fuel treatment and reactor facilities.

- There are no site groundwater or surface water issues. The site owners have existing water rights from the Ogallala Aquifer source to the east of the site and additional rights from existing state allocations can be purchased if required.
- The site has no designated critical habitat within its boundaries. While it does have habitat suitable for two species of concern, the sand dune lizard and lesser prairie chicken, there is an abundance of similar habitats to the west of the site.
- There are a limited but typical number of historical, archaeological or cultural resources associated with southeastern New Mexico located onsite. However, these occurrences can be isolated to prevent the potential disturbance by construction and operation.
- The site is located in an area of stable but relatively low population with favorable climatological and geological, hydrological and seismic conditions.
- The site is a Greenfield site, with no significant nearby hazardous facilities, making it easily adaptable to the needs of the GNEP facilities and their infrastructure. There is nearby highway and rail access and the weighted costs of heavy construction in the region are only 89 percent of the national average.

BARNWELL, SOUTH CAROLINA

The South Carolina Advanced Technology Park (ATP) in Barnwell, South Carolina (Fig. 4) meets all requirements specified by DOE for a locale for the development of the GNEP facilities. It is located in the Central Savannah River Area, a region with a long established record of successful development of nuclear facilities. The ATP is located in a predominantly rural area in the Upland Mixed Pineland/Hardwoods habitat zone characterized by either second growth timber, partially or completely cleared, with limited wetlands or riparian habitat. The proposed site is the location of the Allied General Nuclear Services facility, a nuclear fuel reprocessing plant, that was licensed for construction,

constructed, and successfully completed early start-up testing in the 1970s. Because of this, the ATP already contains the infrastructure (electricity, railroads, and highways) at or near the levels required for GNEP.



Fig. 4. Entrance to the South Carolina Advanced Technology Park.

Section 1, Maps – Site and Surroundings – The Barnwell site is located in the South Carolina ATP immediately adjacent to the DOE owned Savannah River Site (SRS).

Section 2, Aquatic and Riparian Ecological Communities – Sixty-five species of fish are known to occur in the Savannah River. Twelve of these species and two species groups (catfishes and bream) are sought as game fish and/or commercial species in the region. The other fish species include one federally endangered species (short nose sturgeon), several anadromous species, and various minnow, suckers, and other smaller forage species. No recent data on the shellfish community in the Savannah River in the vicinity of the Barnwell Site is available.

Par Pond, a warm water lacustrine habitat, supports at least thirty fish species. The fish community is dominated by common species including largemouth bass, bluegill, lake chubsucker, and brook silversides. Four species of shellfish are known from Par Pond. Three of the shellfish species in Par Pond are common in South Carolina but the paper pondshell is considered a species of Special Concern in the state.

Section 3, Water Resources – Abundant groundwater resources exist at the Barnwell Site in over 305 meters (1,000 feet) of saturated Cretaceous and Tertiary sediments within four distinct aquifers. The confined Cretaceous aquifers are capable of sustained yields of over 7,570 liters (l) (2,000 gallons) per minute to production wells.

Section 4, Critical and Important Terrestrial Habitats – The USFWS confirmed that there are no federally designated or proposed critical habitats, as defined in 50 CFR 17.95 (fish and wildlife) and 50 CFR 17.96 (plants), in Barnwell County.

The plant and wildlife species utilizing Barnwell Site habitats are common in the region and unlikely to be those protected by federal or state threatened and endangered species regulations. Historical harvesting of the pine plantations has provided an economic resource. The GNEP facilities may reduce the amount of land managed for these purposes; however, it appears that some tracts of existing pine plantation coincide with the proposed exclusion zone, and will remain viable for harvesting.

Section 5, Threatened, Endangered and Special Concern Species – The GNEP project would not affect known populations of federally- or state-listed threatened or endangered species, species of concern, or proposed/candidate species or their habitats.

- Based on consultation with South Carolina Department of Natural Resources and United States Fish and Wildlife Service and review of available data sources, the American alligator (*Alligator mississippiensis*) is the only federally- or state-listed threatened or endangered species known to occur at the Barnwell Site.
- No federally- or state-listed species of concern are known to occur at the Barnwell Site.
- Wetlands, pine forests, and early successional habitats at the Barnwell Site could provide habitat for federally- and state-listed species of concern that are known to occur in the region.
- No species that are proposed for federal listing occur in South Carolina.
- Four species that are candidates for federal listing occur in South Carolina; however, none of these species are known to occur in Barnwell County.

Section 6, Regional Demography – The proposed Barnwell Site is located near Snelling (Barnwell County), South Carolina in the southwestern part of the state. The area surrounding the Barnwell Site is rural.

Section 7, Historical, Archaeological and Cultural Resources – There are 1,200 archaeological sites within 10 kilometers of the proposed Barnwell Site and no aboveground historic sites within the same distance. In addition, there are no tribally owned lands or water rights within 80 kilometers of the proposed Barnwell Site. Most of the unsurveyed 243 hectares (600 acres) of the proposed Barnwell Site possess a low potential to contain archaeological sites.

Section 8, Future Projects – Federal projects associated with the SRS, private sector industrial developments/expansions in Barnwell County and the Vogtle Nuclear Power Plant were identified due to the potential for cumulative impacts to the Savannah River as a result of these proposed projects. However, no cumulative impact of concern was identified from the projects outlined in the DSR.

Section 9, Geology/Seismology – The Barnwell Site is located within the Upper Coastal Plain Physiographic Province. In general, the geology of the Barnwell Site and immediate vicinity is comprised of quartz sands, calcareous sediments, clays, and conglomerates of approximately 305 meters (1000 feet) in thickness overlying Paleozoic igneous and metamorphic rock and Triassic sediments of the Dunbarton Basin.

- Faults present in the Barnwell Site vicinity have been extensively studied and do not reach the surface.
- Barnwell Site testing indicates the strata underlying the Barnwell Site are acceptable for the construction of critical facilities with the appropriate site/design studies as similar to those studies at SRS.
- Because these zones tend to be non-continuous, design and engineering for any future critical facility would include a phased, detailed assessment of subsurface properties and a detailed static/dynamic soil structure interaction analysis.

Section 10, Weather/Climatology – The temperate climate of central South Carolina is characterized by hot, humid summers with frequent afternoon thunderstorms and mild winters during which snow and ice are rare.

- During the past 5 years no tornadoes of intensity F2 or higher have occurred within a 2,590 square km (1,000 square mile) area surrounding the Barnwell Site.
- Since 1950, nine named hurricanes have reached landfall, four of them within 160 km (100 miles) of the Barnwell Site.
- Severe weather events such as tornadoes and hurricanes are thus a rare occurrence in the vicinity of the Barnwell Site.
- The Barnwell Site is not in a non-attainment area for any criteria pollutants.

Section 11, Hydrology/Flooding – The proposed Barnwell Site does not experience inundation or hydrostatic loading, dynamic forces, or erosion and sedimentation due to any flood-related hazards.

Section 12, Regulatory and Permitting – The Barnwell Site has already demonstrated to the Nuclear Regulatory Commission (NRC) that it is an acceptable site for locating a commercial fuel reprocessing facility. No legislative or regulatory prohibitions that might prevent siting GNEP facilities at the Barnwell Site were identified.

Section 13, Construction Costs – Relative costs for all elements of Heavy Construction in the Central Savannah River Area, where the proposed Barnwell site is located, were obtained from the commercially available RS Means CostWorks 2007 database generated by Reed Construction Data. The weighted average Heavy Construction index for the Barnwell site is 0.856, indicating that this area experiences significantly lower construction costs than the national average.

Section 14, Storage Capability – The Barnwell Site has existing storage facilities, previously existing facilities that have been dismantled, and land area that is available for development of additional storage capacity. The history of design and construction of storage facilities of the type needed for GNEP demonstrates the suitability of the Barnwell Site to meet applicable facility standards and the land available demonstrates the capacity to expand as needed. The portion of the Barnwell Site proposed for development, as well as the total 392 hectares (970-acre) Barnwell Site, each exceeds the minimum size requirements for locating both the CFTC and the ABR facilities.

Section 15, Other Facilities – The potentially hazardous sites/activities identified within 8 km (5 miles) of the Barnwell Site included those associated with the SRS and with the EnergySolutions existing low-level radioactive waste disposal site.

Section 16, Inclusion on National Priorities List/CERCLIS Database – The proposed Barnwell Site is not included in the CERCLIS database. The Barnwell Site is not on the NPL list; however the adjacent SRS site is an NPL listed site. This listing and ongoing response actions at SRS will not impact development at the proposed Barnwell Site.

Summary

The DSR demonstrates that the Barnwell site is suitable for consideration and evaluation in the PEIS for location of the proposed GNEP fuel treatment and reactor facilities.

- The Barnwell Site has adequate supplies of water both within its boundaries (primarily groundwater) and within the watershed (including Par Pond and Lower Three Runs) in which it is located.
- Assessments for ATP certification and those performed during this investigation indicate that concerns with threatened or endangered species or species of concern, critical habitat, historical, archeological, and cultural resources are very moderate and can be managed with this development.
- The natural phenomena hazards that influence nuclear facility design are well documented and their design implications well understood. The extensive nuclear facility siting work performed in the Central Savannah River Area (CSRA) has established that there are no capable faults near the ATP and that the controlling seismic reference for design is the Charleston, SC, seismic zone, over 160 km (100 miles) away.
- The strata underlying ATP are generally suitable for construction of nuclear facilities and the geologic features that must be considered in design are well understood and documented.

- The weather phenomena that must be considered in nuclear facility design, hurricanes, tornadoes, and severe thunderstorms are well documented and their design implications defined.
- The ATP occupies a location that is favorable to preventing flood impacts. It is 12 meters (40 feet) above the level of the relevant Probable Maximum Flood (Par Pond) and has adequate relief such that water from intense thunderstorms that occur in the area can be drained to prevent localized flooding.
- Socioeconomic impacts are low due to low levels of population and industrial development.

CONCLUSION

EnergySolutions prepared DSRs for the Atomic City Site, the Roswell Site, and the Barnwell Site. A comprehensive review of the potentially affected environment for each of the three sites was completed and no foreseeable environmental impacts or regulatory prohibitions would prevent any of the sites from serving as an effective host for GNEP facilities. Each of the proposed sites were of sufficient size to locate either or both of the planned GNEP Demonstration Facilities and have sufficient room to provide suitably sized feed buffer and interim waste product storage capabilities. All three sites include water rights and access to a reliable source of water to support site operations. In each case, there is strong local and state interest in and support for siting the proposed GNEP facilities. Recommending a preferred site was outside the scope of these financial assistance awards. EnergySolutions complete DSRs can be viewed at <http://gnep.gov/gnepSitingStudies.html>.

REFERENCES

1. Detailed Site Report for the Global Nuclear Energy Partnership Atomic City, Idaho Site, DE-FG07-07ID14801, May 1, 2007.
2. Detailed Site Report for the Global Nuclear Energy Partnership Roswell, New Mexico Site, DE-FG07-07ID14802, May 1, 2007.
3. Detailed Site Report for the Global Nuclear Energy Partnership Barnwell County, South Carolina Site, DE-FG07-07ID14800, May 1, 2007.