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**REFERENCE SITE SELECTION REPORT
FOR THE
ADVANCED LIQUID METAL REACTOR
AT THE
IDAHO NATIONAL ENGINEERING LABORATORY**

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**EG&G Idaho, Inc.
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ABSTRACT

This Reference Site Selection Report was prepared by EG&G, Idaho Inc., for General Electric (GE) to provide information for use by the Department of Energy (DOE) in selecting a Safety Test Site for an Advanced Liquid Metal Reactor. Similar Evaluation studies are planned to be conducted at other potential DOE sites.

The Power Reactor Innovative Small Module (PRISM) Concept was developed for ALMR by GE. A ALMR Safety Test is planned to be performed on a DOE site to demonstrate features and meet Nuclear Regulatory Commission Requirements.

This study considered possible locations at the Idaho National Engineering Laboratory that met the ALMR Prototype Site Selection Methodology and Criteria. Four sites were identified, after further evaluation one site was eliminated. Each of the remaining three sites satisfied the criteria and was graded. The results were relatively close.

Thus concluding that the Idaho National Engineering Laboratory is a suitable location for an Advanced Liquid Metal Reactor Safety Test.

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REFERENCE SITE SELECTION REPORT FOR THE ADVANCED LIQUID METAL REACTOR AT THE IDAHO NATIONAL ENGINEERING LABORATORY

OVERVIEW OF REPORT

Introduction

The U. S. Department of Energy Idaho Operations Office (DOE-ID) manages the Idaho National Engineering Laboratory (INEL) which is under consideration as a site for the safety test of the Power Reactor Innovative Small Module Concept (PRISM) for the Advanced Liquid Metal Reactor (ALMR) technologies. To assist General Electric (GE) in efforts to develop criteria and methodology for locating potential sites, EG&G Idaho, Inc., conducted an ALMR pilot site selection study.

The study was designed to identify primary and alternate sites for the facility and evaluate the relevance of the ALMR Prototype Site Selection Methodology and Criteria. Development of the methodology and criteria is discussed in a separate report entitled "Advanced Liquid Metal Reactor Site Criteria Report."

The pilot site selection study was performed by a field team with members from Argonne National Laboratory-West (ANL-W), the National Oceanic & Atmospheric Administration (NOAA) and EG&G Idaho. Each team member was assigned a specific criterion for analysis based on the specific area of expertise. Some members had responsibility for more than one criterion. The primary task was to conduct an evaluation of possible INEL sites for the ALMR safety test that met or exceeded the criteria. The representatives of the

organizations brought extensive and varied expertise to the study.

ANL-W has operated the sodium-cooled Experimental Breeder Reactor II (EBR-II) since 1964 at the INEL. Its organization has a staff of highly trained and experienced reactor personnel which includes operators, engineering analysts, fuel development personnel and critical maintenance staff.

In 1949, the U.S. Weather Bureau, at the request of the Atomic Energy Commission, established a weather observation station with a full complement of meteorologists at the INEL. They were charged with monitoring a multitude of hourly and daily meteorological phenomenon. These intense measurements continued for 15 years; many were then scaled back to permit intensive studies of the atmospheric turbulence and diffusion characteristics of the INEL and vicinity. Eventually the weather station was absorbed into the Environmental Research Laboratory of NOAA. The diffusion and climatological experience acquired by NOAA during its 40 years of existence at the INEL provides the INEL with a broad base of meteorological expertise.

EG&G Idaho, provided personnel with extensive backgrounds in seismicity, geology, volcanism, hydrology, facility planning, energy management, cost estimating, security, nuclear reactor research and technology, as well as environmental safety and quality.

The field team also drew on past INEL siting study experience since the siting for the proposed New Production Reactor was recently completed.

Methodology

The ALMR Methodology and Criteria Committee established the site selection criteria and a requirement of documentation rigor, patterned after the National Environmental Policy Act (NEPA), which provides traceability for identifying individuals and methods. The site selection criteria were developed around a modified Kepner-Trego Decision Analysis (K-T). The criteria were separated into two categories: "musts" and "wants." The "musts" were the necessary requirements for a site to be deemed suitable for the ALMR. If a site did not meet all the "musts," it was automatically eliminated from further consideration. The "wants" criteria were desirable attributes for the siting selection. The ALMR Methodology and Criteria committee assigned weights to the "wants" according to their relative importance. These were used to rank the specific sites for acceptability. The weights ranged from a low of one to a high of ten. The field team's responsibility was to evaluate each potential site on specific criterion and give it a score from one to ten. The specific site score was then multiplied by the weighing factor and totaled. This allowed a ranking of the investigated sites based on total weighted scores.

The site-specific criteria for the "musts" were initially reviewed to make a "first cut" reduction of the possible INEL sites. The items considered first were the seismic and volcanic criteria since these

were most limiting. The balance of the items included flood plains, population density, land area, meteorology, environmental requirements, U. S. Nuclear Regulatory Commission (NRC) site suitability requirements, water, power production, sales, and land availability. From these efforts, two excellent candidate sites were identified with another site that provides a third possible option. A fourth possibility was originally identified, however, it could not meet the criteria and was eliminated. Appendix A summarizes the criteria, weights, and scores for these sites.

Summary of Best Sites

The effort undertaken for ALMR site selection at the INEL first incorporated all past and current available information concerning locations of capable faults, fault geometry and movement histories, earthquake sources and size seismic attenuation characteristics, volcanic vent distribution, and volcanic rift zone mechanics. Initial screening identified four sites, based on the criteria that the site be located in an area at sufficient distance from the closest fault for peak horizontal accelerations (ground motions) less than 0.30 g, and farther than five miles from a volcanic vent located within a rift zone. Figure 1 shows the location of the four chosen sites relative to the contours drawn for the criteria. The land areas are larger than actual ALMR needs. The areas are:

AREA A: Township 3N, Range 32E, Sections 8 & 9. (near ANL-W)

AREA B: Township 6N, Range 33E, Sections 26, 27, 34, and 35 (near Mud Lake)

Figure 1. Map of site selection criteria for ALMR.

Figure 1 Description

Map showing the two areas (shaded green) containing four possible sites for the ALMR (A - D, highlighted in pink). Also shown is the site selection criteria for ALMR: 1) boundary of maximum probable flood (blue); 2) boundary of volcanic rift zones (purple); 3) locations of volcanic vents (yellow stars); 4) Arcs 5 miles from vents (yellow dashed lines); 5) microearthquake epicenters (red multiple circles); 6) locations of the Howe fault scarp and hypothetical rupture plane (red dashed line); 7) hypothetical epicenter (red star); and 8) contours of peak horizontal accelerations for 0.30 and 0.25 g (red dashed lines). Other features: 1) INEL boundary (thick black line); 2) highways and roads (thin black lines); railroads (black lines with hash marks); 3) power lines (green lines); and 4) township and range grid (black dashed and dotted lines).

AREA C: Township 2N, Range 30E, Sections 4 & 7 (near Central Facilities)

AREA D: Township 3N, Range 31E, Section 13 (near WINCO Idaho Chemical Processing Plant)

Sites A, B, and D are in areas where the peak horizontal accelerations are expected to be less than 0.25 g. Site C lies within a larger area for which the expected accelerations will not exceed 0.30 g. Less than 0.30 g acceleration is the design criterion for ALMR. Although each site is farther than five miles from surrounding volcanic vents, Sites A and D are more desirable choices from a volcanic hazards point of view. Sites A and D are better protected from lava-flow inundation by local topographically high features that would divert flows away from the sites in the unlikely event of a volcanic eruption. Sites A and D are also located outside of the flood plain of the Big Lost River. Site C may be somewhat undesirable because it is relatively low and not topographically protected in the unlikely event of a lava flow and is also close to the boundary of the 100-year flood plain.

Site C is outside of the flood plain of the Big Lost River. However, if Site C were selected, a refined analysis of the flood plain and a detailed study of topographic maps may suggest that dikes or berms two to three ft high may be required to guarantee that Site C is flood proof from the Big Lost River.

Site B did not meet two of the must criteria. The potential flooding from Mud Lake and the Camas Creek drainage area and due to its close proximity to populated areas

and the resulting short evacuation time needed in case of an accidental radiation release are the two criteria not met by Site B. Therefore, Site B has been eliminated from any further evaluation.

Acceptable meteorology was examined for each of the candidate areas. Computer simulations of the effluent transport and diffusion were run for the other three sites using the XOQDOQ model. Wind roses required by the model were built from data collected during 1980-1982 from the INEL meteorological tower network (Figure 2). Since no wind speed and direction sensors are located precisely at the sites under consideration, data from existing stations in close proximity were used in the analysis. The data from ANL-W, CFA, and NRF were deemed to be representative of Sites A, C, and D, respectively (Figure 3).

The results of the computer simulations for each of the three sites are given in Tables 1, 2, and 3. The tables give average annual dilution factors (X/Q) for the INEL boundary from each of the 16 points of the compass. The calculations assume a release height of 26 ft., no plume rise, no decay, and no disposition. The dilution factors are accurate for short distances, but tend to over-predict actual values as distance increases from the source. The reason for this conservative prediction is that the "worst-case" conditions of stable air and light winds tend to drive the model. These conditions are unlikely to persist long enough for the effluent plume to travel very far without significant dilution.

However, in this case, it is more prudent to err on the side of conservatism.

Figure 2. Joint wind speed and direction frequency distributions (wind roses) for Argonne National Laboratory-West (top), CFA (middle), and NRF (bottom) during 1980 through 1982.

Figure 3

TABLE 1
SITE A WIND DATA

DIRECTION FROM SITE	DISTANCE TO		DILUTION FACTOR (SM^{-3})
	MILES	METERS	
S	10.90	17542.	1.510^{-08}
SSW	11.06	17799.	2.010^{-08}
SW	13.22	21276.	1.810^{-08}
WSW	19.69	31688.	8.710^{-09}
W	17.04	27423.	6.410^{-09}
WNW	16.26	26168.	1.110^{-08}
NW	14.29	22998.	1.210^{-08}
NNW	14.29	22998.	1.910^{-08}
N	24.00	38624.	9.710^{-09}
NNE	18.42	29644.	1.310^{-08}
NE	15.62	25138.	1.510^{-08}
ENE	13.73	22096.	1.010^{-09}
E	12.31	19811.	5.510^{-09}
ESE	6.44	10364.	1.910^{-08}
SE	5.75	9254.	2.810^{-08}
SSE	7.36	11845.	1.910^{-08}

Site A average annual dilution factors (concentrations normalized by source strength) at the nearest site boundary in each of the 16 directional sectors using wind data from 1980 through 1982.

TABLE 2
SITE C WIND DATA

DIRECTION FROM SITE	DISTANCE TO		DILUTION FACTOR (SM^{-3})
	MILES	METERS	
S	4.74	7628.	5.410^{-08}
SSW	4.78	7693.	1.110^{-07}
SW	5.62	9045.	6.010^{-08}
WSW	8.46	13615.	1.110^{-08}
W	13.01	20938.	2.810^{-09}
WNW	13.25	21324.	2.010^{-09}
NW	11.86	19007.	4.510^{-09}
NNW	12.03	19360.	9.010^{-09}
N	16.33	26281.	6.410^{-09}
NNE	29.40	47315.	4.910^{-09}
NE	27.43	44144.	1.210^{-08}
ENE	22.32	35921.	1.810^{-08}
E	13.98	22499.	1.910^{-08}
ESE	8.17	13148.	2.410^{-08}
SE	5.66	9109.	3.010^{-08}
SSE	4.78	7693.	4.010^{-08}

Site C average annual dilution factors (concentrations normalized by source strength) at the nearest site boundary in each of the 16 directional sectors using wind data from 1980 through 1982.

TABLE 3
SITE D WIND DATA

DIRECTION FROM SITE	DISTANCE TO		DILUTION FACTOR (SM^{-3})
	MILES	METERS	
S	10.75	17300.	2.210^{-08}
SSW	10.95	17622.	3.110^{-08}
SW	12.88	20728.	1.910^{-08}
WSW	18.02	29000.	5.510^{-09}
W	13.51	21742.	4.310^{-09}
WNW	11.89	19135.	3.110^{-09}
NW	12.34	19859.	3.210^{-09}
NNW	11.65	18749.	5.110^{-09}
N	12.53	20165.	8.910^{-09}
NNE	21.04	33861.	1.310^{-08}
NE	20.64	33217.	1.810^{-08}
ENE	18.65	30014.	1.410^{-08}
E	17.03	27407.	1.010^{-08}
ESE	10.00	16093.	1.410^{-08}
SE	11.18	17993.	1.510^{-08}
SSE	10.18	17381.	2.210^{-08}

Site D average annual dilution factors (concentrations normalized by source strength) at the nearest site boundary in each of the 16 directional sectors using wind data from 1980 through 1982.

In summary, all three remaining sites are in locations that cannot be flooded from surface streams that originate outside the immediate area. Some limited design considerations should be given to flood waters that could be generated from melting snow or rain in nearby areas. The meteorology is acceptable for Sites A, C and D.

Sites A and D are favorable locations due to close proximity to existing established facilities. Both have established support infrastructures and roads. Both sites can be easily linked to the INEL electrical transmission loop and therefore minimize construction costs. Site D is the farthest from an existing facility, this site is a middle ground location. Thus making it a possible alternate site.

SITE CHARACTERISTICS

Seismic Activity

The results of previous geologic field, historical and current seismicity studies were used to define earthquake source areas and to provide an estimate of the earthquake size that could possibly occur on capable faults located closest to the INEL.

Capable Faults

Capable faults within 200 miles of the INEL (Figure 4) are predominantly range-front normal faults associated with the Basin and Range province that surrounds the Eastern Snake River Plain (ESRP). The maximum earthquake magnitude expected from any of the Basin and Range faults is approximately 7.0-7.5 (Doser, 1985; and Arabasz et al., 1988). The closest capable faults to the INEL are the Arco fault segment located at the

southern end of the Lost River Fault and the Howe fault segment located at the southern end of the Lemhi Fault. Pierce (1988) suggested from his studies of the Arco fault scarp that 7-10 ft of movement occurred on this segment 30,000 years ago and that no movement has occurred since then. The last movement on the Howe fault scarp has not been precisely determined. However, it does not displace Holocene alluvial fans that are about 15,000 years old and may have displaced sediments that are 30,000 years old (Malde, 1987)

Regional Seismicity

The INEL is located on the ESRP, which is surrounded by the Intermountain Seismic Belt (ISB). The ISB is a region of seismic activity extending from southern Arizona through eastern Idaho into western Montana (Figure 5). This seismically active area is more than 800 miles long and 60 miles wide. There are two seismic zones associated with it, the Centennial Tectonic Belt which extends from the Yellowstone Plateau area westward into central Idaho (Stickney and Bartholomew, 1987), and a zone which extends from southwestern Utah through southern Nevada and joins with the Nevada seismic zone.

Historical and recent seismic data cataloged for the ISB by the National Geophysical and Solar Terrestrial Data Center of NOAA, the National Earthquake Information Center (NEIC), and the INEL Seismic Network indicate that earthquakes primarily occur in the Basin and Range terrain that surrounds the ESRP (Figure 6). Table 4 lists the date, location, and size of the largest historic earthquakes of magnitude 5.5 and greater (data compiled from NEIC) that have occurred within a 200-mile radius of

EARTHQUAKES WITHIN 200 MILES OF INEL (EXCLUDING AFTERSHOCKS)

FIGURE 5

Figure 6

TABLE 4. EARTHQUAKES WITH MAGNITUDES GREATER THAN 5.5
WITHIN 200 MILES OF THE IDAHO NATIONAL ENGINEERING LABORATORY

Magnitude	Modified Mercalli Intensity at INEL	Date Yr/Mn/Dy	Time (GMT) Hr:Mn	Lat. °N	Long. °W	Geographical Location	Radial Distance From INEL (MILES)
7.5	VI	1959/08/18	06:37	44.83	111.08	Hebgen Lake, MT	116
7.3	VI	1983/10/28	14:06	43.97	113.90	NW of Mackay, ID (Borah Peak)	58
6.7		1925/07/10	14:45	46.08	112.13	Clarkston, MT	125
6.6		1934/03/12	15:05	41.70	112.80	Hansel Valley, UT	138
6.5		1959/08/18	07:56	45.00	110.50	Hebgen Lake, MT ^a	129
6.5		1959/08/18	15:26	44.88	110.73	Hebgen Lake, MT ^a	130
6.3		1884/11/10	08:50	42.00	111.26	Bear Lake, UT	140
6.3		1909/10/06	02:50	41.76	112.66	Hansel Valley, UT ^C	134
6.3		1947/12/17	12:38	44.92	111.53	Virginia City, MT	140
6.1		1934/03/12	18:20	41.70	112.80	Hansel Valley, UT ^C	138
6.1		1944/07/12	19:30	44.41	115.06	N of Stanley, ID	146
6.1	<II	1975/06/30	18:54	44.74	110.60	Yellowstone National Park, WY	130
6.0		1945/02/14	03:01	44.70	115.40	N of Stanley, ID	146
6.0		1959/08/18	08:41	44.80	110.70	Hebgen Lake, MT ^a	129
6.0		1959/08/19	04:04	44.76	111.62	Hebgen Lake, MT ^a	130
6.0	<III	1975/03/28	02:31	42.06	112.54	Pocatello Valley, UT	114

TABLE 4, CONTINUED. EARTHQUAKES WITH MAGNITUDES GREATER THAN 5.5
WITHIN 200 MILES OF THE IDAHO NATIONAL ENGINEERING LABORATORY

Magnitude	Modified Mercalli Intensity at INEL	Date Yr/Mn/Dy	Time (GMT) Hr:Mn	Lat. °N	Long. °W	Geographical Location	Radial Distance From INEL (MILES)
5.8		1930/06/12	09:15	42.60	111.00	E of Soda Springs	118
5.8		1964/10/21	07:38	44.86	111.60	Hebgen Lake, MT ^a	96
5.8		1983/10/28	19:51	44.07	113.91	N W of Mackay, ID ^b	61
5.8		1983/10/29	23:29	44.23	114.10	N W of Mackay, ID ^b	75
5.8		1984/08/22	09:46	44.47	114.01	Challis, ID ^b	79
5.7		1905/11/11	21:26	42.90	114.50	Shoshone, ID	102
5.7		1914/05/13	17:15	41.22	111.96	Ogden, UT	176
5.7		1962/08/30	13:35	42.03	111.74	Cache Valley, UT	129
5.6		1934/04/14	21:26	41.50	112.50	Hansel Valley, UT ^c	152
5.6		1934/05/06	08:09	41.70	112.80	Hansel Valley, UT ^c	138
5.6		1959/08/18	11:03	44.80	111.10	Hebgen Lake, MT ^a	113
5.5		1976/12/08	14:40	44.76	110.79	Yellowstone National Park, WY	123

^a Aftershock following the $M_S = 7.5$, 1959 Hebgen Lake, MT Earthquake.

^b Aftershock following the $M_S = 7.3$, 1983 Borah Peak, ID Earthquake.

^c Aftershock following the $M = 6.3$, 1934 Hansel Valley, UT Earthquake.

the INEL. Table 5 lists the historic earthquakes of magnitude 5.5 and greater that have been associated with known tectonic structures. Figure 5 shows the locations of the largest historic earthquakes of magnitude 5.5 and greater (excluding aftershocks) on the map of the capable faults within the 200-mile radius of the INEL. With the exception of the 1905 5.7 magnitude earthquake, which may not have occurred on the ESRP since it has a location error with a radius of 50 km, no other earthquakes greater than 5.5 magnitude have occurred on the ESRP. However, ground motions produced by earthquakes occurring in the Basin and Range surrounding the ESRP can be transmitted onto plain. The largest and closest historic earthquake that generated strong ground motions, the 1983 7.3 magnitude Borah Peak, Idaho, earthquake, occurred at a distance of 58 miles from the INEL.

Local Seismicity

The INEL Seismic Network began operating with one seismic station in 1971. Currently this network consists of six permanent seismic stations located on and around the ESRP and twenty strong-motion accelerographs located at various critical facilities at the INEL. The network has accumulated earthquake data since it began its operation, and during this period, nine microearthquakes all less than 1.1 magnitude have occurred on the ESRP (Figure 6). Two of these events occurred on the ESRP outside of the INEL Site boundaries. One microearthquake of 1.0 magnitude occurred near Dubois on December 3, 1975. A microearthquake of 0.9 magnitude occurred near the Hell's Half Acre lava field on January 22, 1981.

The first of five microearthquakes (all less than 1.0 magnitude) to occur within the INEL Site boundaries was recorded on November 27, 1983. It was 0.7 magnitude and was located near the western edge of the INEL Site (Figure 6). Another microearthquake of 0.7 magnitude occurred on March 11, 1985, and was located about 9 miles to the east of the western boundary of the INEL near Howe. Two microearthquakes of undetermined magnitude (too small to measure) were recorded during a short-term microearthquake survey (23 days) conducted by Boise State University in July-August, 1987 (Pelton et al., in press). These two events occurred in August and were located approximately halfway between Middle Butte and East Butte. A microearthquake of 0.3 magnitude occurred on May 25, 1988, and was located near the March 11, 1985 event (Jackson et al., 1989).

Several microearthquakes have occurred close to the western edge of the ESRP near the INEL (Figure 6). Other microearthquakes have occurred along the eastern edge of the ESRP near Idaho Falls, Idaho. Even though microearthquakes have occurred on the ESRP, the ESRP appears to be seismically inactive relative to the Basin and Range that surrounds the plain.

The October 28, 1983, 7.3 magnitude Borah Peak, earthquake resulted from slippage on a NW-SE trending normal range-front fault that dips about 45 degrees to the southwest. The epicenter for this event was located along the western edge of the Thousand Springs Valley near Borah Peak in the Lost River Range approximately 56-68 miles from INEL facilities (Figures 6). The earthquake ruptured 22 miles of the Thousand Springs segment of the Lost

TABLE 5. EARTHQUAKES WITHIN 200 MILES
OF THE IDAHO NATIONAL ENGINEERING LABORATORY
THAT HAVE OCCURRED ON KNOWN TECTONIC STRUCTURES

Magnitude	Earthquake	Type of Fault	Known Tectonic Structure
7.5	1959 Hebgen Lake, MT and associated aftershocks	Dip-slip	Caused a fault scarp along the Hebgen and Red Canyon faults. The rupture length was 15 miles and the average offset was 26 feet (Doser, 1985).
7.3	1983 Borah Peak, ID and associated aftershocks	Dip-slip	Caused a fault scarp along the Thousand Springs segment of the Lost River Fault. The rupture length was 22 miles and the average offset was 9 feet (Crone et al., 1985).
6.7	1925 Clarkston Valley, MT	Dip-slip	Associated with a fault oriented in an oblique manner north of the Clarkston Valley Fault (Doser, 1989)
6.6	1934 Hansel Valley, UT	Dip-slip	Caused a fault scarp along an unnamed fault in Hansel Valley. The rupture length was 5 miles and the average offset was 1 foot (Shenon, 1936).
6.3	1947 Virginia City, MT	Dip-slip	Possibly associated with the Madison Fault (Doser, 1989).
6.1	1975 Yellowstone National Park, WY	Dip-slip	Associated with an unnamed fault near the north-central boundary of the Yellowstone Caldera (Pitt et al., 1979).
6.0	1975 Pocatello Valley, UT	Dip-slip	Associated with an unnamed fault in Pocatello Valley, UT (Cook and Nye, 1979).
5.7	1962 Cache Valley, UT	Dip-slip	Associated with the Temple Ridge Fault (Westaway and Smith, 1989).

River Fault with a maximum vertical displacement of 14 ft (Crone et al., 1985) and relative movement of the valley downward to the southwest. It caused two deaths in Challis, Idaho, and approximately \$12.5 million in damage (Stover, 1985). Although the shock was felt at the INEL, no structural or safety related damage occurred at INEL facilities and all reactors in operation at the time scrambled automatically or were shut down manually without any problems (Gorman and Guenzler, 1983). The INEL was within Modified Mercalli Intensity (MMI) Zone VI (Stover, 1985). Thirteen of the fifteen accelerographs in operation at the time of the Borah Peak, earthquake recorded peak horizontal accelerations of 0.022-0.078 g at bedrock or free-field sites (Jackson, 1985).

One other major earthquake occurred on August 17, 1959, at Hebgen Lake, Montana, approximately 100 miles from the INEL (Figure 6). This 7.5 magnitude event was and felt at the INEL, but did not cause any damage. The INEL was within MMI Zone VI during this earthquake also (Stover, 1985). Two moderate size earthquakes, the 6.0 magnitude 1975 Pocatello Valley, Utah, and 6.1 magnitude 1975 Yellowstone Park, Wyoming, earthquakes, have occurred at distances of 114 and 130 miles respectively, from the INEL. The INEL was located in MMI II-III zones for these events (Cook and Nye, 1979; and Pitt et al., 1979).

Earthquake Strong Ground Motions

Currently, a study is under way to provide site-specific estimates of earthquake strong ground motions for the INEL assuming that an event similar to the 1983 Borah Peak, earthquake occurs on the

Howe fault which is the closest capable fault to most of the facilities at the INEL. The approach is deterministic and uses the Band-Limited-White-Noise methodology coupled with Random Vibration Theory (technique accepted by NRC) to estimate the potential strong ground motions (Wong et al., 1989). Figure 1 shows contours at distances of 21 and 23 km from the closest point of rupture on the fault plain where the peak horizontal accelerations will be less than 0.30 and 0.25 g, respectively. These estimates are preliminary and are assumed to be an upper limit for the final site-specific estimates that will be calculated for a total of nine facility areas at the INEL. Contour lines for 0.30 and 0.25 g are also shown for a hypothetical rupture plain along the Arco Fault.

Volcanic Activity

The surface of the ESRP is composed of basalt lava flows with a thin layer of loess deposits. The basalt lava flows were erupted mostly from low-shield volcanoes (vents) scattered widely across the plain (Greenly, 1982). Basaltic volcanism began in the INEL area about four million years ago, producing a sequence of lava flows about one km thick. Within the INEL boundaries, volcanism ceased about 100,000 years ago (Hackett et al., 1987). Younger volcanism has occurred near the INEL at Craters of the Moon a few miles to the southwest (15,000 to 2,000 years ago), at the Cerro Grande, North Robbers, and South Robbers lava fields near the southern boundary of the INEL (about 12,000 years ago), and at the Hells Half Acre lava field near the southeast corner of the INEL (about 5,000 years ago) (Kuntz et al., 1984).

Basaltic vents are concentrated in volcanic rift zones which are characterized by lines of volcanic vents and fissure eruptions (Kuntz et al., 1984; Smith et al., 1989). Figure 1 shows three of the rift zones closest to the INEL. They are the Arco rift zone, the Lava Ridge-Hells Half Acre rift zone (both northwest-trending), and a northeast-trending rift zone along the axis of the plain. All youthful volcanism is concentrated along the northeast-trending zone (Kuntz et al., 1984). Based on available radiometric ages and paleomagnetic data, the northwest-trending zones have not seen volcanic activity for 100,000 to several hundred thousand years (Kuntz et al., 1984).

The possible sites selected for the ALMR lie within a basin between rift zones (Figure 1). The probability of occurrence of future volcanic activity at EBR-II (near site A) has been estimated at once every 80,000-100,000 years (Kuntz and Dalrymple, 1979). This is based on the average recurrence interval for the period of time between 270,000 and 600,000 years ago. However, no activity has occurred in the area since 270,000 years ago, so the probability may be significantly less than that estimate. Similarly, radiometric age determinations of lava flows in a drill hole near the Idaho Chemical Processing Plant (ICPP) (near sites C and D) show a 68,000-year recurrence interval for the period of time between 230,000 and 640,000 years ago (Champion and Lanphere, 1988). No activity has occurred since 230,000 years ago, so the probability of activity affecting these sites is significantly less than the recurrence interval suggests. This is because the time since the last volcanic activity has been several times longer than the recurrence

interval suggesting that the area has gone into a quiescent period.

Although the threat from volcanic activity at the INEL is very small, steps have been taken to further minimize the risk for the selected ALMR sites. These steps include avoidance of topographically low areas where possible lava flows could pond and avoidance of volcanic rift zones where the probability of renewed volcanic activity would be the greatest. Another rationale for avoiding rift zones is the probable occurrence of magmatically induced seismicity. This risk is minimized by selecting sites that are greater than 5 miles from rift-related volcanic vents. At this distance, the moderate seismicity known to be associated with active rift zones would not produce unacceptable peak ground accelerations at the selected sites.

Hydrology

The Snake River Plain Aquifer (SRPA) covers approximately 10,000 square miles of southeaster and south-central Idaho and extends 200 miles in length from Ashton to Bliss and about 60 miles in width from Arco to Blackfoot. The aquifer is recharged by rain and snow in the surrounding 35,000 square-mile drainage area, by precipitation on the Snake River Plain, and by seepage from irrigation and streams. Discharges from the aquifer occur by pumping for irrigation, municipal, industrial, livestock, and domestic users; spring flows; evaporation; and seepage into streams. The aquifer is estimated to contain about 400 million acre-feet of water. It has an annual budget of about eight million acre-feet (both recharge and discharge). The aquifer is contained within predominantly basaltic (lava) rocks

and included sediments. About 90% of the aquifer is rock and 10% is fractures, fissures, and other openings filled with water. The aquifer stores a vast amount of water underground and transports that water from the recharge areas to the discharge areas by seepage through the rock openings.

The INEL covers 890 square miles of the Snake River Plain, which is 9% of the plain. Figure 7 is a map of the INEL site and adjacent areas showing altitude contour on the water table of the SRPA and inferred directions of groundwater movement. The altitude of the water table ranges from 4,584 ft above mean sea level in the northern part of the site to 4,426 ft near the southwestern boundary of the site. The general direction of regional groundwater movement underlying the INEL is to the south and southwest. The average slope of the water table is about four ft per mile.

Figure 8 is a map showing the approximate depth from the land surface to the water table in the SRPA at the INEL. The depth to water ranges from about 200 ft to more than 1,000 ft. The configuration shown in Figure 8 generally reflects the surface topography and the slope of the water table. The actual depth to the water table varies with the recharge to the system. A few wells have water-level fluctuations of about 20 ft but most of the water levels vary about 10 ft over extended periods of time. At the INEL, pumpage has a minimal effect on the water levels, because the amount pumped is a very small portion of the total storage and recharge.

The Big Lost River is the

INEL's most important surface water. Recharge to the SRPA from flow during wet years has been significant. All the flow that enters onto the Snake River Plain is recharged to the subsurface, except for evaporation and transportation losses. During dry periods, flow does not reach the INEL.

Mackay Dam is an irrigation reservoir on the Big Lost River which contains about 45,000 acre-feet of water when filled. This earth-filled dam is the principal storage facility on the Big Lost River. Consequences of possible rupture of the dam have concerned the residents of the river valley since construction began in 1905. The facilities at the INEL that could be flooded give additional cause for concern over the consequences of a rupture of Mackay Dam. In addition, if a maximum precipitation event occurred upstream of the reservoir and the reservoir was filled and failed, The results would effect parts of the INEL. This information has been assembled and modeled. The results of the Probable Maximum Flood are shown in blue on Figure 1. This extreme flood event shows that sites A and D cannot be flooded by any maximum set of conditions that could be postulated for the Big Lost River. The topographic relief puts these sites out of the flood plain of the Big Lost River for any period of recurrence interval for flooding.

The data from pumping tests of wells in the SRPA indicate that the Snake River Plain contains one of the most productive aquifers in the world. Large quantities of water can be obtained from a properly located and properly developed well with a minimum amount of drawdown. For example, wells at the EBR-II can be pumped at 2,000

Figure 7 Generalized altitude contours on the regional water table and inferred directions of ground-water movement, INEL and vicinity, July 1978.

gpm with only one to two ft of drawdown.

The water requirements for the Near Term Safety Test of 3,500 gpm should be satisfied by two or three wells. The actual number of wells and well spacings can be determined by drilling and testing two wells and then evaluating if additional wells are required. There is little difference in the water transmitting properties of the three Sites A, C, and D. The transmissivity maps indicate that the values at the three sites should range from a transmissivity value of about 170,000 ft²/day (1.3 million gpd/ft) to a value of about 260,000 ft²/day (1.9 million gpd/ft). These values are very high and reinforce the large quantities that can be pumped with minimal drawdowns in properly constructed wells. The transmissivity values are shown on Figure 9.

The current water rights for pumpage at the INEL is 51.4 cfs and the current pumpage is from 9 to 11 cfs. In addition, negotiations are under way with the Federal Government and the State of Idaho for additional water rights for future developments at the INEL. The use of 7.8 cfs for the Near Term Safety Test appears to fit within the existing conditions of current permits. The aquifer is capable of supplying this amount of water.

The effects of water production of about 20 cfs (9,000 gpm) would still be allowable under current permits, but some consideration should be given to obtaining additional permits. The State of Idaho has indicated that permits will be issued for provident future projects on the INEL and again, the aquifer is capable of providing the required quantity of

water. About four to ten wells would be needed to supply about 9,000 gpm. The locations of the wells could be accommodated at each of the three proposed sites.

Flow rates on the INEL for the SRPA have been calculated and measured in a number of tracer tests and measurements of arrival times for contaminants. In general, the flow rates appear to range from five to 20 ft per day. These flow rates are high for groundwater movements. Most of the flow rates appear to be in the five to ten ft per day range and in areas unaffected by pumping or recharge, the flow rates are usually near five ft per day.

The quality of water from the SRPA on the INEL is generally very good and suitable for most uses. Treatment is required for some uses. The general water quality for the three sites (A, C, and D) is given in Table 6.

Maps of the SRPA at the INEL are given to show variations in temperature, total dissolved solids, calcium, magnesium, sodium, chloride, potassium, bicarbonate, sulfate, nitrate, fluoride, and silica. These maps provide the information to evaluate the chemical parameters and how they may be suitable for the proposed facility for each of the proposed sites (Table 6).

Population Density Characteristics

According to 10 CFR 100, population considerations for siting facilities are generally related to hazards to the public from facility operations or postulated accidents. Suitable sites for facilities are normally surrounded by: (a) an exclusion area in which the facility controls all activities and no

TABLE 6
WATER QUALITY CONDITIONS AT THE THREE SITES ON THE INEL

	SITE A	SITE C	SITE D
Evaluation above MSL (ft)	5,040-5,120	4,920-4,960	4,930-4,970
Depth of Water (ft)	560-603	480-510	460-500
Top of Aquifer (ft above MSL)	4,480	4,450	4,470
Water Temperature (°F)	56	54	55
Sodium (mg/l)	13	15	7
Chloride (mg/l)	13	30	10
Bicarbonate (mg/l)	150	170	172
Potassium (mg/l)	3	3	2
Nitrate NO ₃ (mg/l)	2	1	1
Sulfate (mg/l)	14	20	20
Fluoride (mg/l)	0.5	0.4	0.2
Calcium (mg/l)	33	40	41
Magnesium (mg/l)	10	17	13
Tritium (pCi/ml)	0.05	5	0.1
Silica (mg/l)	32	26	24
Total Dissolved Solids (mg/l)	200	220	203
Specific Conductance (micromhos at 25°C)	300	365	327
Hardness	120	170	156

outside the exclusion area where only a limited number of residences are permitted.

Both the INEL Site and the surrounding area have low population densities. The population centers within a 50-mile radius from the INEL Central Facilities Area (CFA) are shown in Figure 10. The population distribution for that same area is shown in Figure 10 by both distance and direction from the CFA. Figure 10 shows both the distribution based on the 1970 Census and an updated distribution based on preliminary 1980 U.S. Census data.

The nearest town to the INEL Site is Atomic City, which is less than 1 mile from the southern boundary and has about 35 residents (Figure 11). Arco (population 1241) is the only community within 30 miles of CFA with as many as 300 inhabitants. The larger population centers are located nearly 50 miles from the CFA.

The populations of those towns having more than 300 inhabitants are given in Table 7. Table 8 shows the population by county for the areas within the 50-mile radius. (Because the population numbers in each sector in Figure 11 are estimated, the totals may not correspond exactly to those shown in Tables 7 and 8.)

The growth characteristics of cities and towns around the INEL are similar to other cities in Idaho. A distinct pattern of population increase occurs just outside the city limits, where larger land areas are available. Idaho Falls, Blackfoot, and Pocatello are growing faster than the towns in the vicinity of the INEL.

Siting facilities emphasize isolation as the basis for determining site suitability. The remoteness of the INEL site makes it an ideal location for ALMR with respect to population considerations. The INEL is isolated because of the large exclusion area of the site itself, and also because the very low population centers of the region are not located in the predominant downwind directions (north and northwest).

Climatology

The following paragraphs summarize the climatology of the INEL. A detailed description is found in Climatology of the Idaho National Engineering Laboratory, 2nd Edition, DOE/ID-12118, December 1989.

Area Description

The INEL is located on the western edge of the Eastern Snake River Plain (ESRP). The Lemhi, Bitterroot-Centennial, and Beaverhead mountain ranges near the INEL rise to about 11,000 ft above mean sea level (MSL), and the Site's average elevation is about 5000 ft above MSL. The terrain is gently rolling to broken, and a low, broad volcanic ridge extends northeastward along the southeastern edge of the Site. Three streams flow across the Site from the mountains to the northwest across alluvial fans into playas, or sinks. The streams are often dry in summer.

Surface materials on the INEL are principally loess and olivine basalt, followed by sand, black basalt, playa deposits, alluvial fan deposits, slope wash and talus, and ancient lake-bed sediments. Plant

Figure 10. Towns within a 50-mile radius of the INEL, centered at the Central Facilities Area.

Population Data
1970 Census/1980 Preliminary Census

*Includes about 39000/45022 residents
in Pocatello, which is slightly
beyond the 50-mile radius

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Figure 11 Population distribution around INEL, centered at the Central Facilities Area.

TABLE 7

City populations within 50-miles of the Central Facilities Area.

<u>CITY^a</u>	<u>1970</u>	<u>1980</u>
Aberdeen	1,542	1,528
Ammon	2,545	4,669
Arco	1,244	1,241
Basalt	349	414
Blackfoot	8,716	10,065
Chubbuck	2,924	7,052
Firth	362	460
Idaho Falls	35,776	39,590
Iona	890	1,072
Lewisville	468	502
Mackay	539	541
Menan	545	605
Pocatello ^b	40,036	46,340
Roberts	393	466
Shelley	2,614	3,300
Ucon	664	833
TOTAL	99,607	118,678

a. Cities with more than 300 inhabitants.

b. Pocatello is just outside the 50-mile radius but is included in the table.

TABLE 8

Population by county, living within 50-miles of the Central Facilities Area.

<u>COUNTY^a</u>	<u>1970</u>	<u>1980</u>
Bannock ^b	42,183	49,672
Bingham	23,474	28,404
Blaine	360	432
Bonneville	40,959	50,380
Butte	2,966	3,352
Clark	62	65
Custer	602	668
Jefferson	5,973	7,287
Lemhi	22	25
Power	221	265
 TOTAL	 116,822	 140,550

a. Four other counties (Fremont, Lincoln, Madison, and Minidoka) intersect the 50-mile radius; however, no populations centers lie within the circle.

b. Includes residents of the city of Pocatello, which is just outside the 50-mile radius.

life is primarily sagebrush and various grasses.

General Climatology

The INEL's location on the ESRP, including its elevation, latitude, and intermountain setting, strongly affects the Site's climate. Bordering mountains usually channel the prevailing westerly winds into a flow from the southwest. Annual precipitation is light, and the region is classified as arid to semi-arid. The Pacific Ocean's moderating influence produces a climate that is usually warmer in winter and cooler in summer than more inland locations at similar latitudes.

Wind

Southwest winds are the most frequent on the Site because of the bordering mountains' channeling effect. The highest winds usually occur in the spring when the prevailing westerlies are sometimes strong, producing strong southwest winds over most of the INEL. The second most frequent wind direction is from the north-northeast, and occurs at night when the sky is mostly clear. The mountain slopes cool more rapidly than the valley floor, producing a down-slope, down-valley wind, or drainage wind. The reverse, an upslope wind, occurs in daytime. These mountain and valley winds are generally fair-weather phenomena. The Birch Creek Valley sometimes channels strong north-northwest winds onto the northern portion of the Site. This "Birch Creek" wind sometimes equals the strongest southwest winds recorded on the INEL.

Peak gusts recorded on the Site were 78 mph at CFA from the west-southwest at the 20-ft level,

and 67 mph from the south at the Test Area North (TAN). The annual average wind speed recorded at CFA is 7.5 mph at the 20-ft level and 12.6 mph at the 250-ft level.

Air Temperature

Average daily air temperatures at CFA, based on 39-year records, range from a low of 10°F on January 2 to a high of 70°F on several days in late July. The average number of heating degree days is 55 on January 2, and zero on several days in July and August. In July, CFA averages 123 cooling degree days, ranging from 58 to 224 degree days. In winter, cold air east of the Continental Divide sometimes spills over and across the ESRP from the northeast, and occasionally, intensely cold air from Canada spills over the Centennial and Beaverhead mountains and is trapped on the ESRP. Then, the INEL experiences temperatures below normal for periods usually lasting for a week to ten days.

Soil

Soil temperatures have been recorded to depths reaching 7 ft below a bare sandy soil and asphalt surface. Freezing temperatures were recorded at a maximum depth of 3.25 ft below the bare soil surface. Beneath the asphalt surface, freezing temperatures were recorded at a depth of 3.8 ft. Freezing temperatures in the near-surface layer (1/2 in.) of the bare soil were indicated, on the average, during the winter months of November through February. Figure 12 and Table 9 illustrate and list the soil types found at the INEL.

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Figure 12 Map of the INEL showing soil types.

TABLE 9

Classification of soils on the INEL by mapping unit

Mapping Unit	Description
B1, B2, B9C, B10J, C1, C3	Thin loam over deep sands, gravels (surface glacial till underlying surface loam), and limestone alluvium.
E1, E2, E3, E4, E5, E6J, E7J, E8J, 04	Sandy loams derived from aeolian sands. Strongly calcareous, including cemented calcium carbonates. Overlies basalt rock. Stony to rocky north of the INEL.
F1	Playas in the sinks area. Strongly calcareous clay loam over low-permeability clay at approximately the root zone.
F2, F3, F4, F5, F6, F7	Similar to F1, with high sodium alkalinity.
G	Deep, well-drained, laminated clay loam. Moderately calcareous and slight sodic. Lacustrine sediments in playa east and south of Howe.
H, HJ	Sandy loam surface, low-permeability clay at room zone. Sand dunes in places. (Includes remnants of prehistoric Lake Terreton near Mud Lake.)
J	Sandy loam on alluvial fans. Moderate water-holding capacity. Local rockiness and shallow depth.
L1, L10Bi, L11Bi	Mixed geologic materials from hills an mountains Very shallow soils, very steep slopes, very rocky.
W2, W3, W4, W7, W8, W9, W11Bi, W12Bo, W10, W13J, W14Bi	Thin loess-covered basalt plains. Small areas surrounded by bare basalt. Stony to rocky.
Z1, Z2	Stream bottoms of the Big Lost River at the INEL. Generally moderate depth of soil and moderate water-holding capacity.
Z4, Z5	Alluvial materials of the Little Lost River drainage.

Precipitation

Since 1950, precipitation has been recorded at CFA, which is the only station at which precipitation is currently recorded. The average annual precipitation at CFA is 8.71 in. with a maximum daily precipitation (rain) of 1.64 in. recorded in June 1969. Snowfall as late as May and as early as September has been recorded. The highest monthly average snowfall occurs in December, with 6.4 in. January averages 6.1 in. Maximum snowfall amount in any 24-hour period was 8.5 and 8.6 in. in January and March. December's maximum snowfall has been 22.3 in., and January's has been 18.1 in.

Atmospheric Moisture

Atmospheric moisture has also been recorded at CFA since 1950. Wet bulb temperature, often used to design evaporative cooling systems, is the lowest temperature to which air can be cooled by evaporating water. The average monthly wet bulb temperatures range from a low of 14.7°F in January to a high of 50.3°F in July. The lowest single monthly average, 5.7°F, was recorded in January, and the highest single monthly average was recorded in August at 52.3°F. The lowest hourly wet bulb temperature recorded was -31.5°F in January, and the highest was 67°F in July. As expected, the greatest dry bulb/wet bulb temperature gradient occurs in summer.

Relative humidity, the ratio of the amount of water in a given volume of air to the amount required for saturation at the same temperature and pressure, is almost entirely a function of temperature. The highest relative humidity is observed in winter, when the average

mid-day relative humidity is about 55%. The lowest relative humidity occurs in summer, when the average mid-day relative humidity is about 18%.

Dewpoint temperature is the temperature to which air must be cooled, at a constant pressure and water content, for saturation to occur. The dewpoint temperatures provided here were calculated from the monthly and annual average air and wet bulb temperatures. The lowest average monthly dewpoint was 7.4°F in January, and the highest was 33.5°F in July. These dewpoint temperatures corresponded with the lowest and highest monthly average air temperatures of 16.5 and 69.0°F, respectively.

Mixing ratio is the mass of water per unit mass of dry air, usually expressed in units of grams of water per kilogram of dry air. Values of the mixing ratio were calculated for the same period of time as for dewpoint temperatures. The lowest average mixing ratio was 1.6 g/kg in January, and the highest was 4.8 g/kg in July.

Atmospheric Transport and Diffusion

Atmospheric transport of effluent is caused by wind, and atmospheric diffusion is caused by air current eddies and turbulence breaking up the effluent plume. The direction, rate, and extent of these two phenomena are affected by a great number of variables including the season, time of day, cloud cover, insolation, humidity, precipitation, topography, air stability, and structure wakes, as well as wind speed, direction, and time elapsed after a contaminant release. The nature of the effluent itself also affects its transport and diffusion including such factors

as particle size, electrical charge, solubility in gas or liquid, etc.

Several computerized mathematical models have been used by NOAA to predict the spread of effluent material released in a single puff and in a continuous stream. The models require actual measurements of wind direction and speed at different elevations, from different areas of the INEL, and measurements of several other factors that influence the transport and diffusion of airborne contaminants. Because the interacting forces are so numerous and complex, the use of these models is preferred for long distance transport and diffusion calculations. For longer distances, such as from a given INEL point to the nearest Site boundary, computer simulations are needed.

ENVIRONMENTAL REQUIREMENTS

National Environmental Policy Act

Any project undertaken by a Federal agency must undergo a review pursuant to the National Environmental Policy Act (NEPA) during the project preliminary design phase. NEPA documentation must be completed and approved prior to any construction activities. Construction and operation of the ALMR plant will require either an Environmental Assessment (EA) or an Environmental Impact Statement (EIS). The project appears to fit the following example of "actions which normally require preparation of EA's but not necessarily EIS's" (DOE Guidelines for NEPA Compliance, 52 FR 47662, Section D): "DOE actions which enable or result in engineering development activities, i.e., detailed design, development, fabrication, and test of energy

system prototypes."

Differences among sites at the INEL will not significantly affect the NEPA document.

Endangered Species Act

Only two species on the Endangered Species list are known to inhabit the INEL. These are the bald eagle and Pregrine falcon. Two other "candidate" species may also be present, the Swainson's hawk and Townsend's big-eared bat. The Swainson's hawk is known to nest in cottonwood trees along the Big Lost River and the big-eared bat may be present in caves on-site. For all INEL sites, no impact on the Swainson's hawk would be expected; however, the presence of caves in the vicinity of Site A may be of concern with respect to the big-eared bat.

The State of Idaho rare plant list and a survey of rare plants on the INEL (Cholewa and Henderson 1984), were reviewed. Apparently none of the three sites has any Idaho listed plant species.

Bald and Golden Eagle Protection Act

Any activity that might disturb bald or golden eagles requires a consultative review between the lead agency (DOE), and the U.S. Fish and Wildlife Service/ Idaho Fish and Game Commission. This is usually conducted as part of the NEPA process. No significant impact on either eagle species is anticipated from the ALMR project at the INEL.

Migratory Bird Treaty Act

This act applies primarily to waterfowl and migratory water birds, which are only occasionally present at the INEL in any significant

numbers (in wet years when the Big Lost River flows to the Sinks area). The project has no potential for impacting the river or the sinks on any of the proposed INEL sites.

Historic Resource Protection

Requirements of the National Historic Preservation Act (36 CFR 800), the American Antiquities Act (25 CFR 261 and 43 CFR 3), and the Archaeological Resources Protection Act and American Indian Religious Freedom Act (43 CFR 7) apply to the protection of historic and cultural properties at the INEL, including identified properties and those discovered during construction. Site A is the only site with potentially significant archaeological resources, i.e., a recently discovered cave with artifacts. However, it should be possible to locate the project within the Site A area so impacts can be avoided.

Environmental Survey

DOE Order 5484.1 specifies that any proposed facility that has the potential for adverse environmental impact or that will process, release, or dispose of pollutants must include an environmental survey. The survey is intended to provide baseline data from which impacts from a project can be predicted and later compared. The survey should begin about 20 years, but not less than one year, prior to actual startup. Past and present environmental characterization and monitoring programs at the INEL will provide much of the needed data.

NESHAPS

National Emission Standards
for Hazardous Air Pollutants

(NESHAPS), (40 CFR 61), establishes air emission standards for certain hazardous air pollutants and radionuclides, and limits for annual radiation doses to members of the public resulting from air emissions from DOE facilities. NESHAP requires that owners or operators who construct or modify facilities that emit or may emit radionuclides obtain approval from the EPA Administrator before commencing construction and operation. NESHAP approvals are routinely applied for and granted at the INEL and no difficulties in obtaining approval for the ALMR project are anticipated.

Clean Air Act

The State of Idaho Air Quality Bureau (AQB) has partial primacy for implementing the requirements of the Clean Air Act (42 USC 7401 et seq.). The AQB requires issuance of a Permit to Construct before construction commences on any stationary air pollution source. The AQB also specifies that any increase in radionuclide emissions (and increases above specified levels of certain nonradioactive pollutants) requires submittal of a Prevention of Significant Deterioration (PSD) review as part of the Permit to Construct application. Among the requirements for the PSD review are one year's ambient monitoring data and a Best Available Control Technology analysis. The existing Environmental Survey, for the INEL monitoring programs should satisfy the first requirement. No difficulties in obtaining the necessary State approvals and permits for the ALMR project are anticipated.

INEL Site Suitability

NRC Regulatory Guide 4.7 provides guidance on siting nuclear power stations. Some of the aspects which are considered are discussed elsewhere in this site selection document, including geology/seismology, atmospheric extremes and dispersion, population considerations, and hydrology. The remainder are discussed in this section.

Ecological Systems and Biota

This guidance specifies that "ecological systems and biota at potential sites and their environs should be sufficiently well known to allow reasonably certain predictions that there would be no unacceptable or unnecessary deleterious impacts on populations of important species or on ecological systems with which they are associated from the construction and operation of a nuclear power station at the site." Species are considered "important" if one or more of the following criteria applies:

1. The species is commercially or recreationally valuable,
2. The species is endangered or threatened
3. The species affects the well-being of some important species within criteria one or two or if it is critical to the structure and function of a valuable ecological system or is a biological indicator of radionuclides in the environment.

There are at least three species at the INEL which are "recreationally valuable" (i.e.,

they are hunted off-site), and therefore fit the definition of important species. These are pronghorn, elk and sage grouse. Up to one-third of the entire Idaho pronghorn population winters at the INEL, primarily on the northern portion of the site. Elk have recently become year-round residents on the INEL, with two apparently distinct herds. Sage grouse have numerous breeding sites, or leks at the INEL. At least one of these leks is located in the general area of Site A. Neither of the other two sites have leks in the vicinity. The importance of the three sites to pronghorn and elk is not known at this time; however, from what is known about ranges and habitat preferences of the two species, it is unlikely that siting the ALMR project at any of the three sites would have a significant impact on them.

Land Use and Aesthetics

This guidance calls for consideration of land-use plans adopted by Federal, State, regional, or local government entities, and resolution of any conflicts between such plans and use of a potential site. Because the INEL is on withdrawn Federal land and is committed to energy research and development, land-use conflicts are not an issue. The aesthetics guidance is principally concerned with siting power stations near natural resource-oriented public use areas. No such areas exist near enough to the INEL to be impacted aesthetically by the ALMR project.

Industrial, Military, and Transportation Facilities

This guidance calls for identifying potentially hazardous facilities within five miles of a

proposed site and evaluating potential accidents at those facilities. Both sites A and C would require such an evaluation.

Socioeconomics

This guidance calls for demonstrating that construction of a nuclear power station near distinctive communities will not adversely affect "the distinctive character" of the community. The small size of the ALMR project relative to total INEL activities makes it unlikely that there would be any such adverse effects.

Noise

Noise levels at proposed sites must comply with applicable Federal, State, and local noise regulations. Because of the remoteness of all three proposed ALMR sites, no conflict with noise regulations is expected.

Radioactive Waste Disposal

The INEL has extensive experience on the effects of radioactive waste disposal in the liquid form on the SRPA and in the solid form at the Radioactive Waste Management Complex (RWMC). The Near Term Safety Test gives 30,000 gal/yr of liquid and 400 ft³/yr of solid. The liquid waste averages about 82 gal per day or 0.06 gpm. Facilities and permits can be obtained to suitably dispose or treat and dispose of this volume of liquid. However, information is required to determine what concentrations of what constituents will be in the waste stream. The solid radioactive waste would comprise a volume of 7.5 by 7.5 by 7.5 ft and could probably be disposed at the RWMC on the INEL.

The Long Term Power Production indicates that 70,000 gal/yr of liquid radioactive waste would be generated. This is about 200 gal per day or 0.13 gpm. Facilities could be constructed to handle this waste or treat and dispose of the waste. Again, waste types and concentrations are needed to better address this problem. The solid waste volume of 1,000 ft³/yr is a size of ten ft by ten ft by ten ft and this could be disposed of at the RWMC on INEL if suitable permissions are obtained.

Nonradioactive Waste Disposal

The effects of nonradioactive waste disposal of 5,000 gal/day sanitary waste and 500 gpm industrial waste can be evaluated and facilities designed when waste amounts, types, and concentrations are available. The INEL has considerable experience in evaluation of the effects of such disposal. A large industrial septic system can be developed to handle the sanitary waste. The industrial waste will require detailed plans after more specific information is available.

The effects of nonradioactive waste for the Long Term Power Production can be resolved as stated above when more specific data are available.

Suitable for Long Term Power Production and Sales

Transmission line accessibility and right-of-way existing regional transmission intertie are within a few miles of all three candidate sites. Region intertie should handle reference Prototype Power Plant (155 mile). Higher electrical outputs would require additional transmission construction. Local utilities

presently in a power-surplus condition expect to need additional generation sources by year 2000 and have indicated interest in output from project.

Communications and Computing

A government-owned fiber transmission network (FTN) ties all major INEL areas together. This system along with other existing networks provides both data and voice trans-missions to meet current state-of-the-art capabilities. The INEL's large mainframe computers are located at the INEL Supercomputing Center (ISC). The ISC is a 33,000 sq. ft facility located in Idaho Falls, ID. Scientific and engineering computing is primarily performed on the INEL Cray X-MP/24 system computer.

The INEL's IBM 3090-180E system primarily supports the administrative and business functions of the INEL. The IBM 3083J system is used to support a nationwide low level waste and waste management related database. The INEL maintains these databases for a network of users throughout the United States. The CYBER 830 system is used primarily for scientific data processing. The HP-3000 system is used to monitor and accumulate data for the DOE-wide Safety Performance Measurement System (SPMS). SPMS provides safety performance profiles for various DOE activities. The information gathered through the SPMS is used to control accident losses. The VAX 11/750 provides a system for developing software that interfaces with the other system. This system has been dedicated to provide a computer-based environment to support uninterrupted system's development. Visualization in Scientific Computing (VISC)

laboratory within the INEL Supercomputer Center was developed to provide the necessary tools and expertise to render realistic computer images of symbolic concepts so that INEL computer users can visually interpret complex data. Current tools within the VISC lab include seven SUN and two DEC workstations with high speed links to the Cray X-MP/24 supercomputer and AMIGA 2000 system to produce 3-D animation.

Access

Roads

There are 87 miles of preferred roads within the INEL which meets or exceeds Idaho Transportation Department, Division of Highways Standards. These consist of state highways passing through the INEL with site-owned roads branching off of them. Site selection alternatives A and C have direct access to existing paved roads with Site B on a proposed paved road location.

Railroad

The Union Pacific Railroad line serves the southern portion of the site through the Scoville Spur. The size limit on rail shipments restrict loads to 15.5 ft high and 10.7 ft wide. A 160-ton gantry crane with a maximum spar of approximately 28 ft and a lift range of 23 ft is available at CFA to unload large shipments. Freight services are received from the Union Pacific Railroad's main lines from Butte, Montana, on the north, and Pocatello, Idaho, and Salt Lake City, Utah, on the south.

Existing Facilities

All services are available at INEL and many services are available at several locations. CFA provides or has available laboratory, maintenance support, administration buildings, guard houses, warehouses, personnel buildings, medical, fire protection, and a cafeteria to support the safety test requirements for all INEL ALMR siting options. Site A (near ANL-W) would also have available services at ANL-W. These services include fire protection, cafeteria, laboratory, maintenance support, administration buildings, guard houses, warehouses, and personnel buildings.

Large independent generator sources owned by three separate investor-owned utilities converge at the regional intertie connection within a few miles of all candidate sites at the INEL. All other required utilities and backup systems would be provided on site.

In 40 years of operation experience, Site operations have not been curtailed as a result of an incident.

Self contained plant staff includes specification, operations, security, safeguards, quality assurance, and health physics. Professionals in the above disciplines are available at the INEL and can provide support to all potential ALMR sites.

DOE provides bus services to all site areas. DOE currently operates a fleet of more than 100 government-owned buses to the INEL from residential areas. The bus route is shown in Figure 13. All work shifts, weekends, and holidays are supported. Fire stations are

located at CFA, TAN, and ANL-W, and provide Site-wide support. Medical services are provided to INEL employees through an INEL occupational program. Services include physical examination, treatment of both occupational and nonoccupational illnesses and injuries, employee assistance, and emergency response.

There is access to fuel a cycle facility at ANL-W. All potential INEL sites provide road access to ANL-W. Only Site A near ANL-W provides access without using state highways.

Auxiliary Power

INEL receives electrical power directly from a major interconnection on the regional Pacific Northwest power grid. Additionally, the 20 MW EBR-II provides significant non-firm energy to the INEL 138 kV power loop. There is generally a surplus of electric power in the region, and, under the present contract with Idaho Power Co. The power loop operates with a high degree of reliability due to the use of redundant paths and 24 -hour dispatching of the high-voltage line crew.

Electric Utility/Power Company Involvement

Idaho Power Co. has expressed interest and a willingness to head a consortium of local utilities to construct turbine generator facilities and the necessary transmission facility to allow for sale of generated power.

Figure 13. INEL Bus Routes

SAFEGUARDS AND SECURITY

Badging

Initially, all uncleared construction workers and any other uncleared plan personnel will need to be processed and badged at the Identification Building at CFA.

Initial Fuel Shipment

Due to the quantity and quality of plutonium that will be shipped to the ALMR project, there will need to be adequate security and fuel storage that will be in compliance with DOE orders. These security requirements will be discussed in detail in the future when site selecting has been completed.

Fuel Storage

As previously mentioned, fuel storage will need to be looked at in more detail when site selection is completed. Requirements for fuel storage will be directly related to quantity and quality of plutonium that is to be stored. Requirements change depending on if the fuel meets the self-protecting definition. (According to sources, there could be cold non-self-protecting fuel left over from the initial shipment for start-up.)

Fuel Shipments

The shipments from ANL-W to ALMR for reactor reload and the shipments from ALMR to ANL for reprocessing meet the self-protecting criteria. There will be the need for security escorts. Additional security details regarding fuel shipments will be addressed when site selection has become more complete.

10 CFR 100 Values (Off-site Dose Rate)

Per GE request, the off-site dose rate will not exceed the 10 CFR 100 values. The off-site dose rate shall be within 1 REM whole body count and 3 REM thyroid count.

ALMR Facilities (Guard House)

Based on the Bechtel ALMR plant arrangement diagram, there is a temporary guard house, however, there is no diagram/description of a permanent guard facility. Arrangements will need to be made in regard to security facilities should the ALMR project be built at the INEL.

INEL A, C, and D Sites

When only considering security-related advantages and disadvantages, the C site becomes more attractive than Sites A and D. When considering security-response times, security-training facilities, radio-alarm maintenance facilities, fiber-optic lines for alarms/communications, CFA Identification Building for initial badging, etc., it becomes apparent that there are some security-related advantages and possible cost savings if Site C were to be chosen over the remaining proposed sites. However, one disadvantage of having the ALMR site located near CFA (Site C) is that the fuel that is to be shipped to and from ANL-W and ALMR would take longer and utilize more roadway, thus providing more exposure to the fuel for potential accidents and/or security-related problems. The problems associated with fuel transportation could be minimized if an on-site controlled roadway existed between ANL-W and ALMR. The only Category 1 non-self-protecting shipment will

be the initial shipment for start-up. Therefore, the security concern (i.e., shipments on long stretches of public roadways) is minimized. Currently, the INEL Safeguards and Security program provides protective force response capability, radio- alarm installment/maintenance services, etc., to the ANL-W facility with satisfactory results. All of the previously mentioned proposed site locations are closer in distance than the ANL-W facility. Thus, due to maintaining satisfactory safeguards and security services at ANL-W, the same quality of service can be maintained for any one of the proposed site locations. EG&G Idaho Safeguards and Security rates the proposed sites in the following order when considering security only: Site C (number one), Site A (number two) and Site D (number three). The reasoning behind why Site D is third choice is because of the location. (Site D is located about five to six miles northeast of ICPP.) This location puts this site at a disadvantage when considering the distance from ANL-W and CFA.

MISCELLANEOUS INFORMATION

The ALMR project design incorporates a cask for fuel shipments. This cask is moved by railcar from the reactor to the Fuel Receiving, Storage and Shipping facility within the ALMR project for temporary storage. If the ALMR project is to be built in close proximity to the ANL-W facility (Area A), then it seems feasible to research the possibility of extending the railroad tracks to the ANL-W facility so that shipments can occur on railroad tracks, thus minimizing any security/safety hazards that are more apparent on public roadways or major traffic areas. The above-mentioned

railtrack addition could save manhours if GE plans to unload the cask in the fuel storage building and then at a later date reload this spent fuel on a truck for the ANL-W shipping destination. This would also reduce the amount of fuel that is to be stored at the Fuel Receiving, Storage and Shipping Facility.

The previously mentioned rail system could be reviewed as a future cost savings modification and could change the weight assigned to each proposed site selection area at the INEL. If this modification is valid and feasible, then it would seem that the other possible site areas within the INEL would receive a lower weight in this one area due to the cost factor of laying additional rail. Other sites logistically farther away than Site A (Sites B, C, and D) would be impacted by a lower weight factor due to their distance from ANL-W.

Cost Estimate

The costs of construction can be assumed to be the same for sites A, B, and C. Pre-operational costs need to include site selection, environmental requirements, licensing, permitting, administration, construction, legal, engineering and design, and baseline monitoring costs. The site selection considerations include studies of location and demography, geotechnical characteristics, geohydrology, seismicity and faulting, site archaeology, meteorology, and site stability. The site selection should also include infrastructure improvement estimates for roads, railroads, power, and water. Licensing includes the effort needed and any documentation needed to obtain NRC licensing. EIS costs include

monitoring, data collection, manual preparation, and public hearings for the facility and any new roads or power lines. Permits include any required building, air and/or water. Construction includes the building of the facility and the necessary construction management.

Engineering and design costs are to include designing the facility and associated utilities to meet the applicable codes, standards, and licensing requirements. Engineering should also include reliability studies, safety analysis reports, and meeting NEPA requirements. Legal fees for electrical utility contracts, permitting, licensing, and the environmental requirements should be included. Administration includes the project management and community regulations. Baseline monitoring includes groundwater, surface water, soil, and air sampling and monitoring.

Operating costs need to include start-up of facility, manpower or payroll costs, fuel, waste transport and disposal, equipment and building maintenance, spare parts, utilities, environmental monitoring (groundwater, air, or soil), and decontamination/decommissioning.

IDAHO NATIONAL ENGINEERING LABORATORY

Experience

Established in 1949 as the National Reactor Testing Station, the INEL hosts the largest concentration of nuclear reactors in the world. Over the years, 52 reactors, most of them first-of-a-kind facilities, have been built and operated under the direction of the DOE.

The INEL has a long tradition of pioneering advances in science. In 1951, one of the most significant

accomplishments of the century occurred at the INEL, the first use of nuclear fission to produce electricity. The first pressurized water reactor and boiling water reactor prototypes were also built and operated at the INEL in the 1950's.

The INEL is a leading center for nuclear safety research, defense programs, nuclear waste technology, and advanced energy concepts. Current programs include work in fusion energy, low-head hydropower, industrial energy conservation, environmental research, strategic and critical materials, computer code development for nuclear systems, materials testing, and advanced instrumentation development.

Comprehensive Infrastructure

The INEL has more than 4100 scientists and engineers experienced in large test programs and facilities. This is coupled with strong research and support organizations. Total INEL population exceeds 10,000 employees.

Remote, But Accessible Site

The 890-square mile area of the INEL Site provides excellent isolation, yet allows easy, controlled access by rail, truck, and air.

Outstanding Achievement Record

The INEL boasts a 98 percent record of on-time, on-budget project completion for the last 11 years--an era when the INEL's project load is ever-increasing.

Environmental Considerations

The entire INEL Site has been fully environmentally characterized. This translates to minimal environmental concerns, which means decreased expenditures and time delays caused by unexpected environmental impacts.

State, Federal, and Community Support

The INEL is proud of being a good Idaho neighbor. New programs generally enjoy support at all levels.

Existing On-Site Support Capability

The ALMR facility would be located only a short distance from CFA and/or ANL-W. Thus, the existing medical, fire, health and safety, food services, machine shop, instrument calibration, warehousing, and shipping/receiving capabilities would be immediately accessible.

In Brief

The land and water at the INEL are vast and available. The proximity to the fuel recycling source, ANL-W, is an important feature that cannot be stressed enough. NOAA's involvement with monitoring of the INEL for the past 40 years provides a extensive database. EG&G Idaho provides the expertise in the areas of research and engineering with a proven track record. These are just a few of the high points that the INEL has to offer. The INEL is a suitable location for the ALMR Safety Test with three sites which meet or exceed the criteria requirements.

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APPENDIX A

ALMR PROTOTYPE SITE SELECTION CRITERIA

1. OBJECTIVES

- A. Establish site selection process, priorities, magnitude, and constraints
- B. Apply process to INEL to select a reference site for evaluation.

2. ASSUMPTIONS

- A. Primary purpose of the ALMR Prototype is to perform a near term Safety Test to provide information to support Standard Design Certification. Secondary purpose is to operate during along term Power Production Phase to demonstrate operability, maintainability, inspectability, availability, and to recover a significant portion of the investment.
- B. Near Term Safety Test - one reactor module (including steam generator to bound possible requirements)
- C. Long Term Power Production - full power block (three reactors, three steam generators, one turbine-generator to bound possible requirements)
- D. Government owned site
- E. Fuel fabrication and reprocessing at Argonne National Laboratory - West (ANL-W)
 - Near Term 1 reactor
 - Long Term 3 reactors

SITE DESIGNATION A, C, AND D

DATE NOVEMBER 27, 1989

3. SITE SPECIFIC CRITERIA

A. Musts

YES

NO

1.	Less than or equal to 0.3g safe shutdown earthquake (ALMR design requirement)	<u>X</u>	<u> </u>
2.	Greater than 5 miles from capable fault (10 CFR 100, Appendix A, Part III defines capable fault)	<u>X</u>	<u> </u>
3.	Outside volcanic exclusionary zone (not defined in 10 CFR 100, but an acceptable definition is outside "recent" lava flows, at least 3 miles from "older" vents, and at least 5 miles from "recent" vents)	<u>X</u>	<u> </u>
4.	Above flood plain, both seismically induced and water runoff induce (10 CFR 100, Appendix A. For INEL, this must include above the Mackay Dam failure flood elevation)	<u>X</u>	<u> </u>
5.	Meet 10 CFR 100 population density requirements	<u>X</u>	<u> </u>
6.	Land Area		
a.	18 level acres, approximately square and fenceable (ALMR requirement)	<u>X</u>	<u> </u>
b.	600 acres exclusion zone (~0.5 mile around site boundary)	<u>X</u>	<u> </u>
7.	Acceptable meteorology, given any nearby existing structures (not defined in 10 CFR 100, but an acceptable definition must include meeting radiation limits at site boundary and downwind when plume interactions with nearby structures are included)	<u>X</u>	<u> </u>

SITE DESIGNATION A, C, AND D

DATE NOVEMBER 27, 1989

3. SITE SPECIFIC CRITERIA (continued)

A. Musts

YES

NO

8. Meet environmental requirements

a. National Environmental Policy Act of 1969 (42 USC 4321-4347)

X

b. Endangered Species Act of 1973 (50 CFR 17.11)

X

c. Bald and Golden Eagle Protection Act (50 CFR 10.13.22)

X

d. Migratory Bird Treaty Act (16 USC 703)

X

9. Meet NRC Site Suitability Requirements in Regulatory Guide 4.7

X

10. Water from on-site wells (shallower wells are generally cheaper)

a. Near Term Safety Test - 3,500 gpm

X

b. Long Term Power Production - 9,000 gpm

X

11. Suitable for long term power production and sales

a. Land

X

b. Transmission line accessibility and right of way

X

12. Availability

a. Initiation of formal NEPA process beginning in 1992, with on-site environmental studies including bore holes

X

b. Site preparatory work beginning in 1995, including access road construction, site leveling, and water well drilling

X

SITE DESIGNATION A, C, AND DDATE NOVEMBER 27, 1989

3. SITE SPECIFIC CRITERIA (continued)

B. <u>Wants</u>	WEIGHT	A	C	D
1. Near Term Safety Test (to minimize cost)				
a. Use of existing facilities (labs, maintenance shops, administration building, guard house, warehouse, personnel building, fire protection, cafeteria)	<u>8</u>	<u>8</u>	<u>10</u>	<u>6</u>
b. Use of existing services (security, safeguards, quality assurance, health physics, buses, medical, communications)	<u>7</u>	<u>8</u>	<u>10</u>	<u>6</u>
c. Use of existing support in - sodium technology and operations - operator training - waste handling - inspection and maintenance techniques	<u>8</u>	<u>10</u>	<u>9</u>	<u>9</u>
d. Ease of access to fuel cycle facility at ANL-W (for fuel fabrication and processing)	<u>9</u>	<u>10</u>	<u>8</u>	<u>9</u>
2. Long Term Power Production (to maximize plant availability)				
a. Independent of off-site utilities (power and water)	<u>8</u>	<u>10</u>	<u>10</u>	<u>7</u>
b. Independent of the activities of others (minimize power plant shutdowns due to activities of others, and minimize interference of others due to power plant operation)	<u>8</u>	<u>10</u>	<u>7</u>	<u>10</u>

SITE DESIGNATION A, C, AND D

DATE NOVEMBER 27, 1989

3. SITE SPECIFIC CRITERIA (continued)

B. <u>Wants</u>	WEIGHT	A	C	D
c. Self-contained plant staff (including operations, security, safeguards, quality assurance, health physics)	<u>8</u>	<u>10</u>	<u>10</u>	<u>10</u>
d. Use of some existing infrastructure (buses, fire protection, medical where there is minimal interference with activities of others)	<u>5</u>	<u>9</u>	<u>10</u>	<u>7</u>
e. Support for training operators, and for developing maintenance and inspection techniques (including test labs, simulators, and equipment)	<u>7</u>	<u>10</u>	<u>10</u>	<u>9</u>
f. Ease of access to fuel cycle facility at ANL-W (for fuel fabrication and processing)	<u>8</u>	<u>10</u>	<u>8</u>	<u>9</u>
3. Auxiliary Power				
a. Near Term Safety Test - 13 MWe (startup & operation)	<u>6</u>	<u>10</u>	<u>10</u>	<u>10</u>
b. Long Term Power Production - 18 MWe (startup only)	<u>3</u>	<u>10</u>	<u>10</u>	<u>10</u>
4. Telephone/Computer Communication Links	<u>4</u>	<u> </u>	<u> </u>	<u> </u>

SITE DESIGNATION A, C, AND D

DATE NOVEMBER 27, 1989

3. SITE SPECIFIC CRITERIA (continued)

B. Wants

5. Radioactive Waste Disposal

a. Near Term Safety Test

- (1) 30,000 gal/yr liquid (could be stored on-site)
- (2) 400 ft³/yr solid (could be stored on-site)

b. Long Term Power Production

- (1) 70,000 gal/yr liquid (need off-site disposal)
- (2) 1,000 ft³/yr solid (need off-site disposal)

6. Nonradioactive Waste Disposal

a. Near Term Safety Test

- (1) 5,000 gal/day sanitary (could be disposed on-site)
- (2) 500 gpm industrial

b. Long Term Power Production

- (1) 10,000 gal/day sanitary (could be disposed on-site)
- (2) 900 gpm industrial

WEIGHT	A	C	D
<u>7</u>	<u>10</u>	<u>10</u>	<u>10</u>
<u>7</u>	<u>9</u>	<u>10</u>	<u>8</u>
<u>6</u>	<u>10</u>	<u>10</u>	<u>10</u>
<u>5</u>	<u> </u>	<u> </u>	<u> </u>

SITE DESIGNATION A, C, AND D

DATE NOVEMBER 27, 1989

3. SITE SPECIFIC CRITERIA (continued)

B. <u>Wants</u>	WEIGHT	A	C	D
7. Meteorological services (to provide long term monitoring for environmental records)	<u>4</u>	<u>10</u>	<u>10</u>	<u>10</u>
8. Access (for Near Term Safety Test)				
a. Road (required for construction trucks and personnel)	<u>5</u>	<u>9</u>	<u>10</u>	<u>5</u>
b. Railroad track (a railhead to the site, or close to the site, is desirable for module shipments)	<u>4</u>	<u>3</u>	<u>10</u>	<u>5</u>
c. Barge	<u>1</u>	<u> </u>	<u> </u>	<u> </u>
9. Access (for Long Term Power Production)				
a. Road (required for truck deliveries and personnel)	<u>3</u>	<u>10</u>	<u>9</u>	<u>8</u>
b. Railroad track	<u>2</u>	<u>3</u>	<u>10</u>	<u>5</u>
c. Barge	<u>1</u>	<u> </u>	<u> </u>	<u> </u>
10. Electric utility/power company involvement (for constructing the turbine-generator facilities, for operating the whole plant, and for selling power)	<u>8</u>	<u> </u>	<u> </u>	<u> </u>
TOTAL		<u>1181</u>	<u>1201</u>	<u>1036</u>

APPENDIX B

APPENDIX B

DIFFERENTIATING CRITERIA SCORES FOR ALMR LOCATION ON THE INEL

<u>Want Criterion</u>	<u>Weighted Site Scores</u>			<u>Comments</u>
	A	C	D	
1. NEAR TERM SAFETY TEST				
a. Use of existing facilities	64	80	48	Site C is two miles from CFA which has all the existing facilities and services required for the Safety Test. Site A is two miles from ANL-W and does have access to some of the required facilities and services. Site D is approximately five to eight miles from any required facilities and services.
b. Use of existing services	56	70	42	
c. Use of existing support	80	72	72	ANL-W provides the Sodium Technology, therefore, Site A ranked higher.
d. Access to ANL-W Fuel Facility	90	72	81	Site A's proximity to the ANL-W ranked A higher than Sites C and D. Based on an assumption a new private road would need to be built.
2. LONG TERM POWER PRODUCTION				
a. Utility independence	80	80	56	Sites A/C are near existing facilities.
b. Activity independence	80	56	80	Site C ranked lower due to its close proximity to CFA, the most populated area on the INEL.
c. Self-contained plant staff	80	80	80	All sites scored the same due to location at the INEL.
d. Use of existing infrastructure	45	50	35	See comment 1A. Based on current operating conditions.
e. Training support	70	70	63	Sites A and C have the support.

	f. Access to ANL-W fuel Facility	80	64	72	See comment 1D.
3.	AUXILIARY POWER				
	a. Near Term Safety Test	60	60	36	Sites A and C would be tied into the Antelope Sub-Station as a part of the INEL power loop. Site D has a cost impact to be tied into the existing loop.
	b. Long Term Power Production	30	30	30	Due to future planned electrical support all sites are equal.
4.	TELEPHONE/COMPUTER LINK	40	40	36	See comment 1A.
5.	RADIOACTIVE WASTE DISPOSAL				
	a. Near Term Safety Test	70	70	70	Safety tests are not considered commercial and produce relatively small amounts of waste. All sites would be handled at the INEL RWMC. Two evaporators are located at the INEL, one at CFA and the other at ANL-W. All sites are equal, the waste amounts are so insignificant they would be stored on site.
	b. Long Term Power Production	63	70	56	Presently there are three commercial radioactive waste disposal sites, none are in Idaho. Will federal regulation allow ALMR to use DOE Facilities?
6.	NONRADIOACTIVE WASTE DISPOSAL				
	a. Near Term Safety Test	60	60	60	See comment 5A.
	b. Long Term Power Production	--	--	--	No score will be given to any site until a concept for taking care of non-radioactive waste has been developed.

7.	METEOROLOGICAL SERVICES	40	40	40	NOAA has been recording meteorological data for ten years and has developed systems for technological monitoring. However, the INEL has 40 years of records. All sites ranked equal.
8.	ACCESS FOR NEAR TERM				
	a. Road	45	50	25	Site C had best access to existing roads, Site A require minimal extension, Site D would require all new roads.
	b. Railroad track	12	40	20	The rail system at the INEL arrives at CFA. Spurs could be added for Sites A and D. The scores reflect the estimated expense.
	c. Barge	--	--	--	No score - Barge not available at INEL.
9.	ACCESS FOR LONG TERM				
	a. Road	30	27	24	Site A best since access to ANL-W during Long Term Power Production Phase is more critical due to fuel reprocessing and services.
	b. Railroad track	6	20	10	See comment 8b. The three potential sites would be serviced by truck transport after arriving at CFA.
	c. Barge	--	--	--	No score - Barge not available at INEL.
10.	POWER COMPANY INVOLVEMENT	--	--	--	No score - Future negotiation between DOE-ID, GE and Power Company is required.
	TOTAL WEIGHTED SITE SCORES	1181	1201	1306	