Section 7.0
Cost Benefit Analysis

7.1 ECONOMIC AND SOCIAL EFFECTS OF THE PROPOSED PIÑON RIDGE MILL

This section of the ER builds upon the analysis of potential impacts presented in Section 4.0 to evaluate the potential economic and social effects of the Proposed Action. There are limitations on the extent to which the economic and social benefits and costs of the Proposed Action can be evaluated. Some of the project's benefits and costs are measurable, such as product sales, capital costs, operating and maintenance costs, decommissioning costs, regulatory compliance costs, labor income, tax revenues, and regional output. On the other hand, some potential environmental costs of the Proposed Action and their potential economic and social consequences are not readily quantifiable. Pursuant to NRC Regulatory Guide 3.8 (NRC, 1982a) and NUREG 1748 (NRC, 2003a), this section compares the value of the costs and benefits that can be quantified through a cost-benefit analysis, and discusses qualitatively the costs and benefits that cannot be measured monetarily.

7.1.1 Benefits

The Proposed Action would be a private venture and, as such, would not have a direct public purpose. However, because the Proposed Action would support the expansion of domestic uranium sources, much of which would eventually be used in nuclear reactors to generate electricity, it would have a public benefit. Existing statues obligate the U.S. Secretary of Energy to have a "continuing responsibility" for the domestic uranium mining industry "to encourage use of domestic uranium" (42 USC §§2201b and 22966b-3). The NRC recognizes that the viability of the industry is a federal concern and that there is a public interest in the domestic uranium supply. Between 1996 and 2008, annual uranium production decreased by 38 percent in the United States (EIA, 2009b). In 2008, 14 percent of the 53 million pounds of uranium oxide (U_3O_8) purchased by U.S. civilian nuclear power plants was supplied by domestic sources, and 86 percent was supplied by foreign sources. Australian-origin and Canadian-origin uranium together accounted for 42 percent of the 53 million pounds. Uranium originating in Kazakhstan, Russia and Uzbekistan accounted for 33 percent, and the remaining 11 percent originated from Brazil, Czech Republic, Namibia, Niger, South Africa, and the United Kingdom (EIA, 2009b).

Potential benefits associated with the Proposed Action would include the value of the Mill's products: uranium oxide (U_3O_8), also known as yellowcake, and processed vanadium. Yellowcake is the raw material for nuclear fuel that, after conversion and enrichment, is processed into fuel rods. When placed in a reactor, the fuel rods provide the heat to produce steam to generate electricity. With the exception of hydropower (which accounts for 3 percent of the U.S. supply of electricity), nuclear power is the only source of carbon emissions-free, reliable baseload electricity. Worldwide, there are currently 436 nuclear power plants producing 15 percent of the global electrical power supply. In the United States, 104 nuclear power plants are producing 20 percent of the domestic supply of electricity (World Nuclear Association, 2009a). The EIA forecasts that the annual demand for electricity in the United States will increase by 26 percent between 2007 and 2030 (EIA, 2009c). Meeting this increase in demand through domestically supplied uranium has the potential to increase national energy independence and address climate change concerns.

Yellowcake is also used in small nuclear reactors to produce isotopes for medical, industrial and research purposes around the world. The primary use of vanadium oxide, or black-flake, is as an alloying agent in the manufacture of high strength, low-alloy steels, which are known for their increased strength and durability. Vanadium is used in several applications, including surgical

instruments, tool and die steels, engineering alloy steels used in axles, crankshafts and gears, stainless steels, rail steels, and titanium alloys. Additionally, vanadium serves as a catalyst in numerous industrial processes. Work is currently underway to develop a new, large-scale battery technology known as vanadium redox battery, which would enhance the benefits of renewable energy sources. This newly proposed vanadium battery will have the ability to store large quantities of electrical energy with minimum storage losses and can quickly discharge energy to the electrical grid.

Thus, the potential benefits of the output associated with the Proposed Action are spread across the national and global economies. The major potential benefits to the state and local communities would include tax revenues, employment income, and regional output that would be generated by the Mill. Property tax revenues would accrue to Montrose County, the RE-2 West End School District, Montrose Library District, Southwest Water Conservation District, and San Miguel Water Conservancy District throughout Mill Facility construction, operations, and closure. During all of these phases, the State of Colorado, Montrose County, the towns of Naturita and Nucla, and numerous other localities across the region and state would receive sales tax revenue from the sale of taxable goods to the Mill Facility, its employees and other workers whose jobs are supported by the Mill Facility. The potential employment benefits of the Proposed Action include the income derived from the estimated 326 jobs that would be created during Mill construction, the 315 jobs that would be generated by the Mill's annual operations, and the 15 jobs related to Mill closure.

The potential benefits of the Mill's products, its fiscal and employment impacts, and the increase in income and regional productivity can be quantified monetarily and are included in the cost-benefit analyses shown in Tables 7.1-1 and 7.1-2.

7.1.2 Costs

The primary internal costs associated with the Proposed Action include the capital costs of land acquisition and improvement, and facility construction; operating and maintenance costs; plant decommissioning, closure, and site reclamation costs; and regulatory costs associated with permitting and oversight.

The Proposed Action would also have external costs that would not be borne directly by Energy Fuels. Some of these costs can be estimated quantitatively. For example, the Site's transition from grazing land to industrial use would result in the long-term loss of 722 acres of seasonal grazing land. This loss would continue throughout Mill construction, operations and closure. The restricted tailings area, which includes approximately 158 acres, would be permanently lost as seasonal grazing land. The grazing losses can be estimated by considering the Site's livestock carrying capacity, grazing fees and lost grazing acreage. Similarly, there is an opportunity cost to the surrounding community of the Mill's consumptive use of 227 acre feet of water per year. From an economic perspective, the opportunity cost of this water use is the amount that would have been paid for water withdrawn from the supply system by the next (or marginal) user. Along with the internal costs noted above, these external costs are quantified and included in the cost benefit analyses presented in Tables 7.1-1 and 7.1-2.

There are several potential external costs associated with the Proposed Action that are not amenable to monetary quantification. These costs, which would be widely disbursed among members of surrounding and extended communities, are summarized in Section 5.0 and discussed below.

- Increased truck traffic on rural county highways. Potential traffic impacts to surrounding landowners and recreationists during construction and operations.

- Displacement of native species and herbivores, and the potential spread of invasive plants and noxious weeds due to long-term surface disturbance and heavy truck traffic into the Site.

- Potential drawdown of groundwater in off-site wells in the vicinity of the Proposed Action.

- Potential impacts on endangered fish species due to water withdrawals (227 acre feet per year) from the Upper Colorado River Basin.

- Wildlife losses associated with habitat disturbance and loss and increased traffic would be likely to include burrowing owls, sage grouse, prairie dogs, pocket gophers, mule deer, elk, pronghorn, turkeys, waterfowl and migratory birds.

- Fugitive dust emissions from equipment and diesel engine emissions during construction. Fugitive and non-fugitive air emissions (primarily PM_{10} and VOC) during operations.

- Potential increases in the price and limited availability of short-term housing during Mill construction.

Building upon the potential costs to environmental resources noted above, it is widely recognized that there are some values for natural resources that are not amenable to monetary quantification, and thereby excluded from cost-benefit analyses of activities that impact environmental resources. For example, some people may derive benefits from knowing that undeveloped open space and wildlife habitat exist in the Paradox Valley, or from knowing that these amenities would be available for future generations to enjoy. Although survey techniques (known as contingent valuation methodology) have been developed to estimate non-use and other values for natural resources that are not expressed in monetary terms, their use in government agency cost-benefit analyses has been limited. Although they are not included in the cost-benefit analysis for the Proposed Action, some non-market values for natural resources would be likely to be affected to a limited extent.

7.1.3 Cost-Benefit Analysis

NRC guidance recommends that the benefits and costs of a proposed action that can be expressed monetarily should be discounted to present values (NRC, 1982). Based on Office of Management and Budget (OMB) guidance, the NRC recommends that present value calculations be presented using real discount rates of 3 percent and 7 percent (NRC, 2004). The 3 percent rate approximates the real rate of return on long-term government debt, which serves as a proxy for the real rate of return on savings. This rate is appropriate when the primary effect of a regulation is on private consumption. Alternatively, the 7 percent rate approximates the marginal pretax real rate of return on an average investment in the private sector, and is the appropriate discount rate whenever the main effect of a regulation is to displace or alter the use of capital in the private sector.

Table 7.1-1 compares the present value of the Proposed Action's costs and benefits at a 3 percent discount rate, and Table 7.1-2 compares the project's costs and benefits at a 7 percent discount rate. The project's benefit-cost ratio is 5 to 1 at a 3 percent discount rate, and 6 to 1 at a 7 percent discount rate.

Table 7.1-1
Cost Benefit Analysis for the Piñon Ridge Mill – 3 percent discount rate

Benefits	Present Value	Costs	Present Value
		Internal Costs	
Mill Output (sales)[1]	$2,331,925,894	Land Acquisition, Facility Construction[4]	$130,167,485
		Operating and Maintenance Costs[4]	$551,033,049
Tax Revenues:	$34,046,386	Decommissioning and Closure Costs[4]	$3,268,461
State of Colorado[2]	$7,813,734	Regulatory Costs[5]	$3,459,294
Montrose County[2,3]	$10,701,863	Permitting Fees	$388,350
Town of Naturita[2]	$1,353,024	Regulatory Oversight	$3,070,944
Town of Nucla[2]	$1,353,024	**Total Internal Costs**	**$687,928,289**
RE-2 West End School District[2]	$11,073,815		
Montrose Library District[2]	$1,636,419	**External Costs**	
Southwest Water Conservation District[2]	$92,289	Loss of Grazing Land[6]	$8,371
San Miguel Water Conservancy District[2]	$22,218	Consumptive Water Use[7]	$58,545
		Total External Costs	**$66,916**
Labor Income[1]	$432,635,820		
Regional Output (sales)[1]	$840,621,472		
Total Benefits	**$3,639,229,572**	**Total Costs**	**$687,995,205**
Benefit Cost Ratio:5.3:1			

[1] Based on IMPLAN modeling results.
[2] Based on annual Mill property values provided by Energy Fuels (Vigil, 2009) and property tax rates provided by the Montrose County Assessor's Office (Montrose County, 2009d).
[3] Based on annual sales tax revenue estimated in Section 4.0.
[4] Based on information in the *Mill Decommissioning and Reclamation Cost Estimate* (Energy Fuels, 2009h).
[5] Based on permitting and oversight cost information provided by Energy Fuels (Filas, 2009).
[6] Based on grazing lease information provided by BLM (Stindt, 2009).
[7] Based on water rate information provided by Town of Naturita (Carver, 2009).

Table 7.1-2
Cost Benefit Analysis for the Piñon Ridge Mill – 7 percent discount rate

Benefits	Present Value	Costs	Present Value
		Internal Costs	
Mill Output (sales)[1]	$1,294,685,842	Land acquisition, facility construction[4]	$125,301,411
		Operating and maintenance costs[4]	$317,814,607
Tax Revenues:	$21,818,758	Decommissioning and closure costs[4]	$611,357
State of Colorado[2]	$5,188,044	Regulatory Costs[5]	$2,031,613
Montrose County[2,3]	$6,763,927	Permitting Fees	$373,832
Town of Naturita[2]	$762,760	Regulatory Oversight	$1,657,781
Town of Nucla[2]	$762,760	**Total Internal Costs**	**$445,758,988**
RE-2 West End School District[2]	$7,202,458		
Montrose Library District[2]	$1,064,334	**External Costs**	
Southwest Water Conservation District[2]	$60,025	Loss of grazing land[6]	$4,566
San Miguel Water Conservancy District[2]	$14,450	Consumptive Water Use[7]	$33,766
		Total External Costs	**$38,332**
Labor Income[1]	$245,233,657		
Regional output (sales)[1]	$479,224,412		
Total Benefits	**$2,040,962,669**	**Total Costs**	**$445,797,320**
Benefit Cost Ratio: 4.6:1			

[1] Based on IMPLAN modeling results.
[2] Based on annual Mill property values provided by Energy Fuels (Vigil, 2009) and property tax rates provided by the Montrose County Assessor's Office (Montrose County, 2009d).
[3] Based on annual sales tax revenue estimated in Section 4.0.
[4] Based on information provided in the Mill *Decommissioning and Reclamation Cost Estimate* (Energy Fuels, 2009h)
[5] Based on permitting and oversight cost information provided by Energy Fuels (Filas, 2009).
[6] Based on grazing lease information provided by BLM (Stindt, 2009).
[7] Based on water rate information provided by Town of Naturita (Carver, 2009).

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