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PAYNE COMMENTARY SERIES: **VIEWPOINT**

Exploring Carbon Retirement Portfolios

By Brad Handler and Morgan Bazilian

New financial instruments are being designed and brought into the fight against climate change. One such potential instrument is a Carbon Retirement Portfolio (CRP), a collection of carbon-emitting assets, including oil & gas (O&G) producing wells and coal-fired power plants (coal plants). A CRP would buy these assets with the commitment to retire them more quickly than their business-as-usual case. Thus, CRPs can be a vehicle to accelerate a country or region's reduction of its greenhouse gas (GHG) emissions.

It is likely that governments will need to offer financial incentives to allow CRPs to bid competitively for assets. Tying at least some of this financial incentive to avoided GHG emissions serves two purposes: 1) it provides additional incentive for the CRP to retire the assets more quickly than the commitment date as well as to follow best practices with respect to emissions while the assets are operating, and 2) it allows governments to "give currency" to GHG emissions and further promote societal thinking around a cost of carbon, even in the absence of formal legislation of a carbon price.

This brief paper describes CRPs further and illustrates the financial analysis to calculate a "Carbon Avoidance Bonus" to support CRPs in acquiring O&G assets. The paper concludes by describing some of the further work required, including consideration of appropriate risks and responsibilities.

Analysis of a "typical" O&G well in the Bakken (in North Dakota, USA) suggests that a carbon avoidance bonus of $40-45/ton of CO_2 equivalent can offset the lost Present Value of retiring the well after it has produced for only eight years. It is clear, however, that the bonus required will vary widely depending on the well, the basin and even operator and thus broader financial analysis is needed.

1. INTRODUCING THE CRP

We can define a CRP as a collection of assets in which there is environmental/societal interest in ending their operations in order to avoid future GHG emissions. Logical candidates for a CRP portfolio include coal plants and O&G wells. The CRP would buy those assets, in negotiated agreements with sellers, with the mandate to wind-down and retire the assets earlier than their business-as-usual case.

It is expected that the CRP — or rather its investors — would be able to benefit from government financial support or other incentives. This support could take the form of a Carbon Avoidance Bonus of a fixed dollar per ton of avoided CO_2 (or equivalent) when it shuts down an O&G well or coal plant "early" and lowers GHG emissions while the assets are still in operation. This bonus would (help to) offset the lost Present Value of retiring the assets early and help pay for GHG mitigation investments during the remaining operating period. Support, however, could also come in other forms, including concessional finance mechanisms such as guarantees to lower the cost of borrowing.

Thus, a CRP can be designed to be attractive to sellers, buyers and government. **For an O&G company seller**, the CRP expands the opportunities to sell assets and (provide funds to) reposition the seller's portfolio to cleaner energy, which can address investor demands and raise the value of its stock. The seller can expect comparable proceeds to those in conventional transactions because the buyers have access to the aforementioned government support. Further, the seller gets to free itself of its site remediation obligations, including, plausibly, the risk in conventional transactions that prior owners can be "looked to" if the buyer cannot meet its P&A/remediation obligations.

For Utilities selling their coal plants, a CRP can be another financial mechanism that can help them decarbonize and provide funds that can be put to renewable energy. Financial mechanisms exist today — notably ratepayer backed securitization (RBS) — but a CRP can facilitate coal plant retirements where RBSs have not been authorized and can relieve utilities of the obligation (and risk) of decommissioning/remediation of the plant and site.

For Investors, a CRP creates portfolio(s) of opportunities to invest in CO_2/methane reduction —plausibly with different end market and risk/reward characteristics to suit investors' interests. In other words, these institutional investors could add different types of exposure to their green/transitional investments in their portfolios/offerings to clients.

Finally, for government, a CRP can be one more tool that places a cost on carbon and encourages GHG reduction. It also creates opportunity to set best practice standards for the end of an asset's life (i.e. for Plugging & Abandoning a well, for decommissioning a coal plant and for site remediation) and it institutionalizes funding for Just Transition to help workers and communities impacted by retiring these assets. Perhaps most importantly, a CRP can avoid the problem of "squeezing the balloon," in which an oil company seller looks greener because it has divested carbon emitting assets, but there is no CO_2 emissions reduction for society because another oil company simply assumes operation of those assets.

Importantly, the CRP would have the administrative capacity in place to perform due diligence, measure emissions, provide engineering support, etc. to assist investors in assessing, managing and reporting on their investments.

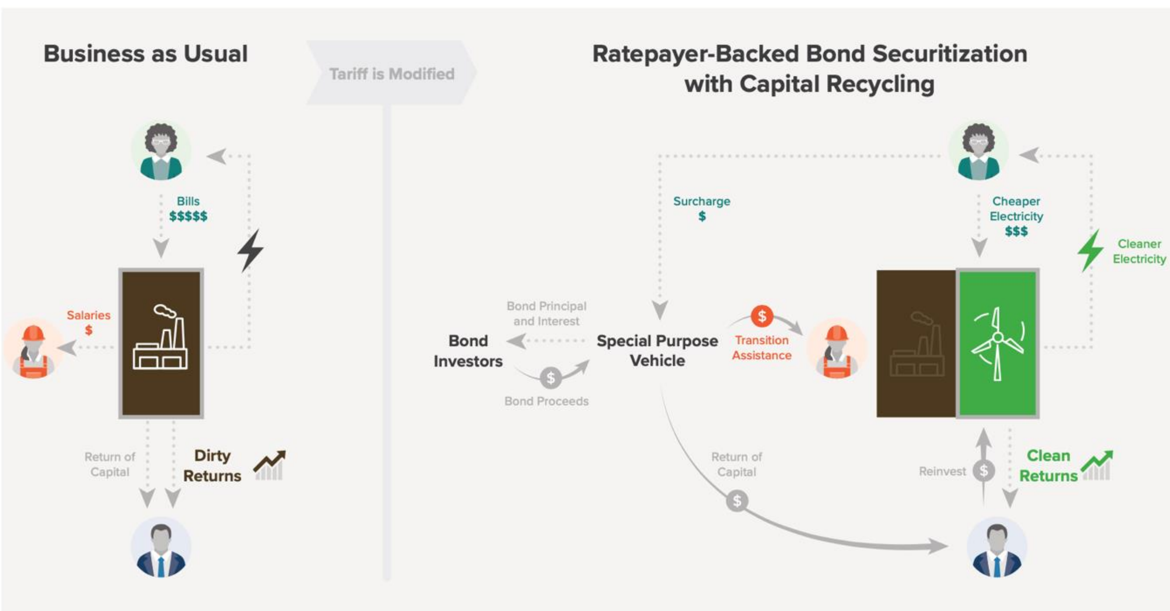
As the two assets, coal plants and O&G wells, are very different, there need to be different structures regarding acquisition as well as, possibly, different concessional or government/ policy/ legislative support for each. Consideration of a CRP investment in each type of asset is offered in the next sections.

1.1 RETIRING COAL PLANTS

Where Securitization (RBS) has been legislated

For coal plants, a CRP can function under the same principles as ratepayer-backed securitization (RBS), which utilities have used for years to raise funds for specific needs. In RBS, ratepayers, through a special purpose vehicle (SPV), raise low cost debt based on their pledge to repay that debt via a dedicated surcharge on their bills. That debt can be used to retire the coal plant and fund the development of replacement renewable power generation and Just Transition programs. Critically for the ratepayers, this new debt carries an interest rate well below the general cost of capital for the utility owner of the coal plant. As such, even though additional debt is incurred, the refinancing of older debt at the lower rate plus lower operating costs of renewable energy offers ratepayers the opportunity to pay less overall. The mechanics of a RBS vs. business-as-usual are illustrated in Exhibit 1.

Exhibit 1: Illustration of Ratepayer-Backed Securitization (RBS)



Source: RMI

RBS has historically been legislatively authorized by the state in which the coal plant resides. In so doing, the state legislature can set terms for protection of the ratepayer but also provide the authority for the ratepayers to pledge to repay the debt.

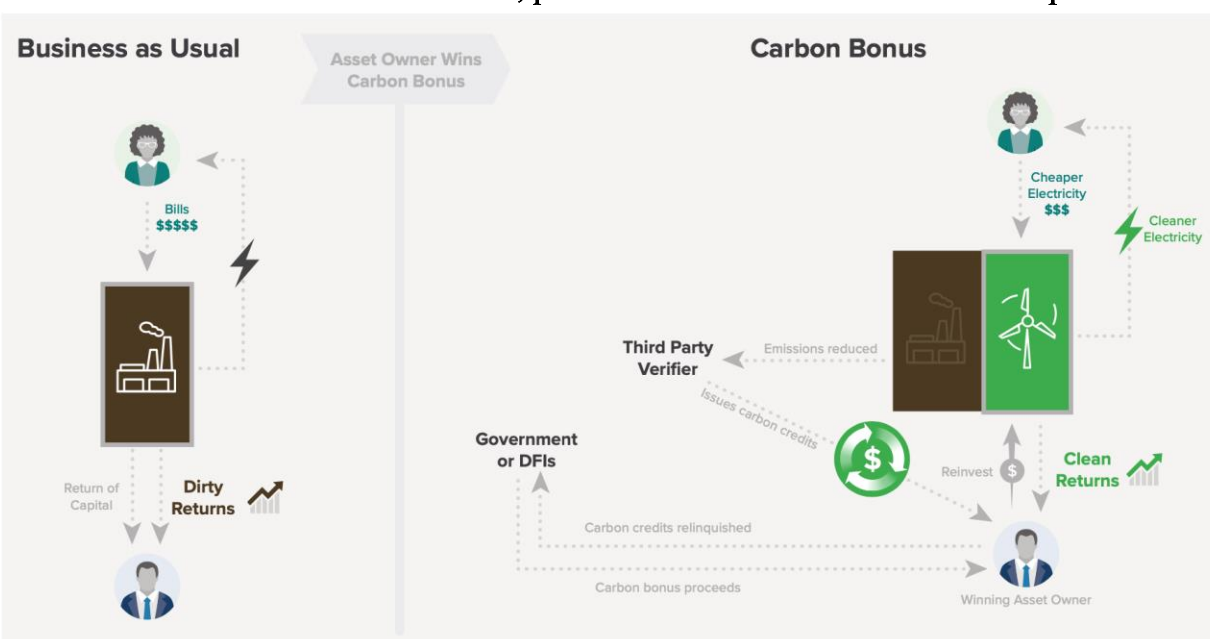
The CRP would have ownership of the SPV. It would assume the responsibilities for operating and decommissioning etc. the coal plant over the agreed schedule.

In this case, the selling Utility benefits by absolving itself of the responsibilities associated with decommissioning and site remediation and it can instead focus exclusively on building replacement power and the associated grid infrastructure. Meanwhile, the investors in the CRP, unlike passive investors in a RBS, have return upside potential related to project execution of the decommissioning and site remediation and, plausibly, from the sale of the property as it is repurposed. From the government's perspective, less financial support should be necessary because the investment economics of RBS have generally been adequate to attract investors.

Where RBS has not been legislated

In states, or circumstances, in which RBS has not been legislated, a Carbon Avoidance Bonus can provide the financial backbone for retirement of a coal plant and Just Transition programs. The CRP offers the utility the same rationale for selling as in the RBS case described above. The mechanics of a carbon bonus program are illustrated in Exhibit 2.

Exhibit 2: Illustration of Carbon Bonus; proceeds used to construct renewable power



Source: RMI

It should be noted that the Carbon Avoidance Bonus can (and should) be offered to existing utility owners and not just to CRPs. Either owner can be expected to operate with the same oversight of the relevant Public Utility Commissions.

1.2 RETIRING OIL & GAS WELLS

In the case of retiring active O&G wells/fields, it is envisioned that the CRP would buy the rights to produce from a seller's operating wells in a given field. The CRP would commit to shut down individual wells after a specific period of time, thus winding down the field's production. Other rules can be attached to any O&G transactions into a CRP, including flaring or venting practices, methane leak detection practices, and decommissioning/site remediation requirements.

The economic analysis for a transaction involves calculating the lost Present Value (PV) from 1) retiring the well/field early, including the additional PV impact of Plug and Abandonment (P&A) and site remediation costs being spent earlier vs. an assumed business-as-usual case, and 2) incurring additional costs to implement emissions management best practices during the wells' lives.

What follows is an illustration using a "typical" well of so-called "non-core" resource rock in the Williston Basin of North Dakota. Using average (2019) GHG emissions intensity in the basin (from upstream operations as reported to the EPA by the operators), a Carbon Avoidance Bonus of $42/ton (after-tax basis) is required to offset the lost PV for the well of retiring it after eight years, versus a Business-as-Usual case of 40 years.

The Carbon Avoidance Bonus is notably sensitive to (1) how long the well produces and (2) the GHG intensity of the well/basin. For example, if the profiled well is to produce for 10 years (vs. again eight in the base case), the required Carbon Avoidance Bonus to offset the lost PV falls by $15.60/metric ton. If the intensity were 5 kg CO_2e/Boe higher, the per ton carbon avoidance bonus could be $6/metric ton *lower* (because more CO_2e is emitted).

Exhibit 3 summarizes the Carbon Avoidance Bonus calculations for this illustration well. Exhibits 4 and 5 illustrate monthly oil equivalent production and the cumulative PV, respectively, of the well. Exhibit 6 provides Carbon Bonus sensitivities to the base case of $42/ton. Finally, more details regarding this well are provided in Appendix 1.

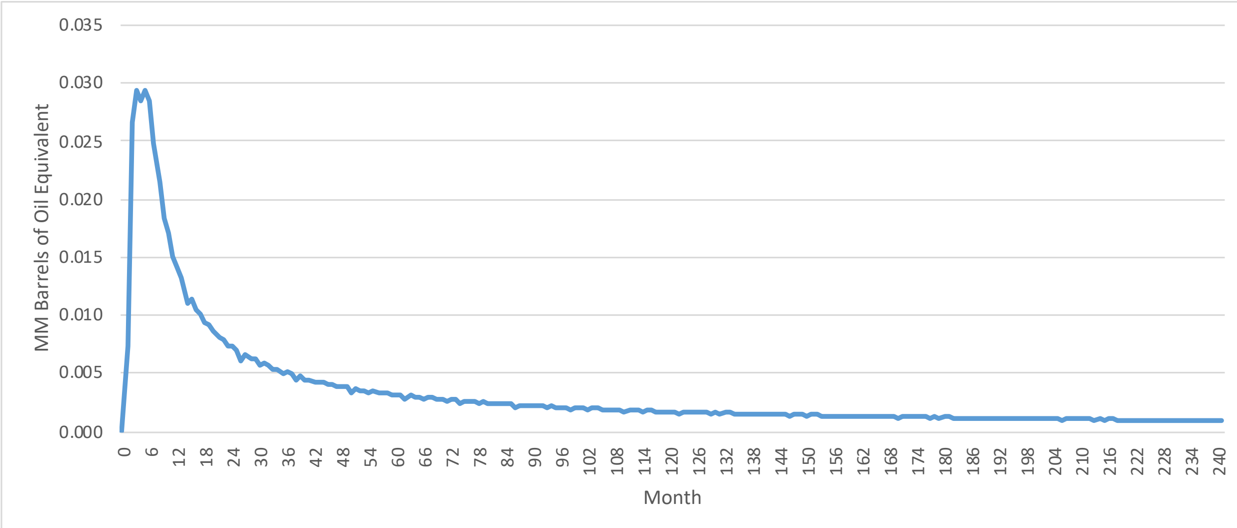
Exhibit 3: Summary Assumptions and Carbon Avoidance Bonus Calculations, Non-Core Williston Basin Well

Well Assumptions		**Select Well Results**	
Initial Capital Cost $MM)	$7.10	% of Present Value (PV) Earned in Years 1-8	91.4%
Year 1 Ave. Production Rate (KBoe/Day) (1)	0.85	PV "Lost" if Retire Well after Year 8 ($MM)	$0.34
Estimated Ultimate Recovery (EUR) (MMBoe)	0.98	% of EUR in Years 1-8 (Boe basis)	64%
Productive Life (Years)	40		
		Calculations to Convert Lost PV to Carbon Bonus	
Price Assumptions (2)		CO_2 Emissions "Intensity" (Metric Tonnes/Boe) (3)	0.030
Brent Oil ($/Barrel)	$50.00	% from Production Operations (4)	75%
NYMEX Gas ($/Thousand Cubic Feet)	$2.75	CO_2 Production Emissions Intensity (MT/Boe)	0.023
Natural Gas Liquids ($/Barrel)	$18.72	Avoided CO_2 (Metric Tonnes)	8,089
		Carbon Bonus Required to offset PV ($/tonne CO_2)	**$42.30**

Notes:
(1) KBoe = Thousands of Barrels of Oil Equivalent
(2) Assumed fixed for life of well
(3) Source is MJ Bradley
(4) Estimate

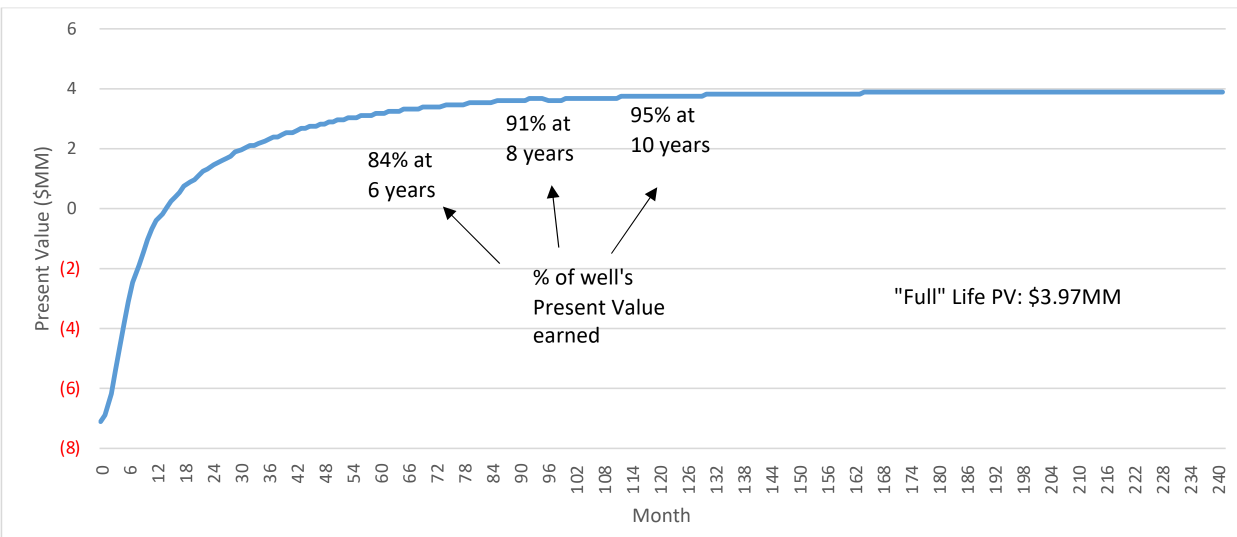
Sources: MJ Bradley, Payne Institute estimates

Exhibit 4: Monthly Production (Oil Equivalent Basis), Typical Non-Core Williston Well, Months 0-240



Source: Payne Institute estimates

Exhibit 5: Cumulative Present Value ($MM), Typical Non-Core Williston Basin Well, Months 0-240



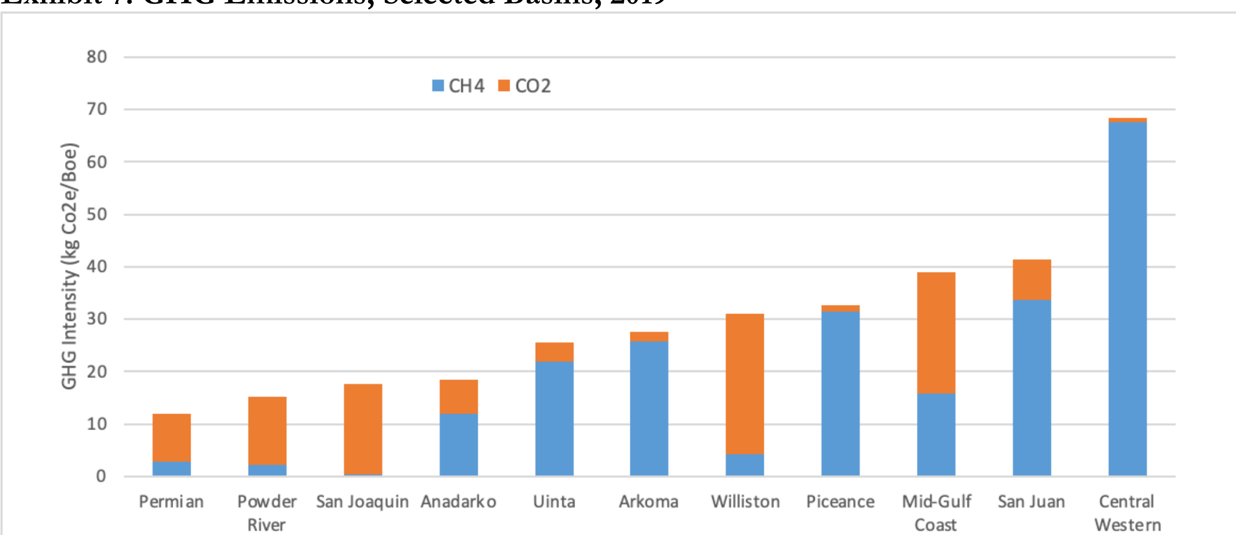
Source: Payne Institute estimates

Exhibit 6: Select Sensitivities, Typical Non-Core Williston Basin Well

	Impact on Carbon Bonus ($/Metric Ton)
+$5/bbl oil price	$10.91
Operate well for 6 years	$25.37
Operate well for 10 years	($15.64)
+5 kg/boe CO2 intensity	($6.01)
-5 kg/boe CO2 intensity	$8.40

For reference, the Williston basin is associated with relatively higher flaring and CO_2 emissions from upstream operations than other unconventional production areas of the U.S., although somewhat less than many conventional basins. The average Williston basin upstream GHG intensity (= CO_2 equivalent emissions per Barrel of Oil Equivalent of production) averaged 31 kg CO_2e/Boe in 2019, per a study conducted by MJ Bradley that drew on company data provided to the Environmental Protection Agency through its Greenhouse Gas Reporting Program. For comparison, emissions were 12 kg CO_2e/Boe in the Permian basin, 18 kg CO_2e/Boe in the Anadarko basin and 41.4 kg CO_2e/Boe in the San Juan. See Exhibit 7.

Exhibit 7: GHG Emissions, Selected Basins, 2019



Source: MJ Bradley

Note: The above figures reflect upstream operations at the well site only; gathering and transportation (mid-stream) operations result in additional emissions not measured in the MJ Bradley analysis.

2. CONCLUSIONS and FURTHER WORK

There are several areas to consider further if CRPs are to be realized. First, there must be a broad scope of analysis to help determine a "reasonable" Carbon Avoidance Bonus. Within O&G assets, there appears to be a wide range of Bonus required that is dependent on the basin, current operator practice regarding flaring/venting (i.e. infrastructure in place to minimize both), and natural gas gathering and pipeline systems in the vicinity. Setting the Bonus "too low" will exclude too many assets and thus limit the potential of the CRPs; setting it too high raises the cost of the program and may make it less politically palatable. Related, it is worth considering if government support can include Bonuses for operators that have already invested to limit emissions — so as not to penalize them for making such investments. A similar economic analysis for coal plants and the use of a carbon bonus is also required.

Second, there must be consideration of the risk assumed by the CRP. A key example is the responsibility for acquisition of the producing assets; in other words, does the CRP underwrite the acquisition of an asset and then find investors or do the investors fund each acquisition?

Third, the responsibilities of the CRP through the life of an asset (beginning with due diligence before acquisition and running through retirement and site reclamation/repurposing) must be determined. This analysis is important to estimate CRP staffing requirements, expertise and operating costs. It may be informed by assessing other heavily regulated businesses and those that receive financial credit from the government.

Fourth, the notion of portfolios merits further study. As envisioned, any carbon emitting asset that can be retired to avoid CO_2 emissions can be eligible and the CRP is premised on the opportunity for an institutional investor to invest in a portfolio of such assets. Yet, determining what is practical — how many and how many types of assets a CRP can reasonably and efficiently manage — will inform decisions as to how many different portfolios can be constructed out of one CRP.

Appendix 1
Detailed assumptions of Williston well used in analysis:

Capital Costs ($MM, in Real Terms)	
Initial	$6.9
At End of Life	$0.2
Incremental for Flaring/Venting Mitigation	$0.03
Production	
Initial 30-day (Kboe/day)	1.12
Year 1 average (Kboe/day)	0.85
Year 1 Decline vs. 30-Day Production	56%
Decline Rate - Oil (B Factor) *	1.10
Decline Rate - Natural Gas (B Factor) *	1.25
Gross Estimated Ultimate Recovery (EUR, MMBoe)	1.23
Net of Royalty EUR (MMBoe)	0.98
Oil/Liquids (%)	82%
Pricing	
Oil ($/Barrel)	$50.00
Natural Gas ($/Mcf)	$2.75
Natural Gas Liquids ($/Barrel)	$18.72
Expenses	
Operating ($/yr)	$17,500
Gathering & Transmission ($/Boe)	$2.00
General & Administrative ($/Boe)	$2.00
Production Tax Rate	10%
Income Tax Rate	24%
Other	
Operated Working Interest	100%
Royalty Rate	20%
Discount Rate for Present Value Calculation	15%

** B Factor is the hyperbolic exponent; sets initial steepness of decline curve*

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