

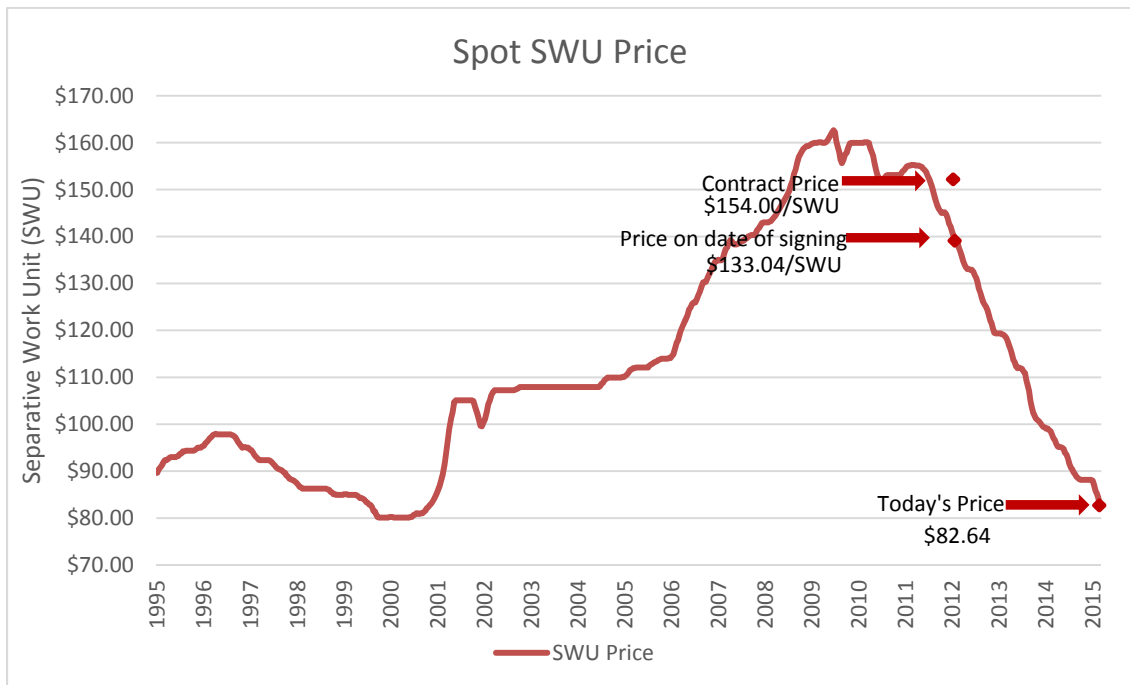
McCULLOUGH RESEARCH

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Date: April 7, 2015
To: McCullough Research Clients
From: Robert McCullough
Subject: 2015 Paducah Update

Last year, after a chance comment by Gregory Delwiche, BPA's Deputy Administrator, I reviewed the economics of the controversial political decision to place Energy Northwest and BPA into the position of speculators in nuclear fuel futures. On reviewing the original board materials, I discovered that the transaction was expected to lose \$150 million when it was initiated.¹ Since then, the rapid decline in nuclear fuel components has cost Energy Northwest and Bonneville an additional \$100 million.

Logically, it might be a good time for Energy Northwest and BPA to consider unwinding the transaction, as any normal speculator might do after years of losses.



¹ Energy Northwest. *Pre-Meeting Materials Package*. 26 Apr. 2012. Page 37.

² <http://www.uxc.com/review/UxCPriceChart.aspx?chart=spot-swu-full>

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The most significant portion of the transaction involves the purchase of some 4,440,000 Separative Work Units (SWUs) from the now defunct Paducah, Kentucky gaseous diffusion enrichment facility. For a variety of political reasons, the U.S. Department of Energy had subsidized this aged facility for many years. Newer plants based on centrifuge technology had eliminated the older World War II technology throughout the world. Paducah was the last of the older plants to close.

The newer technology uses 10% the energy and avoids the significant environmental problems of the Paducah facility – including its role in releasing the majority of Freon in the United States.

The original transaction was designed to produce a year's output at Paducah. Energy Northwest was chosen as a sink for the output with a substantial share destined for the Tennessee Valley Authority. The transaction was complex and poorly understood. In fact, Mr. Delwiche commented at the time:

All - I spent the better part of today trying to understand the 'deal' as it was portrayed last weekend, and by mid-day had concluded I was beginning to make some sense of it, but realized I needed to better understand and track the use of SWU to make UEP vs natural uranium (i.e. I needed some sort of input/output tracking of tails, their associated assay, SWU, EUP, natural uranium, MTU of feed, and dollars). But in reading the below attachments, the deal not only seems to have changed again, but the terms of it, as portrayed in both attachments, with all due respect, are incomprehensible. As an example, EN/BPA input costs seem to have gone down from \$661M to \$596M (a good thing, but without any supporting explanation), and now there's a Russian HEU component that is part of the deal for the first time.

I am fearful that on one hand there is a lot of momentum building behind this deal yet on the other hand, the naturally easier thing to do when one doesn't understand something is to say no to it, and there will be many people that will be faced with making recommendations on something that is very difficult to understand. For us to be able to run this through our risk committees in the next two weeks, the deal is going to have to settle down, and we will need a white paper that is written in a way that is comprehensible for folks who know nothing about uranium enrichment. Bill/Eric - the attachments are a good start but they need to be greatly simplified, otherwise, and with the utmost respect, it looks like a lot of smoke and mirrors. Best regards, Greg³

³ Email from Greg Delwiche to Stephen Wright and others, March 29, 2012.

The analysis of the transaction was poorly undertaken, offsetting a major loss from the purchase of the surplus nuclear fuel components with a massive – although spurious – “profit” to be gained by borrowing money. Energy Northwest’s own analysis of the original transaction indicated a \$150 million dollar loss:⁴

| Commodity Transaction | | | | | Financial Transaction | | | | | | | New Fuel Plan Cost | | Old Fuel Plan Cost | |
|-----------------------|-------------------------------|--------------|---|----------|-----------------------|---------------|-------------------------------|-------------------------------|----------|---------|---------|-----------------------|-----------------------|--------------------|--|
| Year | Investment | TVA Revenues | Net Fuel Savings | Total | Year | Bond Proceeds | Interest | Principal | Total | | Total | 2013 Fuel Plan Rev. 1 | 2013 Fuel Plan Rev. 0 | | |
| Source | April 26, 2012 Board Briefing | TVA Contract | 2013 Fuel Plan Rev. 0 and 2013 Fuel Plan Rev. 1 | | | | April 26, 2012 Board Briefing | April 26, 2012 Board Briefing | | | | | | | |
| FY 2013 | \$ (711) | \$ - | \$ - | \$ (711) | FY 2013 | \$ 711 | \$ (17) | \$ - | \$ 694 | FY 2013 | \$ (17) | \$ (27) | \$ 27 | | |
| FY 2014 | | \$ - | \$ 4 | \$ 4 | FY 2014 | | \$ (17) | \$ - | \$ (17) | FY 2014 | \$ (13) | \$ (43) | \$ 47 | | |
| FY 2015 | | \$ 70 | \$ 3 | \$ 73 | FY 2015 | | \$ (17) | \$ (70) | \$ (87) | FY 2015 | \$ (14) | \$ (26) | \$ 29 | | |
| FY 2016 | | \$ 24 | \$ 53 | \$ 77 | FY 2016 | | \$ (16) | \$ (24) | \$ (40) | FY 2016 | \$ 37 | \$ - | \$ 53 | | |
| FY 2017 | | \$ 25 | \$ (7) | \$ 18 | FY 2017 | | \$ (16) | \$ (25) | \$ (41) | FY 2017 | \$ (23) | \$ (30) | \$ 23 | | |
| FY 2018 | | \$ 110 | \$ 37 | \$ 147 | FY 2018 | | \$ (16) | \$ (109) | \$ (125) | FY 2018 | \$ 22 | \$ (18) | \$ 55 | | |
| FY 2019 | | \$ 281 | \$ - | \$ 281 | FY 2019 | | \$ (13) | \$ (279) | \$ (292) | FY 2019 | \$ (11) | \$ (28) | \$ 28 | | |
| FY 2020 | | \$ 26 | \$ 68 | \$ 94 | FY 2020 | | \$ (6) | \$ (26) | \$ (32) | FY 2020 | \$ 62 | \$ - | \$ 68 | | |
| FY 2021 | | \$ 129 | \$ 32 | \$ 161 | FY 2021 | | \$ (6) | \$ (129) | \$ (135) | FY 2021 | \$ 26 | \$ - | \$ 32 | | |
| FY 2022 | | \$ 66 | \$ 29 | \$ 95 | FY 2022 | | \$ (2) | \$ (51) | \$ (53) | FY 2022 | \$ 42 | \$ (42) | \$ 71 | | |
| FY 2023 | | | \$ 33 | \$ 33 | FY 2023 | | | | \$ - | FY 2023 | \$ 33 | \$ - | \$ 33 | | |
| FY 2024 | | | \$ 35 | \$ 35 | FY 2024 | | | | \$ - | FY 2024 | \$ 35 | \$ (38) | \$ 73 | | |
| FY 2025 | | | \$ 35 | \$ 35 | FY 2025 | | | | \$ - | FY 2025 | \$ 35 | \$ - | \$ 35 | | |
| FY 2026 | | | \$ 37 | \$ 37 | FY 2026 | | | | \$ - | FY 2026 | \$ 37 | \$ (38) | \$ 75 | | |
| FY 2027 | | | \$ 36 | \$ 36 | FY 2027 | | | | \$ - | FY 2027 | \$ 36 | \$ - | \$ 36 | | |
| FY 2028 | | | \$ 8 | \$ 8 | FY 2028 | | | | \$ - | FY 2028 | \$ 8 | \$ (67) | \$ 75 | | |
| FY 2012 NPV @ 1% | \$ (704) | \$ 682 | \$ 366 | \$ 344 | | \$ 704 | \$ (121) | \$ (666) | \$ (83) | | \$ 261 | \$ (328) | \$ 693 | | |
| FY 2012 NPV @ 3% | \$ (690) | \$ 596 | \$ 303 | \$ 209 | | \$ 690 | \$ (111) | \$ (582) | \$ (3) | | \$ 206 | \$ (279) | \$ 582 | | |
| FY 2012 NPV @ 6% | \$ (671) | \$ 490 | \$ 232 | \$ 52 | | \$ 671 | \$ (98) | \$ (480) | \$ 92 | | \$ 144 | \$ (225) | \$ 457 | | |
| FY 2012 NPV @ 9% | \$ (652) | \$ 407 | \$ 181 | \$ (64) | | \$ 652 | \$ (88) | \$ (399) | \$ 165 | | \$ 101 | \$ (186) | \$ 368 | | |
| FY 2012 NPV @ 12% | \$ (635) | \$ 340 | \$ 144 | \$ (150) | | \$ 635 | \$ (79) | \$ (334) | \$ 221 | | \$ 71 | \$ (158) | \$ 302 | | |

In response, Brent Ridge, Energy Northwest’s chief financial officer, argued that if a sufficiently low discount rate was assumed, the transaction was profitable.⁶ As any finance or economics undergraduate knows, this is always true. Any analyst can define the result by choosing unusual assumptions in the analysis.

The “profit” from borrowing money comes from the assumption that it can be borrowed at a lower rate than it can be put to use. For example, if you could borrow from Peter at 5% and lend to Paul at 10%, you would borrow all of Peter’s money. Unfortunately, Energy Northwest has no “Paul” to invest with. The only investment is the purchase of nuclear fuel which has a negative return.

⁴ Energy Northwest. *Pre-Meeting Materials Package*. 26 Apr. 2012. Page 37.

⁵ McCullough Research. *Energy Northwest Losses in the 2013 Forward Purchase of Nuclear Fuel*. 25, Jan. 2014.

⁶ Ridge, Brent. *Tails Fuel Procurement Transaction*. Energy Northwest. 10 May 2012. Page 11.

In this case, the assumed discount rate was highly doubtful. Commodity speculation is risky – among the most risky of investments – and assuming that speculating in nuclear fuel is less risky than almost any other investment is incorrect.

Gregory Delwiche, for example, addressed the issue in the original analysis:

Eric - I understand you are meeting with TVA, DOE and USEC tda. Marcus just briefed me on the current gameplan and it looks to me as though BPA's threshold criteria isn't being met unless we bond for interest in the near term, which goes against the general logic of not borrowing money to buy groceries. Our criteria are:

- 1) -\$20M/y in rate relief for each of the next two rate periods (i.e. FY14-15, and FY16-17) or said slightly differently, net benefits of -\$80M between now and the end of FY17, with the \$80M roughly split between rate periods],
- 2) at least \$50M in NPV,
- 3) valuation of the deal needs to be assessed under the terms of the existing CGS license, and
- 4) a 12% discount rate needs to be assumed {this is our standard practice for uses of capital where there is price uncertainty and/or broad uncertainty about the accuracy of assumptions driving the analysis}.

I would also emphasize that borrowing more money now shouldn't be thought of as a viable strategy for improving near term cash flow and meeting the associated rate relief criteria, we simply don't run the business that way. Marcus will be sharing our analysis with all of you shortly. Greg⁷

Greg Delwiche took issue with the sleight of hand required to create a rate savings in the first two years of the transaction. His logic was impeccable -- only a very desperate household takes out a mortgage to pay for its groceries. And only a very confused housewife would believe that such a measure constituted a cost savings for the household.

Accounting of financial flows between BPA and Energy Northwest is always challenging. This is caused in part by their use of different financial years and also complicated by the use of inconsistent terminology. At FERC, whose accounting system Energy Northwest is obligated to use, the financing of interest for the first two years should show up as \$30 million in deferred interest in FY 2013 and 2014.

⁷ Email from Gregory Delwiche to Eric Rockett, Current status of tailings deal, April 4, 2012.

It should be noted that while the Energy Northwest board was informed that the interest would be borrowed in the early years in order to create the illusion of rate savings, there is little evidence that this is the case.⁸

Since the transaction was signed, the price of SWUs has fallen steadily. The current loss from the transaction is \$250 million. It should be noted that this is somewhat optimistic since it assumes that forward prices will be recovering. If they continue to fall, the results will be even more dour.

The following table uses all of the quantities from the original Energy Northwest analysis, but updates the cost of purchases to current price levels. Since the alternative purchases are significantly less expensive than the Paducah supplies, the net present value has plunged another \$100 million.

| Commodity Transaction* | | | | | Financial Transaction* | | | | | | | New Fuel Plan Cost | Old Fuel Plan Cost |
|------------------------|-------------------------------|--------------|---|----------|------------------------|---------------|-------------------------------|-------------------------------|----------|---------|---------|-----------------------|-----------------------|
| Year | Investment | TVA Revenues | Net Fuel Savings | Total | Year | Bond Proceeds | Interest | Principal | Total | | Total | 2013 Fuel Plan Rev, 1 | 2013 Fuel Plan Rev, 0 |
| Source | April 26, 2012 Board Briefing | TVA Contract | 2013 Fuel Plan Rev. 0 and 2013 Fuel Plan Rev. 1 | | | | April 26, 2012 Board Briefing | April 26, 2012 Board Briefing | | | | | |
| FY 2013 | \$ (711) | \$ - | \$ - | \$ (711) | FY 2013 | \$ 711 | \$ (17) | \$ - | \$ 694 | FY 2013 | \$ (17) | \$ (27) | \$ 27 |
| FY 2014 | | \$ - | \$ (13) | \$ (13) | FY 2014 | | \$ (17) | \$ - | \$ (17) | FY 2014 | \$ (30) | \$ (43) | \$ 30 |
| FY 2015 | | \$ 70 | \$ (8) | \$ 62 | FY 2015 | | \$ (17) | \$ (70) | \$ (87) | FY 2015 | \$ (25) | \$ (26) | \$ 18 |
| FY 2016 | | \$ 24 | \$ 32 | \$ 56 | FY 2016 | | \$ (16) | \$ (24) | \$ (40) | FY 2016 | \$ 16 | \$ - | \$ 32 |
| FY 2017 | | \$ 25 | \$ (16) | \$ 9 | FY 2017 | | \$ (16) | \$ (25) | \$ (41) | FY 2017 | \$ (32) | \$ (30) | \$ 14 |
| FY 2018 | | \$ 110 | \$ 18 | \$ 128 | FY 2018 | | \$ (16) | \$ (109) | \$ (125) | FY 2018 | \$ 3 | \$ (18) | \$ 36 |
| FY 2019 | | \$ 281 | \$ (7) | \$ 274 | FY 2019 | | \$ (13) | \$ (279) | \$ (292) | FY 2019 | \$ (18) | \$ (28) | \$ 21 |
| FY 2020 | | \$ 26 | \$ 41 | \$ 67 | FY 2020 | | \$ (6) | \$ (26) | \$ (32) | FY 2020 | \$ 35 | \$ - | \$ 41 |
| FY 2021 | | \$ 129 | \$ 23 | \$ 152 | FY 2021 | | \$ (6) | \$ (129) | \$ (135) | FY 2021 | \$ 17 | \$ - | \$ 23 |
| FY 2022 | | \$ 66 | \$ 2 | \$ 68 | FY 2022 | | \$ (2) | \$ (51) | \$ (53) | FY 2022 | \$ 15 | \$ (42) | \$ 44 |
| FY 2023 | | | \$ 24 | \$ 24 | FY 2023 | | | \$ - | \$ - | FY 2023 | \$ 24 | \$ - | \$ 24 |
| FY 2024 | | | \$ 7 | \$ 7 | FY 2024 | | | \$ - | \$ - | FY 2024 | \$ 7 | \$ (38) | \$ 45 |
| FY 2025 | | | \$ 25 | \$ 25 | FY 2025 | | | \$ - | \$ - | FY 2025 | \$ 25 | \$ - | \$ 25 |
| FY 2026 | | | \$ 8 | \$ 8 | FY 2026 | | | \$ - | \$ - | FY 2026 | \$ 8 | \$ (38) | \$ 46 |
| FY 2027 | | | \$ 26 | \$ 26 | FY 2027 | | | \$ - | \$ - | FY 2027 | \$ 26 | \$ - | \$ 26 |
| FY 2028 | | | \$ (20) | \$ (20) | FY 2028 | | | \$ - | \$ - | FY 2028 | \$ (20) | \$ (67) | \$ 47 |
| FY 2012 NPV @ 12% | \$ (635) | \$ 340 | \$ 44 | \$ (250) | | \$ 635 | \$ (79) | \$ (334) | \$ 221 | | \$ (29) | \$ (158) | \$ 202 |

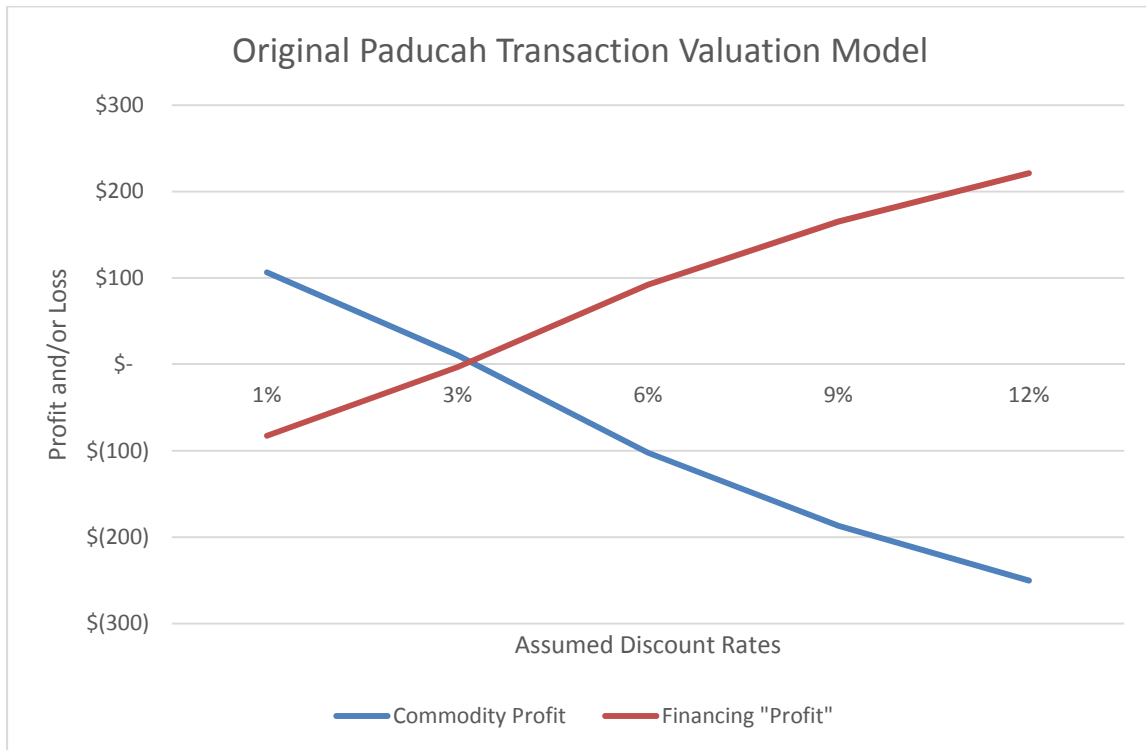
* in millions of dollars

⁸ Energy Northwest Pre-Meeting Materials Package, May 10, 2012, pages 15 and 19. Please note this is page 6 of the included Bank of America financing summary. Energy Northwest's 2014 Annual Report contains the following passage on pages 46 and 47:

Capitalized interest costs were \$19.1 million. This amount includes an adjustment for a correction of an error which relates to prior periods. The cumulative, net effect of the prior period correction recorded in the current year is \$18.7 million, of which \$11.7 million has been capitalized to Nuclear Fuel and \$7 million to Utility Plant. Capitalized interest relating to fiscal year 2014 is \$0.4 million. The correction of the error in the current period is not considered to have a material effect on the fiscal 2014 financial statements.

A year ago, Energy Northwest responded to our use of their original model and data by proposing a dramatic change in the discount rate from 12.00% to 2.81% and eliminating the analysis of the fictitious earnings created by issuing bonds.^{9,10}

Mr. Ridge’s analysis showed a profit on the uranium fuels transaction, largely as a function of the choice of discount rate. And, not surprisingly, he did not apply the discount rate to the original calculations presented to the Energy Northwest Board. If he had, he would have noticed that assuming an arbitrary discount rate eliminated the fictitious financing profit that had originally proved the transaction was profitable:



This chart shows the profit and loss of the two components of the Paducah transaction at different discount rates. In the original presentation to the Energy Northwest board the loss on the uranium fuel transaction was \$150 million. This was offset by a fictitious profit on borrowing \$700 million at interests rates lower than the discount rate.

Using today’s prices, the loss on the commodity trade has increased to \$250 million. The imaginary profit on borrowing money has stayed just above \$200 million. If you simply as-

⁹ Uranium Tails Transaction, Brent Ridge, January 30, 2014

¹⁰ PPC Data request, Energy Northwest, February 4, 2014

sume away the problem by changing the discount rate to one low enough to make the commodity transaction look profitable, the same calculation dramatically reduces the fictitious borrowing profit. Thus, according to the logic of Mr. Ridge's original board presentation, it is impossible to make the transaction look significantly better by changing the discount rate since as the assumed discount rate is reduced, the amount of the fictitious profit from issuing bonds decreases as well.

And, of course, the blue line, representing the commodity profit, continues to fall as uranium enrichment prices continue to decrease.

Given the continuing fall in uranium enrichment prices, almost any assumed interest rate shows a loss – either in the fall of the underlying price of the enrichment or in the assumed profit to be gained by borrowing money.

This primarily political transaction has proved costly for Pacific Northwest ratepayers who are now carrying unneeded inventories of nuclear fuel at higher than market – now considerably higher than market – costs. Logically, when a commodity transaction turns sour – as this one has – it would be appropriate to see if it can be wound up. In this case, it would mean either selling the surplus inventory, or finding a way to hedge against future price decreases.