

April 21, 2014

Mr. Lynn Helms
Director
Department of Mineral Resources
North Dakota Industrial Commission
600 E Boulevard Ave. Dept. 405
Bismarck, ND 58505

Via email: brkadrmas@nd.gov

Dear Director Helms:

This letter serves as Environmental Defense Fund's (EDF) comments as the Oil and Gas Division of the North Dakota Department of Mineral Resources considers policy changes relating to the Bakken and Three Forks pools to reduce the flaring of associated natural gas from oil wells. EDF is a national membership organization with over 750,000 members residing throughout the United States, many of whom are deeply concerned about the pollution emitted from oil and natural gas sources. EDF brings a strong commitment to sound science, collaborative efforts with industry partners and market-based solutions to environmental issues.

Oil and gas development in North Dakota brings with it both new opportunities and new challenges. The Bakken development requires re-evaluation of systems, models and methods that have been used in the past but that no longer effectively ensure the responsible development of the resource.

We appreciate your efforts to reduce natural gas flaring in North Dakota. EDF shares your concern and fully supports the Industrial Commission's (NDIC) stated goals of reducing the volume of flared gas, the number of wells flaring and the time period within which flaring occurs. Industry, regulators and conservation-minded groups like EDF all agree that flaring approximately 30 percent of produced natural gas is unacceptable. Wasting this resource undermines national energy security goals, has negative impacts on the region's air quality and represents millions of dollars of lost revenue for operators, state and local governments and mineral estate owners. In fact, in 2012, flaring resulted in the waste of around \$1 billion in fuel¹ – or enough gas to heat more than a million homes.

¹ Flaring Up: North Dakota Natural Gas Flaring More Than Doubles in Two Years, Ceres, July 2013.

I. Flaring Reduction Goals

The gas capture goals enunciated by the North Dakota Petroleum Council's (NDPC) flaring task force are reasonable and achievable and we recommend that the NDIC adopt these targets as enforceable limits on overall flaring statewide. We further recommend that the NDIC adopt an additional, enforceable target of reducing flaring to less than 1% of production by 2025². Achieving these reductions would bring North Dakota into alignment with flaring rates occurring in other major oil and gas producing states in the U.S. Finally, we recommend that the state establish enforceable annual targets in the intervening years so as to ensure a process of continuous improvement in reducing flaring and to ensure the state has an ability to exercise its oversight responsibilities for making sure flaring reduction efforts are staying on track. A flaring reduction schedule could be established as follows:

Fig. 1:

	Recommended Statewide Flaring Limit (as % of gas production)
2015	33
2016	15
2017	12
2018	9
2019	7
2020	5
2021	4
2022	3
2023	2
2024	1
2025	< 1

It should be noted that because production in North Dakota continues to increase substantially, meeting these goals will still result in the flaring of high volumes of gas. For example, the North Dakota Pipeline Authority projects that the state's operators will be producing around 2 billion cubic feet of gas per day (730 billion cubic feet per year) in 2020³. Flaring of 5% of that gas will amount to 36.5 billion cubic feet of wasted gas per year or, at the current price of \$4.14 per MCF for dry gas, the waste of over \$151 million per year⁴.

² We acknowledge that the NDPC Flaring Task Force couched its goals in terms of captured associated gas. However, because reductions in flaring can be achieved through other means (e.g., on-site use, remote capture, etc., . . .), it is preferable to precisely tie the performance metric to the desired outcome, i.e., reductions in wasted (flared) gas.

³ North Dakota Natural Gas: A Detailed Look at Natural Gas Gathering, North Dakota Pipeline Authority, Fig.3, p.4 (October 21, 2013).

⁴ At the widely-cited current \$7.00 per MCF for the liquids-rich gas in North Dakota, the waste will be over \$255 million per year.

II. EDF Analysis of Curtailment Scenarios

The NDPC Flaring Task force has suggested that one way to meet the state's general goal of reducing flaring would be to employ production limits. These policies were initially designed to limit flaring by curtailing liquids production in a step-down fashion until a well connects to a gas gathering system in conventional oil development. However, these policy tools have gone unutilized – apparently due to concerns that imposing the production limits would unduly delay the “pay-out” period for wells, thereby harming the economics of production in the state. Thus, it has been suggested that, if the state were to relax the production limits, it could find a “sweet spot” where the prospect of curtailment would provide a meaningful incentive to accelerate connection to gas gathering systems yet not be so burdensome as to undermine fundamentally the economics of well development.

While we understand the thinking behind this idea and would welcome an opportunity to review any data developed in support of it, our own analysis indicates that this approach would likely be insufficient to guarantee that flaring in North Dakota is reduced by the percentages recommended above. The analysis below indicates that ***even under a scenario where existing curtailment policies were enforced – rather than a more relaxed curtailment policy – current flaring levels (around 30%) would be reduced by only about 37% over a 5-year timeframe in the state's highest-flaring fields (see Fig. 2, below), resulting in a capture percentage of only about 81%.***

Methodologies for and limitations of our analysis are discussed below. However, it is clear that if our analysis is directionally correct, it is highly unlikely that the state could meet a goal of increasing gas capture to 95% by 2020 through the enforcement of curtailment policies similar to those on the books today; and under a relaxed curtailment policy scenario, the prospects for meeting these gas capture goals would be diminished further still.

A. Our Methodology

According to the NDPC Flaring Task Force, a majority of the volume of flaring in the state comes from a relatively small number of wells. It is reasonable to assume that, generally, these wells would tend to be concentrated in fields where there is a combination of high production volumes and limited take-away infrastructure. Therefore, in order to identify a set of fields where enforcement of existing curtailment policies would likely result in the greatest reductions in flaring volumes statewide, EDF began by identifying the 200 wells in the state with the greatest flaring volumes (using reported data from October 2013). These wells serve as our sample population. We then selected the 10 fields with the greatest total volume of flaring coming from wells within our sample population (See Appendix I). Next we pulled production and flaring data for *all* wells in these 10 fields for the months of January 2005 through December 2013. Finally, we excluded from our analysis those fields that did not have at least 60 months' worth of production and flaring data (We analyzed a 60-month timeframe in order to get a view of the extent to which curtailment policies could achieve the NDPC flaring reduction goals through the year 2020. The excluded fields are: Clarks Creek, Grail, Pembroke and Truax. Medicine Pole Hills was also excluded due to its unique characteristics as an in-situ combustion recovery site).

Based upon these data, we examined the expected impact on flared gas volumes and percentages if the NDIC’s current curtailment policies (contained in most existing field orders) were enforced. Specifically, we analyzed the impact of enforcing the following production limits at wells where flaring is occurring (regardless of whether the wells are connected to a gathering system):

- Maximum Efficiency Rate (MER) allowed for days 1–60
- 200 BBLD production limit for days 61-120
- 150 BBLD production limit for days 121–180
- 100 BBLD from day 181 onward

Avoided flaring volumes were then derived by multiplying reported flared gas volumes by the percent difference of actual oil production and the oil production limit for each production month. The percent difference was calculated by subtracting the oil production limit from actual oil production, and dividing by actual oil production.

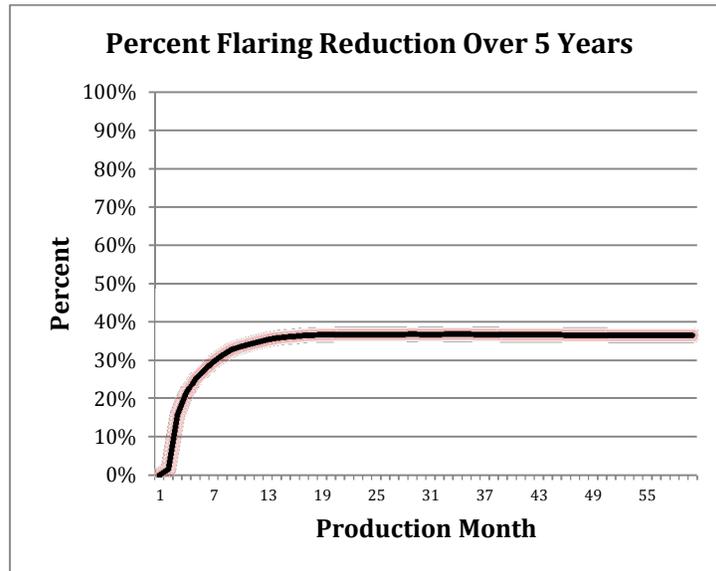
B. Our Projections

Based on the methodology set forth above, our calculations indicate that enforcement of current production limits would result in a reduction in the current percentage of flared gas in the state, it would fall well short of meeting the reduction goals set forth by the NDPC Task Force and our enhanced schedule set forth in Fig. 1, above.

Fig. 2:

Field	Production Months	1 & 2	3 & 4	5 & 6	7 – 24	25 – 60	1 – 60
	Oil Production Limit	MER	200 BBLD	150 BBLD	100 BBLD	100 BBLD	Combined
Antelope	Actual Flared (MCF)	1,538,243	1,574,203	851,113	2,857,136	446,099	7,266,793
	Avoided Flared (MCF)	-	840,583	542,502	1,813,615	188,304	3,385,003
Blue Buttes	Actual Flared (MCF)	1,436,782	820,909	502,317	798,136	236,251	3,794,395
	Avoided Flared (MCF)	-	462,567	278,665	467,766	66,663	1,275,661
Eagle Nest	Actual Flared (MCF)	768,355	614,028	455,155	1,732,417	224,270	3,794,225
	Avoided Flared (MCF)	-	218,208	186,530	718,644	43,994	1,167,375
Heart Butte	Actual Flared (MCF)	1,114,643	1,276,747	955,715	3,582,974	698,502	7,628,580
	Avoided Flared (MCF)	-	594,536	436,481	1,695,607	264,953	2,991,577
Siverston	Actual Flared (MCF)	2,270,022	1,409,830	728,697	1,432,981	209,161	6,050,691
	Avoided Flared (MCF)	-	645,787	325,845	635,739	34,017	1,641,388
Period Totals	Actual Flared (MCF)	7,128,045	5,695,716	3,492,997	10,403,644	1,814,283	28,534,685
	Avoided Flared (MCF)	-	2,761,680	1,770,023	5,331,370	597,931	10,461,004
	<i>Potential % Flaring Avoided</i>	0%	48%	51%	51%	33%	37%
Cumulative Totals	Cum. Actual Flared (MCF)	7,128,045	12,823,761	16,316,758	26,720,402	28,534,685	
	Cum. Avoided Flared (MCF)	-	2,761,680	4,531,703	9,863,073	10,461,004	
	<i>Cum. % Flaring Avoided</i>	0%	22%	28%	37%	37%	

Fig.3, below is a graphic representation of the percentages of avoided flaring under the curtailment scenarios described in our methodology above:



Given that North Dakota producers are currently flaring approximately 30% of produced gas, reducing that amount by 37% would mean **19% of produced gas would continue to be flared if existing production limits were imposed**. It is therefore clear from the analysis above that enforcement of current policy alone would prove inadequate to achieve the flaring reduction targets consistent with the goals laid out by the NDPC Flaring Task Force. A relaxed curtailment policy would have even less of an impact on reducing flaring.

It is also worth noting that the above analysis is conservative in a two key respects:

1. The above analysis assumes that production limits would apply to all wells that are flaring, not just those that are not connected to gathering systems. Thus, the analysis will tend to overestimate potential flaring reductions since it does not account for the fact that under today's typical field order language, production limits only apply to those wells that are not connected to a gathering system.
2. The analysis deliberately focuses on fields with the highest number of wells flaring at the greatest volumes. These are the areas where a curtailment policy would tend to have the most impact on reducing flaring volumes and percentages. However, when the same curtailment policy is applied statewide, the overall percentage of flaring avoided will be lower than this analysis shows because a greater number of wells will have production levels that naturally fall below the curtailment policy production limits – though they may be flaring nonetheless.

It is also important to acknowledge that our analysis does not take into account the reductions in flaring that would occur as a curtailment policy creates incentives for accelerated build-out of midstream infrastructure, better utilization of existing systems (e.g. through improved compression and expanded

on-site beneficial use of produced gas and remote capture technologies). Unfortunately, it is not possible to estimate with any real degree of accuracy the pace and extent to which enforcement of a curtailment policy would incentivize accelerated mid-stream build out, greater uptake of on-site beneficial use technologies, etc.

Therefore – given that a curtailment policy on its own is unlikely to result in the desired flaring reductions, and given the uncertainty around whether and to what extent a curtailment policy would incentivize accelerated uptake of the systemic fixes that are ultimately needed in order to address this problem – we would like to suggest attacking the problem from a different angle, which focuses on setting the flaring reduction goals and then builds policy at the state and field levels to achieve those goals.

III. EDF Alternative Flaring Policy Proposal: Flaring Performance Standard

Our shared flaring reduction goals can best be realized by first establishing enforceable statewide limits on flaring, and then allowing producers and midstream operators a wide degree of flexibility in developing the solutions to meet those targets at the field level.

In general, we propose that the state establish statewide targets for reducing flaring as per the reduction schedule set forth in Fig. 1, above. We further recommend that the Director be given authority to establish field-specific reduction targets. The default reduction targets for each field would be the same as the statewide targets. However, the Director would have the discretion to create special, field-specific targets – taking into account various factors that may justify an accelerated flaring reduction schedule for one field or a more lenient reduction schedule for another. Operators in each field would be required to reduce flaring to comply with the field targets but, as discussed below, would have a high degree of flexibility in determining how to best meet the targets.

Specifically we suggest:

A. Statewide and Field-Specific Flaring Reduction Targets

As previously mentioned, EDF supports the flaring reduction targets proposed by the NDPC Task Force as both reasonable and achievable. We further recommend that the NDIC establish a target of reducing flaring statewide to less than 1% of gas produced by 2025 and that the Oil and Gas Division establish (and the NDIC adopt) annual interim targets to ensure steady progress is being made.

Because North Dakota's fields are diverse in many respects, the Oil and Gas Division should have the flexibility to set field-specific targets tailored to the characteristics of each particular field – such as ambient air quality, the amount of current flaring, the proximity and capacity of gathering and processing infrastructure, the availability of remote capture alternatives, the available on-site use options, the characteristics of the underlying reservoir, etc. The field-specific targets, to which each operator in the field will be bound, should be set such that, in the aggregate, they achieve the statewide targets each year.

Finally, the statewide targets and field-specific targets should be mandatory and enforceable.

B. Operator Flexibility

Operators should be allowed to evaluate their entire fleet of assets within a given field and determine how to meet the field-specific flaring reduction targets on a field-wide basis (i.e. rather than require operators to meet the field-specific flaring reduction targets on a well-by-well basis, they should be allowed to target whichever wells and use whichever strategies they deem most appropriate – so long as their aggregated flaring does not exceed the field-specific target). We believe the greatest economic efficiencies – and the greatest innovations in technology and process improvement – will come when operators are given maximum flexibility for achieving what amounts to a broad performance standard. The industry should be encouraged to utilize every tool available to reduce flaring and minimize the imposition of curtailment policies, through advance planning of development, coordination with mid-stream companies and landowners, maximum utilization of remote capture and on-site utilization technologies and other beneficial use of the produced gas.

C. Ensuring Compliance

In order to ensure flaring reduction targets are being achieved at both the field and statewide levels, the Oil and Gas Division will need to put appropriate reporting requirements in place. This will be particularly important in the context of providing operators a high degree of flexibility in meeting field-specific targets.

We also recommend that operators be required to submit Gas Capture Plans as part of the permitting process, in keeping with the NDPC Flaring Task Force recommendations. Engaging in this sort of planning process is good practice that should be required of all North Dakota operators. Likewise, Gas Capture Plans can serve as an important “forward looking” tool for regulators. They can also help midstream developers more effectively plan for new projects. We note, however, that merely connecting to a gathering system doesn’t guarantee that the ultimate goal of reducing flaring will be met – as evidenced by the fact that roughly half of today’s flaring comes from wells that are connected to gathering lines. Therefore, we are not recommending that enforcement be tied to the Gas Capture Plans, as was recommended by the Task Force.

Rather, enforcement should be tied directly to an operator’s compliance with the reduction targets set by the Division for a given field. In cases where an operator fails to meet the flaring reduction targets, the Director should be allowed to curtail the operator’s production to whatever extent necessary to ensure the operator is quickly brought into compliance. The Director should have complete discretion in deciding which wells to curtail and the depth of curtailment to apply at any given well.

Finally, we note that the effectiveness of any new flaring policy – particularly a highly flexible one such as we are recommending – depends on certainty of enforcement. Therefore, the availability of any exemptions from compliance and enforcement should be very tightly circumscribed – if they are allowed

at all. If the Division believes exemptions may be necessary, we recommend that a detailed set of criteria for exemptions be established such that it is clear to operators, citizens and state officials that exemptions will only occur in the rarest of circumstances.

D. Air Quality and Regional Haze

As North Dakota continues working to protect the air quality of critical areas around the state's crown jewels (Teddy Roosevelt National Park and the Lostwood Wilderness Area), it is important that the Division consider the impacts of flaring on regional haze. Imperfect combustion of hydrocarbons, particularly the liquids-heavy gas produced from oil wells in the Bakken, are likely contributors to regional haze and reductions in flaring in these areas should help the state get back on track to meet its visibility goals set forth in its State Implementation Plan. Therefore, the language already included in the vast majority of the state's existing field orders (i.e. "if the flaring of gas produced with crude oil from the [FIELD]-Bakken Pool causes, or threatens to cause, degradation of ambient air quality, production from the pool shall be further restricted") should be maintained and these air quality considerations should be included in the setting and further adjustment of field level flaring reduction goals.

IV. Conclusion

We recognize that our proposal represents a somewhat significant shift from the line of thinking that has emerged in public discussions thus far. However, we believe it has the dual advantage of providing a high degree of certainty that the state's flaring reduction goals will be met and providing a flexible path that should be appealing to producers. If this proposal is of interest, we would be pleased to work with you and your staff to help develop the concept further.

Thank you again for your leadership. We look forward to working with you, members of industry and the staff of the NDIC in the coming months to carefully craft solutions to this pressing issue.

Sincerely,

A handwritten signature in blue ink, appearing to read "Dan Grossman". The signature is fluid and cursive, with a long horizontal stroke at the end.

Dan Grossman
EDF Rocky Mountain Regional Director

Appendix I: Fields for Top 200 Flaring Wells in Oct 2013

Field	MCF flared from wells in sample population	# of wells from sample population
MEDICINE POLE HILLS	587466	22
GRAIL	398485	13
ANTELOPE	216599	9
EAGLE NEST	185053	13
PEMBROKE	183672	11
BLUE BUTTES	142156	8
TRUAX	140798	10
HEART BUTTE	138679	11
SIVERSTON	129209	8
CLARKS CREEK	124489	4
WESTBERG	109992	5
HAWKEYE	96790	4
KEENE	95101	5
FOUR BEARS	90276	5
ALKALI CREEK	89828	7
TIMBER CREEK	80968	5
SPOTTED HORN	79596	4
CLEAR CREEK	73806	5
NORTH TOBACCO GARDEN	70480	3
MCGREGORY BUTTES	68088	4

CEDAR COULEE	51809	2
WEST CAPA	49079	2
CROFF	39268	1
WILLISTON	37604	2
RAWSON	35133	3
AMBROSE	33874	3
JOHNSON CORNER	26340	2
MCGREGOR	23911	1
LOST BRIDGE	23119	2
LITTLE KNIFE	22472	2
BUFFALO WALLOW	21699	1
LIGNITE	21699	1
SANISH	21666	2
PARSHALL	21340	1
MANDAREE	18383	1
BANKS	18345	1
TEMPLE	15690	1
UNION CENTER	15492	1
HAMLET	15103	1
TRACY MOUNTAIN	12902	1
BEAR DEN	12669	1
TYRONE	12490	1
PAINTED WOODS	11837	1
VAN HOOK	11649	1

BULL MOOSE	11570	1
FRAZIER	10578	1
SOUTH FORK	10528	1
TWIN BUTTES	10340	1
CORRAL CREEK	10103	1
CHARLSON	10085	1
AVOCA	9827	1
SPRING CREEK	9575	1
WOLF BAY	9522	1