

McCULLOUGH RESEARCH

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PRINCIPAL

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To: McCullough Research Clients

From: Robert McCullough

Subject: Response to Public Power Council staff comments on replacing the Columbia Generating Station with lower cost renewables

On May 4, 2017, Energy Northwest, the operator of the Pacific Northwest's Columbia Generating Station nuclear plant (CGS), distributed a 3-page memorandum by Portland-based Public Power Council (PPC). The letter criticized the 48-page report released by McCullough Research on February 15, 2017, titled "Replacing the Columbia Generating Station with Renewable Energy."¹

Energy Northwest has published a number of similar rebuttals in the past. In general, they have made overly generous assumptions, contained calculation errors, or misstated facts.^{2,3,4}

In this case, the PPC staff continues to misstate the recommendation of McCullough Research, which is to proceed with a request for proposal (RFP) and then close the Columbia Generating Station if cheaper and safer alternatives are found. This is the same path that has led to closure of nuclear plants across the United States and Canada.

One assertion by the PPC staff is that the renewable energy figures put forth by the highly-regarded New York-based financial advisory firm Lazard are not credible. Instead, they stake their entire analysis on one out of date forecast for one solar installation in Idaho. For many years, Lazard has published actual transaction prices – not forecasts – and has been used as a

¹ McCullough Research. "Replacing the Columbia Generating Station with Renewable Energy." February 15, 2017. <http://www.mresearch.com/pdfs/20170215_Replacing_CGS.pdf>.

² For example, in 2013, Energy Northwest commissioned a study arguing that if natural gas prices rose to \$5.30/mmbtu, CGS would appear cost effective compared to new natural gas plants. In reality, prices have averaged \$3.20/mmbtu since the time of that report. Our detailed review of this study can be found at <<http://www.mresearch.com/pdfs/556.pdf>>.

³ In 2014, Energy Northwest released a report entitled "Uranium Tails Transaction" defending a 2012 contract to purchase depleted uranium tails for a price of \$154/SWU; since that time, the price for enrichment fell precipitously to \$47/SWU in April 2017. See: McCullough Research. "Daniel Poneman and the Paducah Transaction." March 20, 2015. <<http://www.mresearch.com/pdfs/20150320%20Poneman.pdf>>.

⁴ PPC staff released a rebuttal on January 2, 2014 entitled "Physicians for Social Responsibility "Economic Analysis of Columbia Generating Station" containing a number of the arguments reprised in the most recent comments. You can see our rebuttal at <<http://www.mresearch.com/pdfs/559.pdf>>.

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benchmark across the industry. The McCullough Research report carefully compared Lazard's numbers against other values, which PPC staff appears to have overlooked. This includes a comparison to National Renewable Energy Laboratory (NREL) and Energy Information Administration (EIA) figures, as well as discussion of Northwest Power and Conservation Council's assumptions.

The McCullough Research report extensively discusses the applicability of Lazard's figures to the Pacific Northwest.⁵ At a regional level, the principal consideration for renewable energy's levelized cost is its capacity factor, which is determined by solar or wind resource quality. Comparing Lazard's capacity factor assumptions to the Northwest Power and Conservation Council's, these figures were demonstrably applicable to the Pacific Northwest. Most importantly, the Northwest Power and Conservation Council capital cost assumptions are far higher than the rest of the industry, and are outdated.⁶ For example, the Northwest Power and Conservation Council solar PV "reference plant" assumes an overnight capital cost between \$1,685 and \$2,413/kW; this is far above current estimates by Lazard, EIA, or NREL, which range from \$1,300 and \$1,898/kW in 2016.^{7,8,9} As always, it is possible to cherry pick estimates. The proposal to disregard actual market data with outdated forecasts has little merit.

An additional criticism levied by PPC staff is that the McCullough Research report does not consider resource adequacy or the integration of non-dispatchable resources. In fact, the report expounds upon these topics for 15 pages in Section IV. Resource adequacy figures consider a wide range of sources, including the Western Electricity Coordinating Council (WECC), Pacific Northwest Utilities Conference Committee (PNUCC), and Bonneville Power Administration (BPA). The WECC figures, which are criticized by PPC, represent the official reliability values contributed by the utilities themselves. Under the 2005 Energy Policy Act, they are the authoritative source for reliability information in the region.¹⁰ They are the legal basis for reliability estimates required by the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corporation (NERC).

The PPC staff further take issue with the McCullough Research report for comparing CGS costs to the market price of Mid-Columbia energy, writing that "replacing that power through

⁵ Ibid. See pages 8-9.

⁶ The forecast assumptions for renewables in the Seventh Plan date back to 2015.

⁷ Lazard. "Levelized Cost of Energy Analysis – Version 10.0." December 2016. <<https://www.lazard.com/media/438038/levelized-cost-of-energy-v100.pdf>>. See page 18.

⁸ Energy Information Administration (EIA). "Cost and Performance Characteristics of New Generating Technologies, Annual Energy Outlook 2017." January 2017. <https://www.eia.gov/outlooks/aeo/assumptions/pdf/table_8.2.pdf>. See NWPP figure in Table 8.3, "Total overnight capital costs of new electricity generating technologies by region."

⁹ National Renewable Energy Laboratory (NREL). "Annual Technology Baseline (ATB)." September 2016. <http://www.nrel.gov/analysis/data_tech_baseline.html>. See overnight capital cost in ATB spreadsheet under Utility-Scale PV for year 2016.

¹⁰ Federal Energy Regulatory Commission (FERC). "Energy Policy Act of 2005 Fact Sheet." August 8, 2006. <<https://www.ferc.gov/legal/fed-sta/epact-fact-sheet.pdf>>.

the market... would have a significant impact on market prices.” This is an unfortunate misreading by PPC, as the McCullough Research report explicitly does not advocate a substitution of CGS energy with market purchases. Instead, it clearly outlines the cost savings from replacing CGS primarily with renewable energy, which is indicated by the title of the report.

As noted above, our recommendation is to issue an RFP. Still, it is germane to compare CGS to the Mid-Columbia market in light of BPA’s agreement to subject the nuclear plant to a biennial “rate test.”¹¹ The rate test compares the value of the plant’s output to its cost of operations over the next four years:

“BPA intends to subject CGS operating costs to a market test biennially, testing whether market value of the CGS output recovers annual operating costs of the plant. BPA intends to solicit input on the precise nature of this market test in a public process this year.

“Likewise... BPA intends to re-evaluate plant termination if operating costs are projected to exceed revenues achievable at market prices by more than the termination costs.”¹²

This too was included in the McCullough Research report, but was apparently overlooked by PPC. CGS continues to fail the Market Test adopted by Energy Northwest and BPA nineteen years ago and under the terms of Rate Test should be closed.

Mid-Columbia market forward prices as of May 5, 2017



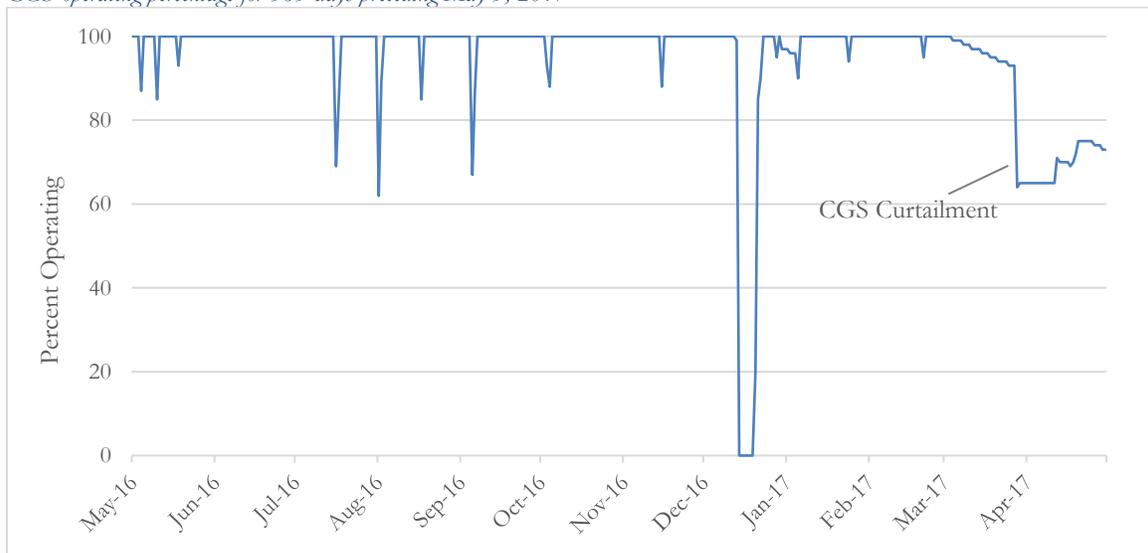
¹¹ BPA. “Issues ‘98 Fact Sheet #1: Cost Management.” June 1998.

¹² Ibid.

Even when accounting for its improvements in generation, the cost of CGS is exorbitant compared to available resources, and especially compared to market prices. A projected delivered cost of \$48.50/MWh for CGS is not a low figure by any means. Further, Energy Northwest has consistently overestimated the plant’s performance in its Long Range Plans, so this estimate should necessarily be viewed with a high degree of skepticism.

In fact, the conclusions of the McCullough Research report have continued to be borne out in recent experience. CGS has curtailed its output in response to regional overgeneration, which occurs especially during the spring months when large amounts of hydroelectric and wind energy are produced. The plant can operate partially at 65% power, but the inflexible baseload generation nevertheless represents a strain on the grid.¹³ This has been the case in the past month, with the plant operating between 64% and 75%.¹⁴ The problem is outlined extensively in the McCullough Research report, which recommends a more flexible grid, including demand response initiatives.

CGS operating percentage for 365 days preceding May 5, 2017



Several facts are clear.

Pacific Northwest ratepayers would realize substantial cost savings by closing CGS and replacing its output with a combination of renewable resources, energy efficiency, demand management, and market purchases.

¹³ Ingersoll, D.T. et al. “Can Nuclear Power and Renewables be Friends?” Proceedings of the International Congress on Advances in Nuclear Power Plants (ICAPP). May 3-6, 2015. <http://www.nuscale-power.com/images/our_technology/NuScale-Integration-with-Renewables_ICAPP15.pdf>. See page 2.

¹⁴ U.S. Nuclear Regulatory Commission (NRC). “Power Reactor Status Reports.” May 5, 2017. <<http://www.nrc.gov/reading-rm/doc-collections/event-status/reactor-status/>>.

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The recommendation of McCullough Research has been, and continues to be, that BPA issue an RFP to determine real prices and real generating options, and then to close CGS to gain these significant cost advantages.

We are now in the fourth year of this debate. The aging nuclear station remains markedly more expensive than a variety of options and continues to put a heavy strain on BPA's finances.