

In response to the July, 26, 2018, letter from the Colorado Oil & Gas Commission ("COOGC"), Rocky Mountain Natural Gas LLC d/b/a Black Hills Energy ("BHE") provides the following information.

## **Mechanical Integrity Overview**

### COGCC request:

Prepare an outline of the mechanical integrity program for the underground gas storage facility. This program should address monitoring of existing plugged and abandoned wells within the unit as well as the evaluation and monitoring of reservoir integrity.

### RMNG response:

BHE uses the Black Hills Energy Storage Integrity Management Plan ("SIMP") for monitoring the mechanical integrity of its wells. The complete SIMP mechanical integrity monitoring program can be reviewed in the attachment "O&M 30 – Underground Storage Operation and Maintenance." In summary, surface equipment is monitored regularly and checked for leaks, corrosion, and functionality. Additionally, annulus pressure is monitored regularly. BHE investigates sources of anomalies as they are discovered.

BHE is currently in the process of acquiring baseline assessments of downhole assets. Logs and replacement of equipment (tubing, packer, safety valve) on 6 of the wells in the Wolf Creek storage Field have been completed. The Wolf Creek storage field has only 9 active wells due to the plugging and abandonment of Wolf Creek #9, one of Wolf Creek's oldest wells, after assessments found multiple casing leaks. Repairs to Wolf Creek #8 were made after one leak was found. Once baseline logs are completed, BHE will determine reassessment intervals based on the findings of previous logs. Further reassessments will be made after more information is received.

Reservoir integrity monitoring activities include evaluating unexpected conditions found and comparing average reservoir pressures to expected reservoir pressures. BHE will investigate inconsistencies found in observation wells and third party operator wells in the vicinity of the wells, if applicable. Once there are baseline logs and gamma ray/neutron logs are rerun, BHE will investigate migration of gas to higher formations. BHE is working with third party engineering companies to better understand the reservoir and the formations around the storage zone. BHE will attempt to identify plugged and abandoned well sites which penetrate the storage zone and add a yearly surface assessment to check for the presence of fluids or gas migration.

## Risk Assessment and Management Overview

### COGCC request:

Prepare a summary of the risk assessment and management program for the underground gas storage facility that includes a basic outline and the general philosophy of the program. This does not need to be an exhaustive document.

### RMNG response:

BHE uses Integrity Solutions PFIM Risk Modeling software to rank the risk of failure of the wells. The inputs listed below are run through an algorithm which assigns scores to each well and determines a relative risk ranking.

- Well Design (age, depth, size, etc.)
- Casing Inspection Data (cement coverage and quality, log data)
- Well Product (solids produced, corrosives, etc.)
- Cathodic Protection (existing protection type, results monitored)
- Well Geology (casing depth relative to storage zone, geologic uncertainty, seismic activity level)
- Well Environment (ground movement, prior vandalism, surface activity level)
- Well Incidents (history of incidents, response times, corrective action taken and timing)
- Well Assessments (magnetic Flux or caliper tool ran/results, corrosion presence)
- Well Operations (flow/capacity knowledge level, operational turnaround frequency)

The ROF% is the relative risk value of the wells. It is not a percentage of likelihood of failure. The table below shows the results of the model.

Well Name	Subsurface External Corrosion	Atmospheric External Corrosion	Internal Corrosion	Outside Force Damage	Design	Weather and Natural Forces	Operation	Equipment	Likelihood of Failure (LOF)(sum of all)	Consequence of Failure (Cons)	Risk of Failure (LOF x Cons)
Wolf Creek 9	26.62%	13.68%	23.61%	25.95%	37.06%	17.24%	42.84%	5.37%	89.90%	68.15%	61.27%
Wolf Creek 71	24.48%	11.49%	22.35%	24.81%	34.61%	16.00%	40.60%	5.37%	87.95%	68.15%	59.94%
Wolf Creek 12	23.94%	10.40%	22.19%	24.75%	33.39%	16.09%	39.48%	5.37%	87.22%	68.15%	59.44%
Wolf Creek 35-1	25.54%	12.59%	23.14%	25.38%	35.84%	16.61%	41.72%	5.37%	88.98%	60.65%	53.97%
Wolf Creek 5	17.28%	13.68%	9.32%	15.39%	37.06%	18.81%	42.84%	5.37%	84.86%	63.40%	53.80%
Wolf Creek 6	26.62%	13.68%	23.61%	25.95%	37.06%	17.24%	42.84%	4.37%	89.80%	59.10%	53.07%
Wolf Creek 4	26.35%	13.68%	23.37%	25.69%	37.06%	16.88%	42.84%	4.37%	89.64%	59.10%	52.98%
Wolf Creek 3	26.35%	13.68%	23.37%	25.69%	37.06%	16.88%	42.84%	4.37%	89.64%	59.10%	52.98%
Wolf Creek 8	26.62%	13.68%	23.61%	25.95%	37.06%	17.24%	42.84%	5.37%	89.90%	57.35%	51.56%
Wolf Creek 14	13.07%	10.40%	8.63%	11.38%	33.39%	12.06%	39.48%	5.37%	78.84%	63.40%	49.99%

The results above include both known and unknown data. At the time the table was developed, only Wolf Creek Well #14 and Wolf Creek Well #5 had baseline assessments. If BHE does not have data to input into a certain column, the risk model inputs a worst case value. Therefore, wells without a baseline assessment would likely have higher risk values for certain columns due to the data being unknown. An example is the Internal Corrosion column from both Well #14 and Well #5 which have a considerably lower value than the other wells because these wells have known internal corrosion inputs while the model assumes a worse case value for the other wells due to the data not being known. The data acquisition and baseline assessment program and corrective actions taken based on assessment results are the largest risk reducing initiative.

## **Emergency Response Overview**

### COGCC request:

Prepare a basic outline of the Emergency Response Plans/Program for the underground gas storage facility that includes the general philosophy of the program. This does not need to be an exhaustive document.

### RMNG response:

BHE partnered with Wild Well Control to create an Emergency Response Plan and state specific capping plans. BHE had a mock drill hosted by Wild Well Control and is currently planning the second annual Emergency Response training and mock drill, scheduled for November 2018.

Due to the specialized training and equipment needed in well control events, BHE is not training its employees to take corrective actions in the event of a well control event. Instead, BHE is focusing on protecting people and the environment while waiting for experts to take control and repair any leak. Therefore, the training focuses on people counts, air monitoring for gas migration, and working with local first responders to maintain a safe perimeter.

To improve response times BHE has met with operations and assigned roles to Wild Well Controls, created an "Incident Command" structure, and made a phone list of local vendors so that needed materials can be procured in a timely manner when necessary.

To avoid emergency situations BHE is working on completing well assessments and monitoring the integrity of all facilities and is committed to abandoning those assets if safety cannot be ensured.