Northern Arizona Proposed Withdrawal Draft Environmental Impact Statement

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Appendix B

B.8

Total Estimated Uranium Resources

The methodology for determining the estimated uranium reserves in the withdrawal areas is flawed. The uranium reserves obtained from Denison Mines or from published technical reports (Scott Wilson RPA) represent, for the most part, the minimum uranium resource that can be calculated from the data available to make a resource calculation.

From “Technical Report On The Arizona Strip Uranium Project, Arizona, U.S.A.” prepared by Scott Wilson RPA on February 26, 2007 on page 6.7:

HISTORICAL RESOURCE ESTIMATE COMPARISON WITH ACTUAL PRODUCTION

In its Preliminary Feasibility Report for the Canyon project (dated December 11, 1984), Energy Fuels provided historical reserves/resources estimates for various pipes based on surface drilling only. Scott Wilson RPA has compared those reserve/resource estimates with actual production results in Table 6-2.

TABLE 6-2 ENERGY FUELS RESOURCE ESTIMATES VS. ACTUAL PRODUCTION
Denison Mines Corp. - Arizona Strip Project

Pipe	Surface Drilling Estimate			Production + Remaining Resource			Ratio (lbs)
	Tons	Grade (% U_3O_8)	M Pounds (U_3O_8)	Tons	Grade (% U_3O_8)	M Pounds (U_3O_8)	
Hack #1*	132,400	0.37	0.98	133,800	0.53	1.42	1.45
Hack #2*	125,400	0.57	1.43	497,100	0.70	7.00	4.90
Hack #3*	21,250	0.40	0.17	111,300	0.50	1.12	6.59
Pigeon*	164,700	0.75	2.47	439,400	0.65	5.70	2.31
Kanab N.	83,300	0.45	0.75	260,800	0.53	2.77	3.69
Pinenut	150,000	0.50	1.50	137,800	0.53	1.45	0.97
Hermit*	n/a	n/a	0.60	36,339	0.76	0.55	0.92

* Note: Not included in the Denison property. These properties were reclaimed by Energy Fuels.

As can be seen from Table 6-2, the surface drilled estimate does not often correspond to the actual production of the mine. The average estimated uranium resource found in an "unexplored" breccia pipe has been set to 1500 tons U_3O_8 based on the average ***production*** from the above mines. If the surface drilled indication of resource was used, the average estimated resource for a representative ore grade pipe would have been 565 tons vs the 1500 tons that is currently being used.

It is a fact that the actual production from a breccia pipe uranium mine is, on average, much greater than the surface drilled resource estimate. The average of the seven "surface drilled to production resource" ratios can be used to provide a better resource estimate for surface drilled ore grade breccia pipes. The average for the above ratios in Table 6-2 is **three** and this should then become the Production Ratio Factor or **PRF**!

A Vane Minerals press release illustrates my point :

http://www.vaneminerals.com/press/pressview/334

The Arizona 1, Kanab North, and Pinenut mines have all been surface drilled *and* drilled from underground station to such an extent that the estimated resource will be assumed to be the actual production resource. The EZ-1, EZ-2, and Canyon mines have only been surfaced drilled and so should have the PRF applied to them to determine estimated uranium production resource.

The DB, Findlay Tank NW, Findlay Tank SE, Rim, and What breccia pipes should have the PRF applied as well. However, if these breccia pipes have only a relatively few surface drill holes and the resource estimate was based on so few surface drilled holes, then I believe that the generic 1500 ton estimate of uranium resource should be applied to these breccia pipes. Often, exploration companies will provide interim resource figures for "bragging rights" or to let their stockholders know they are making progress. I leave it to the authors of this DEIS to determine which category the above pipes belong in.

Not using the Production Ratio Factor underestimates the total uranium resource by 19% and alternately 30% if the DB, Findlay Tank NW, Findlay Tank SE, Rim, and What breccia pipes are adjusted to 1500 tons per pipe.

Both the 19% and 30% increases in the estimated uranium resource for the withdrawal area is very significant and the authors of the DEIS need to make adjustment to this section and all other segments of the DEIS that use these figures.

The following table summarizes the above. The uranium resources for the DB, Findlay Tank NW, Findlay Tank SE, Rim, and What breccia pipes were evenly divided by these targets after the DEIS resources for the EZ-1 and EZ-2 were subtracted from the original 2362 ton resource for the seven pipes.

Breccia Pipe Mine	Surface Drilled	Number of Drill holes	Underground Drilling	Underground Drill Holes	Inferred Reserves (lbs)	Assumed or Estimated	Tons	Ave. Surf. Drld to Mined Ratio	Likely Reserves	Alternative Reserves
Arizona 1	Yes	17	Yes	236	956,000		478	0	956,000	X
Kanab North*	Yes	?	Yes	Dense drilling	382,893		191	0	382,893	X
Pinenut	Yes	29	Yes	483	873,000		437	0	873,000	X
EZ-1	Yes	34	NO	0	1,127,000		564	3	3,381,000	X
EZ-2	Yes	47	NO	0	978,000		489	3	2,934,000	X
Canyon	Yes	42	NO	0	1,523,000		762	3	4,569,000	X
DB^	Yes	?	NO	0	524,000		262	3	1,572,000	3,000,000
Findlay Tank NW^	Yes	?	NO	0	524,000		262	3	1,572,000	3,000,000
Findlay Tank SE^	Yes	?	NO	0	524,000		262	3	1,572,000	3,000,000
Rim^	Yes	?	NO	0	524,000		262	3	1,572,000	3,000,000
What^	Yes	?	NO	0	524,000		262	3	1,572,000	3,000,000
U in Known Mineralized pipes w/o Res Estimate	Yes	A Few ?	NO	0	0	9,000,000	4,500	0	9,000,000	
15% of 163,000 Tons	No	None	NO	0	0	49,014,000	24,507		49,014,000	
								LBS	78,969,893	
						My U3O8 Estimate	33,237			
						Drafft EIS U3O8 Estimate	33,155			
						Difference**	82			
								Likely Tons U3O8	39,485	
								%difference From DEIS	19%	
									Alternate Reserves (LBS)	86,109,893
									Alternate Reserves (Tons)	43,055
									%Difference From DEIS	30%

* Kanab North reserves calculated by .53%*36122 tons of ore shipped. Ore grade of .53%

** Difference represents differing values for the Kanab North Remaining U3O8.

^ Depending on the number of surface drill holes that have been made in these Breccia Pipe Targets, they may be better classified as mineralized breccia pipes without reserve estimates if those estimates are based on a relatively few drill holes.

At the public meeting in Phoenix, I spoke with the gentleman that wrote this section and he confirmed that he knew about the underestimation of the uranium resource due to the surface drilling estimate v. production results issue, but that a decision was made to go with the "published" resource. This is in error and injects a BIAS into the EIS. Remember, this is a resource estimate and so it is entirely appropriate to estimate the uranium resource for surface drilled breccia pipes when there is good evidence to do so. After all, that is exactly what you are doing when you estimate the unexplored ore bodies yet to be discovered at 1500 tons.

Is it correct to believe that any of these pipes, if surface drilled, would actually have a defined resource of 1500 tons?

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In most cases, the presence of a breccia pipe can only be confirmed by actual drilling and usually only by drilling deep enough to identify the presence of breccia below the lower horizon of the Toroweap Formation.

This statement is not true. The combination of Soil Gas Hydrocarbon (SGH) Analysis and CSAMT geophysics survey can determine with certainty whether a uranium mineralized breccia pipe exist at a given location. The CSAMT survey will model the sub-surface structure of the pipe and the SGH survey and analysis will determine if uranium mineralization is present. Since only breccia pipes have uranium in them in the withdrawal areas, the combination of the two techniques confirms the breccia pipe and its uranium mineralization. New technology makes identifying breccia pipes easier.

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As prices have risen over the past decade, exploration activities have increased as well; however, with the exception of the resumption of mining in Arizona 1, no new breccia pipes have been developed or mined, partially as a result of the uncertainty of price and regulatory conditions.

This statement is not wholly true. It is my opinion that Denison Mines sought to restart both the Arizona 1 and Canyon mine as expeditiously as possible after it was certain that long term contracts for uranium could be secured that would allow mining and milling at a profit. Regulatory requirements, opposition to uranium mining/exploration, and the filing of lawsuits regarding regulatory requirements for exploration were the main impediments for developing new mines. It is very hard to develop a new mine if you cannot first drill your priority targets for exploration or to develop resource estimates. It has been well recognized by uranium mining and exploration companies that there exists a structural and increasing deficit between current and future mining supply and demand for U_3O_8.

It is this deficit that will drive increasing prices and has done so in the last seven months. China's build out of nuclear power plants and their announced intentions to accelerate and raise their nuclear capacity goals even further has galvanized the uranium market makers that the projected supply deficit will become worse. The recent run-up in uranium prices is not mere speculation, but a recognition of this fact.

B.7.2 Page B-18

While production costs can be controlled or anticipated through management and technology, ***the significant unknown factor will continue to be the price of uranium****.*

The bold portion of this sentence is false. The price of uranium is past the point where its future price will bar the profitable development of breccia pipe mines. The uranium exploration companies recognize this situation and have therefore invested their resources in the proposed withdrawal area. That the authors of this DEIS do not explicity recognize this fact is troubling. The other point to recognize is that the Spot Market price for Uranium is the thinnest traded part of the uranium market. The largest majority of uranium is sold through negotiated long term contracts that are *usually* higher than the "spot" price at any given time.

While there is certainly speculative factors in the uranium market place, it is a very,very, small and somewhat exclusive market place that is driven primarily by supply and demand. The uranium marketplace is at the beginning part of a long term supply to demand deficit. There are numerous and detailed analysis available online from multiple sources that confirm this concept and explain it in great gory detail. To suggest that the price of uranium will, for reasons unknown, fall to the point of unprofitability is unreasoned in the face of all the evidence to the contrary. While there are scenarios that could be developed that would cause the price of uranium to fall dramatically, the probability of them happening is remote. Therefore the scenarios of increasing price over time should be applied in the evaluation of impacts in this EIS.

There is a basic primer on these concepts at:

http://en.wikipedia.org/wiki/Peak_uranium#Uranium_demand

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Figure B-3 does not have enough context to provide a meaningful interpretation of the graph.

An excerpt from **Uraniumletter International** October 2006 gives the following historical explanation of Figure B-3.

HISTORY

In the 1940s, the US government began buying large amounts of uranium in the effort to produce the world's first atomic bomb. After World War II, the Atomic Energy Commission began examining peaceful uses. The first privately funded nuclear energy plant came online in Illinois in 1959.

By the 1970s, about 250 nuclear reactors were planned across the United States – but then the Pennsylvania located Three Mile Island Unit 2 (TMI-2) nuclear power plant accident in 1979 happened and starting in the 1980s utilities were canceling plants. This resulted in a collapse of the uranium price from a high of $ 45 per pound U3O8 to a low of $ 7.10 per pound U3O8 at December 31, 2000. Since then, the U3O8 price, hasn't only fully recovered from its low, but has further increased to a current new historic high of $ 52.00 per pound, equal to a price increase of more than 600% since year end 2000.

A second blow to the uranium industry came when the Soviet Union fell apart in 1991, and enriched uranium removed from Russian bombs was blended down to reactor-grade fuel and dumped on the market. The third jolt occurred when the Clinton-administration privatized a government-owned uranium-enrichment program, and 70 million pounds of "yellowcake" was unloaded on the market.

Growing uranium needs temporarily met by secondary uranium supplies

The growing uranium needs were met by the utilization of so-called "secondary uranium supplies" which reflected a draw down of stockpiles developed in the pre-1990 time frame. Since the late-1980s, the global uranium market was dominated by secondary uranium supplies especially as the Republics of the Former Soviet Union (FSU), particularly the Russian Federation, aggressively pursued uranium sales as one avenue to raise hard currency following the dissolution of the USSR. The international non-proliferation program involving the down-blending of Russian weapons grade uranium into commercial grade fuel being consumed in the United States, the "Megatons-to-Megawatts" Program had a huge impact on uranium prices in the latter half of the 1990s.

The program involves an estimated 360-400 million pounds U3O8 that is sold into the US market under strict limitations (Europe/Asia Pacific) or shipped back to the Russian Federation. Since the program began in 1995, shipments of HEU-derived nuclear fuel have contained about 158 pounds U3O8. In June 2004, three western companies: Cameco Corporation, Cogema (AREVA) and RWE NUKEM signed an amended deal for uranium from dismantled Russian nuclear weapons with Techsnabexport (Temex) that ensures the continued operation of the UF6 feed component. Under the current HEU contract, which runs to 2012, Russia annually delivers the equivalent of 24 million pounds of uranium derived from HEU into the United States.

While Russia can deliver approximately 24 pounds per year, sales to utility and users in the US are limited by annual legislated quotas. In 2004 and 2005 quota was 14 and 16 million pounds U3O8 respectively, to be followed by annual increase of 1 million pounds U3O8 from 2006 to 2009. From 2009 to 2013 the quota is 20 million pounds U3O8 per year. Other reserves included substantial uranium incentives held by the US government, which were transferred to the U.S. Enrichment Corporation (USEC) upon its privatization in 1998. Much of that uranium, totaling about 74 million pounds U3O8, found its way into the market place, either spot or term, with resultant price declines. Uranium reserves currently held by the U.S. Department of Energy (USDOE) are another potential source of uranium to the market place. A recent source of uranium that USDOE's uranium stockpile totals almost 75 million pounds U3O8-various forms.

A large portion of the US government inventory (52.6 million pounds U3O8 equivalent or 70%) must be held in a Monitored Stockpile until 2009 under terms of the US-Russian HEU Program and another 7.6 million pounds U3O8 (10%) is in the form of HEU which would not meet technical specifications for commercial grade fuel and requires extensive processing.

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The statement:

The peak in 2007 was driven largely by global speculation, and prices have since settled to approximately $40/lb. **It should be noted that the spot market may not be an accurate indicator of long-term contract prices for uranium, which are what determine the economics of mining specific breccia pipe ore bodies.** *For the purposes of the RFD scenarios, it is assumed that uranium prices will remain stable at this level.* Historically, price changes have been the primary reason for mining companies to operate under interim management; therefore, based on the assumption that prices will remain stable, the mines considered in the RFD are not likely to operate under interim management.

The **bolded** statement is valid and an important concept. The italicized statement is a sad, silly, assumption, certain to drive any sane person to slavering madness**.** It would be better to explicitly admit that the price of uranium will not fall below the profitability level required to operate a breccia pipe mine. That is exactly what the last sentence in this statement tacitly does. That being done (whew!!!), it does not *matter* what the particular price of uranium is at any given time period over the next 20 years, but the primary concept is that there will be upward pressure on pricing.

For computational purposes, a bar graph for the value of the estimated uranium resources in the withdrawal area could be constructed to demonstrate the range in values (say 50 to 120 dollars) that the uranium would have at various prices with an explanation that the "true value" is unknown but would most probably fall somewhere within this range. To insist on a $40 constant value over 20 years really serves no purpose at all, but detracts significantly from any sense of institutional competence in the writing of this EIS.

The follow on statement in the DEIS:

The RFD assumes that prices will remain constant at current levels for the next 20 years. (see above and ditto to the Nth power) Prices play a critical role in the extent to which uranium deposits are developed in the United States and in other parts of the world. **Relatively higher prices would be anticipated to stimulate additional mining, from both new and existing mines. Additional production would be expected to act as a moderating force on additional price increases.** Deviations from this assumption could affect several parts of the RFD, such as the total number of mines and the total uranium mined, which would then carry through to the evaluation of impacts.

One of the drivers of uranium prices is world supply. The top five uranium producers (Kazakhstan, Canada, Australia, Namibia and Russia) accounted for 75% of world supply in 2008 and 85% in 2009 (World Nuclear Association 2010a). The United States produces about 3% of world supply. *An increase in production by the top producers would be expected to put downward pressure on prices.* These changes would affect the other impacts described in the EIS. For example, reduced mining activity may lead to reduced impacts under the No Action Alternative, such as fewer particulate matter emissions, less disturbance of habitat and cultural, historical, or Indian resources, and less displacement of recreation activity. This in turn reduces the differences between the No Action Alternative and any of the action alternatives (B, C, or D).

The above **Bold** and *Italicized* statements are some what true in a general economic sense, but in the case for uranium, will *probably* only apply over short time intervals while uranium buyers delude themselves into believing that the increase in production supply is going to ease the structural large gap that exists in real and projected uranium consumption. The second issue is that of ***depletion*** of uranium supply. When the lower cost supplies of uranium are mined, these low cost materials are depleted and lost to future production. Accelerating the depletion of these low cost sources to moderate increasing prices (as will happen) will deplete these sources sooner rather than later. The next mining projects available will be those that can be brought online at a higher price, and thus will move prices up to the next pricing tier. However, the late realization that this event will unfold will cause multiple spikes in prices over time because the new projects won't be brought online in time to provide additional supply before the supply falls back into increasing deficit. *Rinse* and repeat, this cycle of price moderation, depletion, and price increase would be expected to exist for the 20 year time period under consideration.

See article from Mineweb at:
http://www.mineweb.com/mineweb/view/mineweb/en/page72103?oid=122532&sn=Detail&pid=92730

Recommendation: Ditch the idea that uranium prices are so volatile and mysterious and that the price cannot be figured out. Embrace the concept that we are at a point in history where the price will be increasing over time and that breccia pipe mining will be profitable for the foreseeable future. The ***particular*** price of uranium is ***not*** relevant, provided that the price makes breccia pipe mining profitable. The scenario with the highest degree of confidence is uranium prices increasing over time and certainly over the next 20 years.

Provide a range of values for the worth of the estimated uranium resource in the withdrawal areas.

B.8, Page B-28 Commodity Prices

In general, the section headed with "Commodity Prices" makes reference to Table B-2 and to Figure B-4 without supplying any historical context to explain what external events were driving the pricing of uranium. The continually and repeated stated "commodities market volatility" with respect to uranium implies that the reasons for the changes in uranium prices are at the "whim" of some nebulous "Commodities Market" and are therefore beyond credible analysis. This is simply not true.

Solution: Provide a "historical" section on how and why the uranium market is the way it is today by looking at the past. I have provided a basic analysis in these comments above by excerpting an analysis found on the net. There are others to chose from or synthesize your own.

Refer to this historical EIS section when referencing tables and figures that look backwards in time to give context to the time period under discussion.

This section "COMMODITY PRICES" third paragraph,

The historical data also show how much variability can occur in commodity prices even over several years. Future commodity prices and price fluctuations are a source of uncertainty in this analysis. The assumption in this analysis is that uranium prices will remain stable at current levels over the 20-year period of analysis. Similarly the estimate of the industrial capacity to maintain six mines in production at any one time is assumed to be primarily driven by uranium commodity prices and will remain similar over the 20-year period of analysis. A degree of variation in commodity prices is expected to occur, but to predict that drastic increases or decreases in uranium commodity prices will occur is considered speculative for this analysis.

My general comment is more of my above comments applied heavily with a butter knife.

I do have a more specific comment or perhaps "rant" and that is one of perceived fairness in analytical detail. That is, why does this DEIS spend copious amounts of analysis and text based on ***mere speculation*** for the negative impacts of uranium mining and exploration, but the authors are unwilling to provide the same level of detail and context to the “Pro Mining” side of the argument. This bias is pervasive in this DEIS document and I have provided examples of it throughout my comments.

B.8, any section that has haul trips

The haul trips to take uranium ore to the mill will have to be adjust based on the increased uranium resource to be mined as outline in my comments on “Total Estimated Uranium Resources”.

B.9, page B-56 “SUMMARY”

Adjust haul trips.

Table B-44, page B-57 “Assumptions Used to Develop Reasonably Foreseeable Development Scenarios”

Redo any assumptions that my comments for Appendix B pertain to that are found to be valid.

Assumptions 3,16, and 17.