BEFORE THE PUBLIC SERVICE COMMISSION OF WYOMING

IN THE MATTER OF THE APPLICATION OF ROCKY MOUNTAIN POWER TO ESTABLISH INTERMEDIATE LOW-CARBON ENERGY PORTFOLIO STANDARDS	))))	DOCKET No. 20000-616-EA-22 (RECORD No. 17032)

POWDER RIVER BASIN RESOURCE COUNCIL'S
PRE-FILED CROSS-ANSWER TESTIMONY

The Powder River Basin Resource Council ("Resource Council" or "PRBRC"), by and through its undersigned counsel, hereby submits to the Parties and Commission its pre-filed cross-answer intervenor testimony, PRBRC Exhibit 603, prepared by witness David Schlissel. Mr. Schlissel will include a signed affidavit with his testimony as part of the pre-hearing exhibit filing in this docket.

Respectfully submitted this 23rd day of September, 2022.

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CERTIFICATE OF SERVICE

I hereby certify that on this 23rd day of September, 2022 I served a true and correct copy of the foregoing PRE-FILED CROSS-ANSWER TESTIMONY on the following parties via electronic mail and the PSC's electronic filing system:

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Q. Please state your name and business address.

A. My name is David A. Schlissel. I am the President of Schlissel Technical Consulting, Inc. My business address is 45 Horace Road, Belmont, MA 02478.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of the Powder River Basin Resource Council.

Q. Have you previously submitted testimony in this Docket?

A. Yes. I submitted direct testimony on August 24, 2022.

Q. What is the purpose of this cross-answer testimony?

A. I am addressing a significant mistake and a series of unrealistic assumptions in the testimony filed by Glenrock Energy witness Manning.

Q. What is the significant mistake in Mr. Manning's testimony

A. Mr. Manning testifies that Glenrock's proposed carbon capture facility at Dave Johnston 4 would operate at a 90% capacity factor and consume 793,000 megawatt-hours (MWh) of energy produced by the unit. This would mean that the carbon capture facility would represent a new 100 megawatt (MW) load on Dave Johnston 4. So far, so good.

However, Glenrock goes wrong when it assumes that the plant could serve this load without reducing its net MW output by 30.5% from 330MW to 230MW. Thus, Mr. Manning's analysis incorrectly adds the 793,000 MWh that would be supplied to the carbon capture facility instead of subtracting it from the net generation that would be available to serve Rocky Mountain Power's (RMP) customers.

Q. What should be the net generation from Dave Johnston 4 that would be available to serve RMP's customers?

A. Using the numbers in Glenrock's exhibits and workpapers, the new net output of Dave Johnston 4 would be 69.5% of the 1,875,000 MWh of Dave Johnston 4's current net

energy output that Mr. Manning assumes in his calculation. This reflects the MWh production of the unit's entire 330 MW of net power output at a 64.9% annual capacity factor. If you reduce the net MW output of the unit by 100MW, then the net energy output of the remaining 230MW would be 1.308 million MWh, not the full 1.875 million MWh Mr. Manning assumes in his testimony.

In essence Mr. Manning double counts the power and energy produced by the 100MW of Dave Johnston 4 that would serve the carbon capture facility.

Q. In this example, what would be the total net generation from Dave Johnston?

A. The total net generation would be the 793,000 MWh that would be used to serve the carbon capture facility plus another 1.308 million MWh that would be available to serve RMP's other customers.[1]

The total generation from the 330MW Dave Johnston 4 would then be slightly more than 2.1 million MWh.

Q. What would be the unit's annual capacity factor in this example?

A. Dave Johnston 4 would have a 72.7% average annual capacity factor using these numbers.

Q. Is it reasonable to expect that Dave Johnston 4 would be able to achieve a 72.7% average annual capacity factor after being retrofitted for carbon capture?

A. No. The unit is currently 50 years old. If Glenrock pursues its proposal to retrofit the unit it will take somewhere in the range of six to eight years, or longer, to design and construct the new carbon capture facility. This means that Dave Johnston 4 will be about 56 to 58 years old, or older, when the retrofitted plant starts capturing CO_2. Given Dave Johnston's actual operating experience over the past 22 years, it is not reasonable to

[1] This 1.308 million MWh = 230MW x 8760 hours x (.649).

expect that the plant will run at a 72.7% capacity factor for 20 years from the age of 56 to the age of 76.

Moreover, there is a significant uncertainty whether the carbon capture facility will actually achieve an average 90% capacity factor over its planned 20-year operating life. For example, the Petra Nova project, which also used technology supplied by Mitsubishi Heavy Industries, (MHIA) achieved only a 67% capacity factor during its three plus years of operation. This was significantly lower than the 85% planned capacity factor.

Q. Has Glenrock offered any evidence to support its assumption that the carbon capture facility would operate at a 90% capacity factor?

A. No.

Q. Is it even more unrealistic to assume that Dave Johnston 4 would operate at the 92.3% average capacity factor over that same 20 year period?

A. Yes.

Q. Has Dave Johnston 4 operated at a 92.3% capacity factor in any recent year?

A. No. Dave Johnston Unit 4 has not achieved a 90%, let alone a 92.3% capacity factor, in any year since 2000.

Q. Has the unit operated at a 92.3% in any single month in recent years?

A. The last month in which Dave Johnston 4 has achieved a 92.3% or higher capacity factor was February 2010, more than 12 years ago.

Q. What has been Dave Johnston 4's capacity factor so far this year?

A. The unit achieved a 26% percent capacity factor during the first six months of 2022, the most recent data available.

Q. What would be the impact on the cost of power to ratepayers and the financial viability of Glenrock's proposal to retrofit Dave Johnston 4 if the unit actually runs at a 72.7% or lower capacity factor instead of the 92.3% Mr. Manning claims?

A. There would be two major impacts. First, the per-MWh cost of the power produced by Dave Johnston 4 would be higher because the unit's fixed operating & maintenance costs would be spread over fewer MWh of output. Second, the reduced generation by the unit would mean less CO_2 would be produced and captured. This, in turn, would mean Glenrock would get fewer 45Q credits and the project would be on even shakier ground financially.

Q. Glenrock witness Manning claims that the MHIA technology that would be used at Dave Johnston 4 is "a proven technology" and that the carbon capture facility would "remove substantially all of the CO_2 from the effluent stream produced by the operation" of Dave Johnston 4.[2] What evidence has Glenrock provided in support of these claims?

A. Glenrock has provided a single document which it says is from MHIA but is actually an article from Forbes describing the testing of the MHIA capture technology.[3] This article notes that the new MHIA capture technology has undergone testing at a facility in Norway.[4]

Q. Was this testing conducted on a commercial-scale (100MW or larger) coal-fired generator?

A. No. According to documents on the website of the testing facility, Technology Centre Mongstad, the testing was conducted on a 12MW model which captured CO_2 from a blend of gases from a gas-fired combustion turbine and a refinery, not from a commercial-scale coal plant.

[2] Glenrock Exhibit 400, at page 4, lines 12 through 17.
[3] Glenrock's response to PRBRC Data Request 1-8.
[4] Meet the Solvent that Captures Up to 99.8% of CO_2 Emissions. Forbes, July 26, 2022.

Q. How long was the testing conducted?

A. According to MHIA, the testing was carried out between early May and late August 2021, a period of less than four months.[5]

Q. Did the Petra Nova project use MHIA carbon capture technology?

A. Yes. Petra Nova used an earlier version of the MHIA technology that Glenrock intends to use at Dave Johnston 4.

Q. Did Petra Nova achieve its planned 85% CO_2 capture rate?

A. No. As I explained in my direct testimony, the actual CO2 capture rate at Petra Nova was only 70%.

Q. Does this suggest that there will be significant uncertainty over whether the new MHIA technology Glenrock proposes to use actually will capture "substantially all" of the CO_2 produced by Dave Johnston 4?

A. Yes. Whether the new MHIA capture technology works as well as MHIA and Glenrock claim will only be known after it is used on a commercial-scale coal plant and for years, not just four months. After all, the technology is being marketed as removing "substantially all of the CO_2" for a period that could last as long as 20 years, if not longer.

Q. Are there any significant costs that Glenrock has failed to include in the economic analysis presented by Mr. Manning?

A. It is clear that Glenrock does not include the cost of adding an SCR to Dave Johnston. However, beyond that the workpapers provided by Glenrock are so skeletal that it is

[5] MHIA press release dated 2021-10-19.

impossible to know exactly what costs his economic analysis includes and which others have been excluded.

Q. Does the study prepared by PacifiCorp's consultant, Kiewit Engineering Group, state whether an SCR would need to be added at Dave Johnston 4 as part of a carbon capture retrofit?

A. Yes. Kiewit concludes that an SCR would need to be added to Dave Johnston 4 as part of the unit's retrofit for carbon capture.[6] As Kiewit explained:

> When units are newer and already equipped with necessary [Air Quality Control] equipment, the amine [carbon capture] technology does not require much retrofit and is a good technology to be implemented in existing coal plants. However, old plants that do not have Sox, NOx and/or particulate controls will need to be retrofitted with these for the amine technology and can result in very costly and time-consuming projects.[7]

Q. What is Glenrock's current estimate for the capital cost of adding carbon capture at Dave Johnston 4?

A. According to Glenrock's Exhibit 402, the company has two estimates for the cost of adding carbon capture. The lower estimate is $600 million that would be for using the captured CO_2 for EOR. The higher estimate, involving underground sequestration, would be $700 million.

Q. Has Glenrock provided any studies that formed the basis for these estimates?

A. No. Although we asked for the studies and analyses that form the basis for its capital cost estimates for retrofitting Dave Johnston 4 for carbon capture, the company totally ignored that request.

[6] Wyoming CCUS Feasibility Study. March 2022, at pages 24-26.
[7] Id., at page 26.

Q. How do Glenrock's capital cost estimates compare to PacifiCorp's estimate for retrofitting Dave Johnston 4 for carbon capture?

A. Glenrock's estimates are 38% to 48% lower than PacifiCorp's $1.14 billion estimated cost.

Q. Is it reasonable to expect that Glenrock's estimated cost for retrofitting Dave Johnston 4 for carbon capture will increase over time?

A. Yes. In fact, Glenrock's estimated cost for the retrofit already has increased from $480 million to the range of $600 to $700 million since 2020. Additional cost increases can be expected as the design work continues and construction is undertaken.

Moreover, adding an SCR, as Kiewit has said is necessary, would mean a significant increase in the cost of retrofitting Dave Johnston 4.

Q. Have the estimated costs of other proposed carbon capture projects also increased over time as their designs have evolved?

A. Yes. For example, the proposed carbon capture retrofit of the Milton R. Young 2 coal unit in North Dakota, named Project Tundra, already has increased by 45%, from the $1 billion figure originally project to $1.45 billion.[8] Similarly, the estimated cost of the proposed retrofit of the San Juan Generating Station in New Mexico had increased by 23% from the originally estimated cost of $1.295 billion to $1.6 billion.[9]

Q. Are these the final costs of those projects?

A. No. These estimates costs for the proposed projects in North Dakota and New Mexico can be expected to continue to increase as design work evolves and construction work begins.

[8] With cost upped to $1.45B, Project Tundra seeks funds from North Dakota energy board.
[9] Can NM build world's largest CCS project?

Q. Are there significant risks for Rocky Mountain Power's ratepayers from Glenrock's proposal to retrofit Dave Johnston 4?

A. Yes. There are a number of potential risks even if Glenrock's undertakes its proposed retrofit.

First, there is uncertainty about how the proposed addition of carbon capture will affect both the cost of producing electricity at Dave Johnston 4 and how well the unit will run.

Second, there also is uncertainty about what party (Glenrock or ratepayers) will pay for major maintenance expenses and capital expenditures (CAPEX) that would be needed to keep the unit running after it is retrofitted. This is a risk for ratepayers given that PacifiCorp has determined that Dave Johnston 4's retirement at the end of 2027 is part of the lowest cost resource portfolio.

Third, if the retrofitted Dave Johnston 4 operates less reliably or produces less energy, Rocky Mountain Power' ratepayers will have to pay for replacement power.

Finally, there is risk that if the proposed Glenrock project costs more or doesn't operate as well as the company now projects ratepayers or taxpayers, who are the same people, will be ask by the state to bail out the project.

Q. Are there significant risks for investors in Glenrock's proposed retrofit of Dave Johnston 4?

A. Yes. Investors could see their investments decline in value or evaporate entirely if any or all of the following occur: (a) it costs much more to retrofit Dave Johnston 4 for carbon capture; (b) the carbon capture facility doesn't capture as much of the CO_2 produced by the unit or operate as reliably as Glenrock and MHIA now claim; (c) it costs significantly more to operate the carbon capture facility; and/or (d) Dave Johnston 4 does not generate as much energy as Glenrock now claims it will and, therefore, does not produce as much CO_2 that could be captured and either sold for EOR or sequestered underground.

The total value of the 45Q credits that investors will receive will be directly based on how much CO_2 the unit produces and how much of that CO_2 is captured. If either is lower than Glenrock now claims, investors could be harmed.

Q. Does this complete your testimony?

A. Yes.