Chapter 6
Resource Commitments

6.0 RESOURCE COMMITMENTS

This section describes: any unavoidable adverse environmental impacts that could result from implementation of the alternatives; the irreversible and irretrievable commitments of resources; and the relationship between short-term uses of the environment and long-term productivity. Unavoidable adverse environmental impacts are impacts that would occur after implementation of any mitigation measures. Resources that would be irreversibly and irretrievably committed are those that cannot be recovered or recycled and those that are consumed or reduced to unrecoverable forms. The relationship between short-term uses of the environment and long-term productivity addresses issues associated with the condition and maintenance of existing environmental resources used to support the proposed action and the function of these resources after their use.

6.1 Unavoidable Adverse Environmental Impacts

Implementing any of the alternatives considered in this *Versatile Test Reactor Environmental Impact Statement* (VTR EIS) would result in varying degrees of unavoidable adverse environmental impacts. As described in Chapter 4, and summarized in Chapter 2, Section 2.9, these impacts are expected to be minor overall and would arise from incremental impacts attributed to the construction and operations of the VTR and associated facilities at the candidate sites.

6.1.1 Construction

As described in Chapter 4, construction of a VTR and associated facilities at any site would result in land disturbance, air emissions and noise, damage to the soil profile, stormwater runoff and soil erosion, damage to wildlife habitat, consumption of utilities and material resources including labor, generation of waste, and increased vehicle traffic that would be unavoidable, even with the application of best management practices. Activities performed to modify or upgrade existing facilities to support VTR operation (such as modification of existing post-irradiation examination, reactor fuel, and spent nuclear fuel (SNF) conditioning facilities at Idaho National Laboratory [INL]) would also result in some unavoidable adverse impacts that would generally be similar to but less than those noted above for construction of new facilities. Also, activities that would modify contaminated facilities or equipment, would result in worker radiation exposure and would generate radioactive wastes. Although some of the impacts would be unavoidable, construction activities are expected to have minor impacts overall and would be temporary in nature (i.e., lasting less than 5 years).

6.1.2 Operations

As described in Chapter 2, Sections 2.4 and 2.5, the completed VTR complex would occupy up to 25 acres at the Materials and Fuels Complex (MFC) at the INL Site or 50 acres at the Oak Ridge National Laboratory (ORNL), and is assumed to operate for 60 years. As described in Chapter 4, operation of a VTR and associated facilities at any site would result in committing land to that use for the operations period, generation of air emissions and noise, generation of stormwater, radiation exposure to workers and the public, consumption of utilities and material resources including labor, generation of waste, and increased vehicle traffic that would be unavoidable, even with the application of best management practices.

Operation of new or modified facilities at any of the candidate sites would produce minimal unavoidable adverse impacts on air quality and climate change. Emissions would be associated with facility emissions, testing of emergency generators, employee vehicle trips, delivery vehicle trips, and truck trips for transporting waste to offsite management facilities.

VTR and associated facility operations would result in unavoidable radiation and chemical exposure to workers and the general public. Workers would be exposed to radiation and chemicals associated with material handling, reactor fuel fabrication, reactor operation, and SNF and waste management. The public would be exposed to minor radioactive emissions during facility operations and small amounts of direct radiation during radioactive material and waste transportation. Independent of the characteristics of the cargo, there would be unavoidable risks of accident fatalities among members of the public resulting from the physical forces imposed by traffic accidents. The risks from facility operation to the general population, maximally exposed offsite individual, and workers are discussed in Chapter 4, Section 4.10. The risks from transportation of radioactive materials and wastes to the general population, maximally exposed offsite individual, and transportation crew are discussed in Section 4.12.

Also unavoidable would be the generation of radioactive, hazardous, mixed, and solid waste associated with normal facility operations. Any waste generated during operations would be collected, packaged, and eventually removed for recycling or disposal in accordance with applicable U.S. Environmental Protection Agency and/or State regulations. Recycling of solid waste is preferable because it would avoid the impacts of disposal. Sanitary wastewater would also be generated and disposed of through onsite wastewater treatment systems.

Under the No Action Alternative, operation of existing reactors and associated facilities would also result in similar unavoidable adverse impacts.

Future decontamination and decommissioning of reactors and associated facilities (see Chapter 4, Section 4.16) would result in unavoidable adverse impacts in terms of air emissions, worker radiation exposure, consumption of fuel and labor, and waste generation.

6.2 Irreversible and Irretrievable Commitment of Resources

Table 6–1 presents the commitment of resources related to construction activities under the Action Alternatives at INL, ORNL and Savannah River Site (SRS). Implementation of any of the alternatives, would entail the commitment of land, energy (e.g., electricity, fossil fuels) and water, labor, and materials and resources (e.g., steel, concrete, crushed stone, soil). In general, the commitments of energy, many materials, and labor, would be irreversible and, once committed, these resources would be unavailable for other purposes.

Table 6–2 presents the commitment of resources related to facility operations, over the projected periods of operation, of the reactor fuel capability, VTR, post-irradiation examination facilities, SNF conditioning capability, and spent fuel pad at INL, ORNL, and SRS as applicable.

6.2.1 Land

Operation of the VTR and associated facilities would require the commitment of land to the prescribed use over the 60-year operating period considered in this VTR EIS. Thus, land would be committed during the operational period, but not necessarily irreversible over the long term. Over the long term, the land that would be occupied by either existing or proposed facilities could ultimately be returned to another use if the buildings, roads, and other structures were removed. Alternatively, at the end of their VTR-related mission, facilities could be converted for other beneficial uses. In addition, the disposal of waste would entail the irreversible commitment of land.

Table 6–1. Commitment of Construction/Modification Resources under the Action Alternatives and Options

	INL			*ORNL*	*SRS*
	VTR Alternative	*Reactor Fuel Production Options*	*Total*	*VTR Alternative*	*Reactor Fuel Production Options*
Land Use					
Disturbed land (acres)	100	NA	100	150	Minimal
Energy and Water					
Electricity (megawatt-hours)	4,300	Minimal	4,300	5,600	Minimal
Diesel fuel, gasoline (gallons)	2,700,000	300	2,700,000	3,800,000	24,000
Water (gallons)	128,000,000	460,000	129,000,000	167,000,000	18,000,000
Labor					
Full-time equivalent (person-year)	2,700	36	2,800	3,700	720
Materials and Resources					
Acetylene, Oxygen, Nitrogen, CO_2, Argon (cubic feet)	4,600,000	Minimal	4,600,000	6,000,000	130,000
Asphalt (cubic yards)	1,400	NA	1,400	3,300	NA
Backfill and Landscaping (cubic yards)	200,000	NA	200,000	300,000	7,200
Cable and Wire (linear feet)	1,200,000	–	1,200,000	1,600,000	170,000
Cable Tray (linear feet)	18,000	–	18,000	23,000	4,900
Concrete and Cement (tons)	110,000	–	110,000	150,000	1,600
Conduit (linear feet)	270,000	–	270,000	410,000	150,000
Crushed stone, gravel, sand, rip rap (tons)	68,000	–	68,000	110,000	4,600
Ductwork (pounds)	–	–	–	–	100,000
Formwork (square feet)	–	–	–	–	72,000
Fencing (linear feet)	NA	NA	NA	10,000	NA
Helium (cubic feet)	–	Minimal	Minimal	–	2,300
Lumber (tons)	250	NA	250	330	NA
Paints, Coatings, and Sealants (square feet)	–	–	–	–	250,000
Piping (linear feet)	32,000	–	32,000	41,000	28,000
Road base geotextile (square feet)	NA	NA	NA	380,000	NA
Steel (tons)	8,600	–	8,600	11,000	1,200

– = use of material was not identified as significant; INL = Idaho National Laboratory; NA = not applicable; ORNL = Oak Ridge National Laboratory; SRS = Savannah River Site; VTR = Versatile test Reactor.

Notes:

- VTR includes supporting facilities (i.e., post-irradiation examination facilities, spent fuel conditioning capability, and spent fuel pad).
- Assumes 51-month construction period for VTR, 2 years for Reactor Fuel Capability at INL, and 3 years for Reactor Fuel Capability at SRS.
- Only chemicals used in quantities of over 1,000 pounds are shown in the table. Other chemicals and gases would be used in smaller quantities.
- Values rounded to 2 significant figures.

Sources: Appendix B.

Table 6–2. Commitment of Operations Resources under the Action Alternatives and Options

	INL			ORNL	SRS
	VTR Alternative	Reactor Fuel Production Options	Total	VTR Alternative	Reactor Fuel Production Options
Land Use					
Occupied land (acres)	25	NA	25	50	Minimal
Energy and Water					
Electricity (megawatt-hours)	9,000,000	1,200,000	10,000,000	12,000,000	1,200,000
Diesel fuel (gallons)	550,000	210,000	760,000	710,000	630,000
Propane (cubic feet)	5,600,000	1,000,000	6,600,000	5,600,000	2,000,000
Water (gallons)	260,000,000	140,000,000	400,000,000	260,000,000	170,000,000
Labor					
Full-time equivalent (person-years)	18,000	36,000	54,000	18,000	36,000
Materials and Resources					
Acetone (pounds)	1,000,000	NA	1,000,000	1,000,000	NA
Adhesive (pounds)	420,000	NA	420,000	420,000	NA
Alcohol (pounds)	2,600,000	110,000	2,700,000	2,600,000	–
Aluminum nitrate nanohydrate (pounds)	NA	40,000	40,000	NA	40,000
Ammonium hydrozide (pounds)	420,000	NA	420,000	420,000	NA
Antifreeze (pounds)	100,000	NA	100,000	100,000	NA
Argon/carbon dioxide/ hydrogen/methane/methanol/ oxygen (cubic feet)	270,000	2,000,000,000	2,000,000,000	270,000	3,400,000,000
Acsorbic acid (pounds)	NA	13,000	13,000	NA	13,000
Compressed helium (cubic feet)	90,000	95,000,000	95,000,000	90,000	160,000,000
Compressed neon (gallons)	360,000	NA	360,000	360,000	NA
Coolant (pounds)	84,000	NA	84,000	84,000	NA
Decon (pounds)	840,000	NA	840,000	840,000	NA
Gasoline (gallons)	790,000	NA	790,000	790,000	NA
Graphite (pounds)	NA	66,000	66,000	NA	66,000
Groundskeeping (pounds)	110,000	NA	110,000	110,000	NA
Polymer resin (pounds)	NA	5,300	5,300	NA	5,300
Hydroxylamine nitrate (pounds)	NA	17,000	17,000	NA	17,000
Liquid argon (cubic feet)	3,700,000	NA	3,700,000	3,700,000	NA
Liquid nitrogen (cubic feet)	200,000	NA	200,000	200,000	NA
Metal cleaner (pounds)	120,000	NA	120,000	120,000	NA
Oils and lubricants (pounds)	6,200,000	NA	6,200,000	6,200,000	NA
Oxalic acid (pounds)	NA	190,000	190,000	NA	190,000
P-10 argon/10% methane gas (cubic feet)	190,000	NA	190,000	190,000	NA
Paints, coatings, and sealants (pounds)	1,100,000	NA	1,100,000	1,100,000	NA
Plutonium (metric tons)	NA	34	34	NA	34
Potassium fluoride (pounds)	NA	79,000	79,000	NA	79,000
Quartz (pounds)	NA	400,000	400,000	NA	400,000
Refrigerants (pounds)	850,000	NA	850,000	850,000	NA
Sodium hydroxide solutions (pounds)	470,000	5,700	470,000	470,000	5,700

	INL			ORNL	SRS
	VTR Alternative	Reactor Fuel Production Options	Total	VTR Alternative	Reactor Fuel Production Options
Sodium hypochlorite (pounds)	72,000	NA	72,000	72,000	NA
Sulfuric, nitric, hydrochloric, and boric acids (pounds)	40,000,000	18,000,000	57,000,000	40,000,000	18,000,000
Uranium (metric tons)	NA	120	120	NA	120
Yttria (pounds)	NA	1,200	1,200	NA	1,200
Zirconia mold wash (pounds)	NA	12,000	12,000	NA	12,000
Zirconium (metric tons)	NA	17	17	NA	17

– = use of material was not identified as significant; INL = Idaho National Laboratory; NA = not applicable; ORNL = Oak Ridge National Laboratory; SRS = Savannah River Site; VTR = Versatile Test Reactor.

Notes:

- VTR includes supporting facilities (i.e., post-irradiation examination facility, spent fuel conditioning capability, and spent fuel pad).
- Assumes 60 year operations period.
- Only chemicals used in quantities of over 1,000 pounds are shown in the table. Other chemicals and gases would be used in smaller quantities.
- Values rounded to 2 significant figures.

Sources: Appendix B.

6.2.2 Energy and Water

Energy expended to support construction and operation of the VTR and associated facilities would be in the form of electricity to operate equipment and fossil fuels to operate equipment (including heating equipment) and vehicles. Consumption of electricity (from certain sources) and fossil fuels would be an irretrievable commitment of nonrenewable resources. Some of the water consumed for construction and operation (e.g., water used in concrete) would constitute an irreversible commitment and would not be available for other uses. Some water, such as that discharged from wastewater treatment facilities, would return to the natural hydrologic cycle and would not be irreversibly and irretrievably committed.

6.2.3 Materials and Resources

The irreversible and irretrievable commitment of materials, equipment, and other resources comprises those used in the construction and modification of facilities, and those used during operations. This includes materials that cannot be recovered or recycled, materials that are contaminated and cannot be effectively decontaminated, and materials consumed or reduced to unrecoverable forms of waste. Principal construction materials would include concrete (a product of cement, sand, and gravel), crushed stone, and steel, although other materials such as wood, gases, and other metals would also be used. For practical purposes, materials including concrete incorporated into the framework of existing or new facilities would be unrecoverable and irretrievably lost. Some materials such as uncontaminated steel and other metals may be recycled when the facility is eventually decontaminated, decommissioned, and demolished. Materials such as uranium, plutonium, and zirconium used in the reactor fuel during operations would be disposed of as SNF and therefore would be irreversibly and irretrievably committed. Employee labor during construction and operations would also be irreversibly and irretrievably committed.

6.3 Relationship Between Short-Term Uses of the Environment and Long-Term Productivity

Each of the action alternatives would entail similar relationships between short-term uses of the environment and long-term productivity. However, there would be differences in the relative magnitude of the short-term uses based on differences in location, including use of existing versus new facilities, utility and transportation infrastructure availability, and labor availability and utilization. Regardless, upon completion of the useful life of the VTR and associated facilities at any of the candidate locations, land and facilities could be returned to other uses, including long-term productive uses.

Air emissions associated with the VTR and associated facilities would introduce small amounts of radiological and nonradiological constituents to the air. As described in Chapter 4, over the assumed 60-year operating period, these emissions would result in additional environmental loading and exposure to human receptors, but would not impact compliance with air quality or radiation exposure standards. Because of the very small quantities of constituents released and the short half-life of many of the constituents, there would be no substantial residual environmental effects on long-term productivity.

At the INL Site, losses of wildlife and sagebrush habitat during construction are possible. At ORNL, losses of wildlife and forested and aquatic habitat during construction are possible. Land clearing and construction activities would disperse wildlife and temporarily eliminate habitat. These short-term disturbances of wildlife and habitat could cause long-term reductions in the biological productivity of an area. Although some wildlife and habitat destruction would be inevitable during construction, these losses would be minimized by timing land disturbance to avoid nesting and mating seasons, by compensation of certain lost habitats (e.g., sagebrush and/or wetlands, and by restoration of temporarily disturbed habitat where possible. Groundwater at the INL Site and SRS, or surface water at ORNL, would be used to meet process and sanitary water needs over the construction and operations periods. After use and treatment, most of this water would be released through outfalls into evaporation basins or surface water streams. The withdrawal, use, treatment, and discharge of water is not likely to affect the long-term productivity of this resource.

The disposal of waste would require energy and labor, and space at disposal facilities. The land occupied for waste disposal would require a long-term commitment and a reduction of the long-term productivity of the land.

After the operational life of the VTR and associated facilities, DOE could decontaminate and decommission the facilities in accordance with applicable regulatory requirements and then repurpose the facilities for other productive uses. Alternatively, DOE could demolish the facilities and then restore the areas occupied by the facilities for other productive uses. Demolition activities could have short-term impacts similar to those normally associated with construction activities. Appropriate environmental regulatory reviews, including National Environmental Policy Act reviews, would be conducted before initiation of decontamination, decommissioning, and demolition actions.

Under the No Action Alternative, environmental resources have already been, and continue to be, committed to operation of existing reactors and supporting facilities. Similar to the Action Alternatives, upon completion of their useful life, land and facilities used under the No Action Alternative could be returned to other uses, including long-term productive uses.