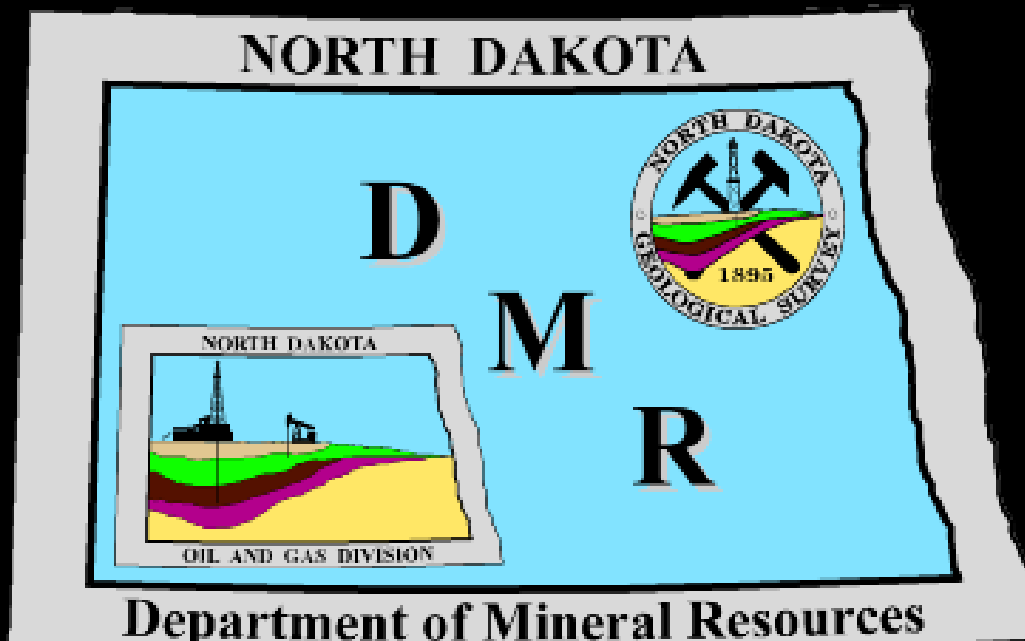


North Dakota Department of Mineral Resources



<http://www.oilgas.nd.gov>

<http://www.state.nd.us/ndgs>

600 East Boulevard Ave. - Dept 405

Bismarck, ND 58505-0840

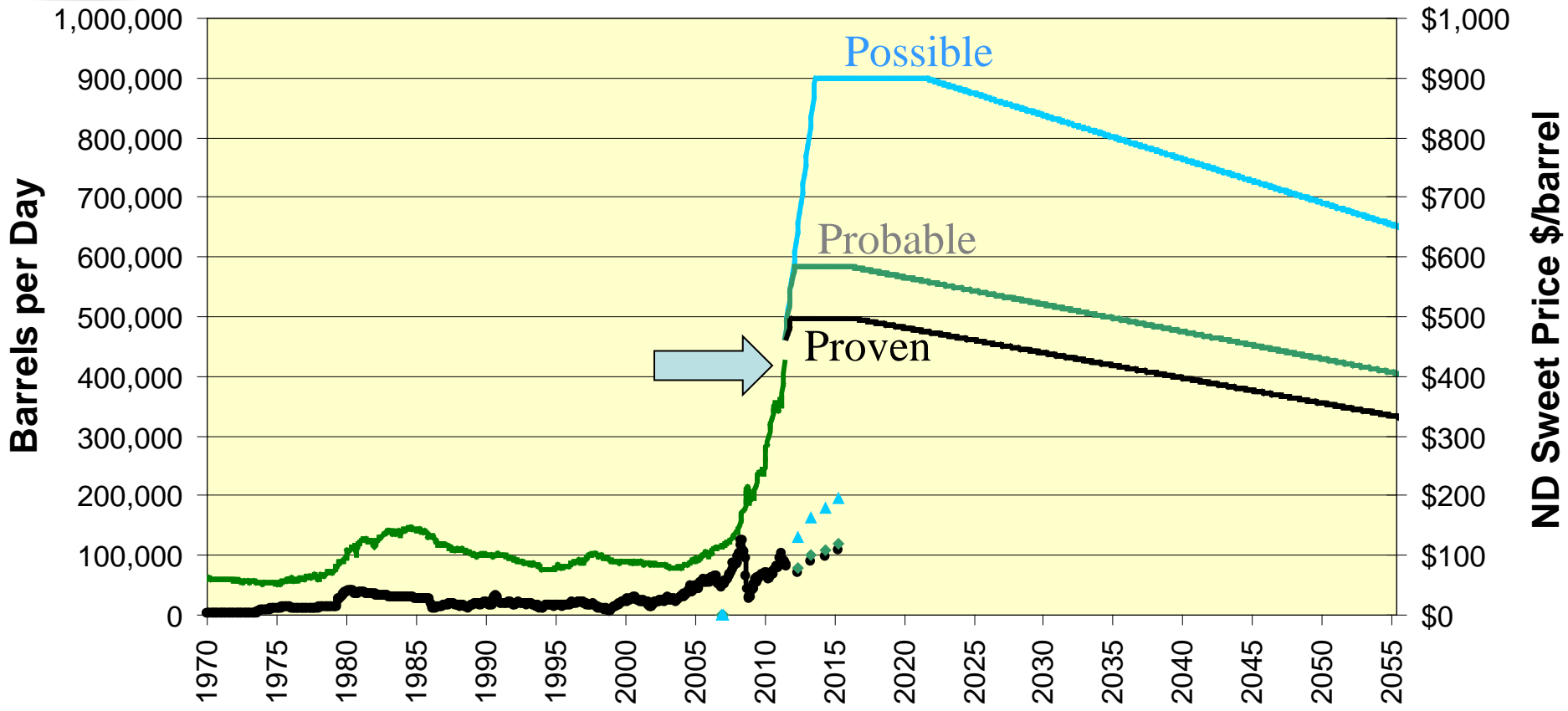
(701) 328-8020 (701) 328-8000

Western North Dakota

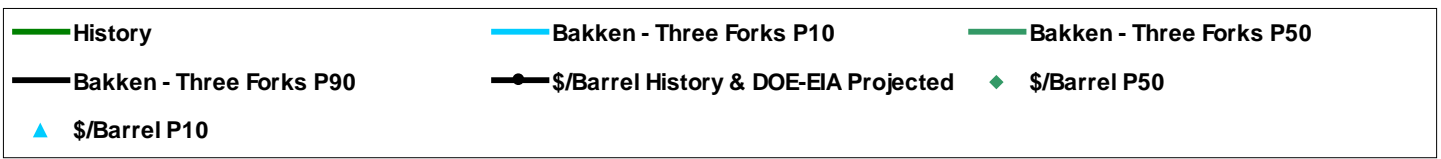
- 1,100 to 2,700 wells/year = 2,000 expected
 - 100-225 rigs = 12,000 – 27,000 jobs = 12,000 – 27,000 jobs
 - Another 10,000 jobs operating wells and building infrastructure
 - 225 rigs can drill the 5,000 wells needed to secure leases in 2.5 years
 - 225 rigs can drill the 28,000 wells needed to develop spacing units in 14 years
 - 33,000 new wells = 30,000-35,000 long term jobs



North Dakota Oil Production and Price

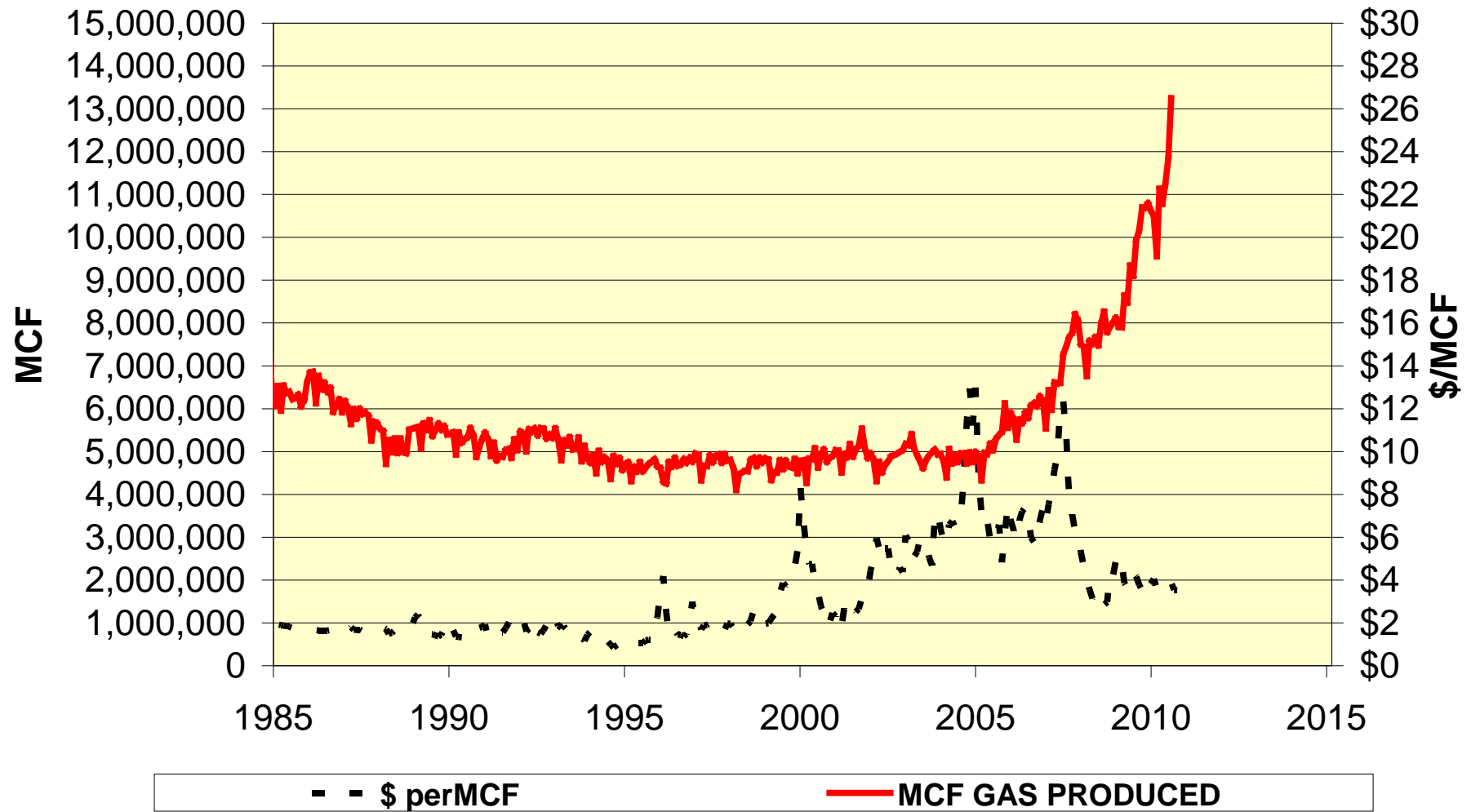


2,650 Bakken and Three Forks wells drilled and completed
33,000 more new wells possible in thermal mature area
P90=5 BBO – P50=7 BBO – P10=11 BBO (billion barrels of oil)

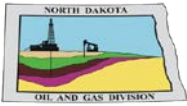




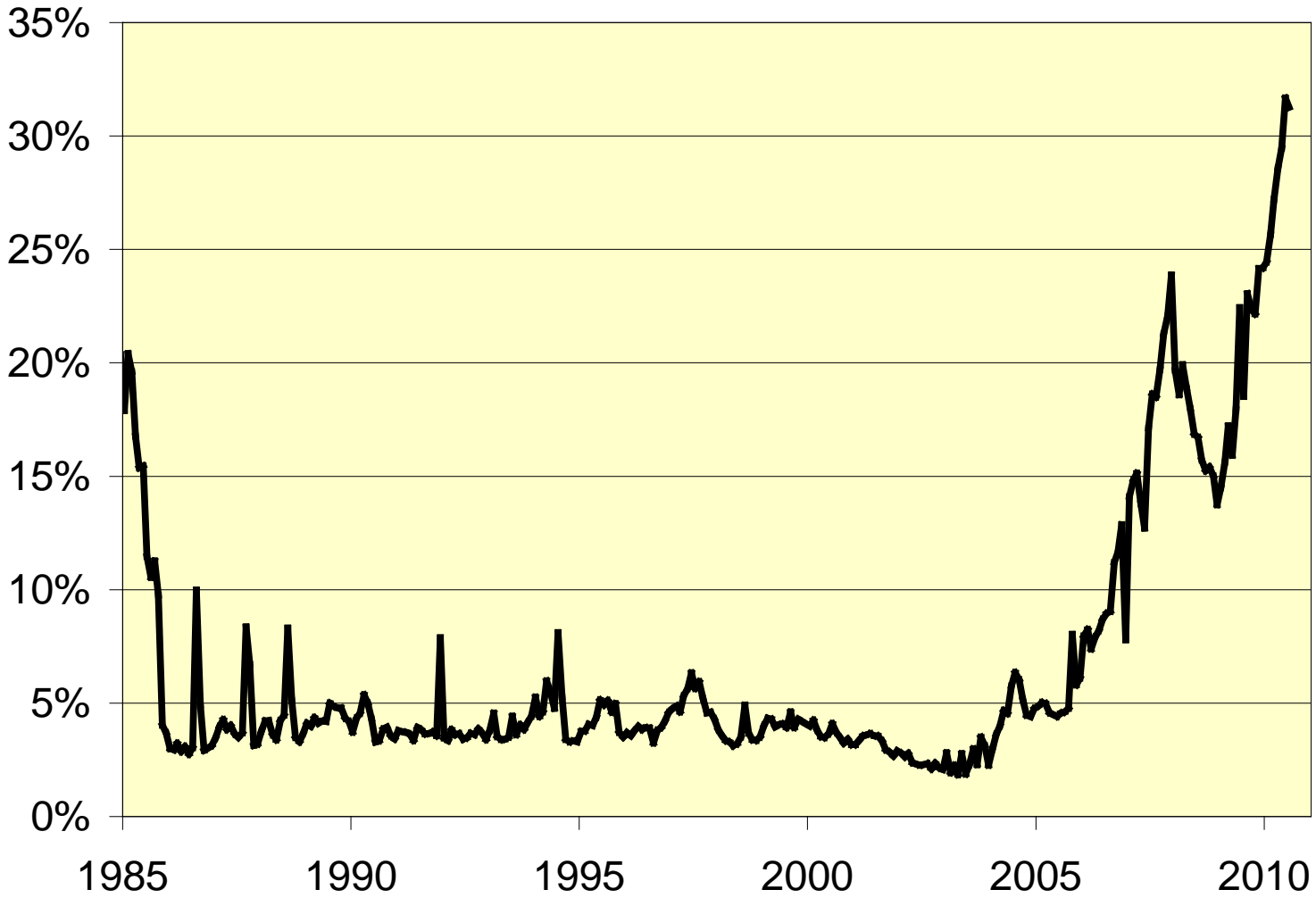
North Dakota Monthly Gas Produced and Price





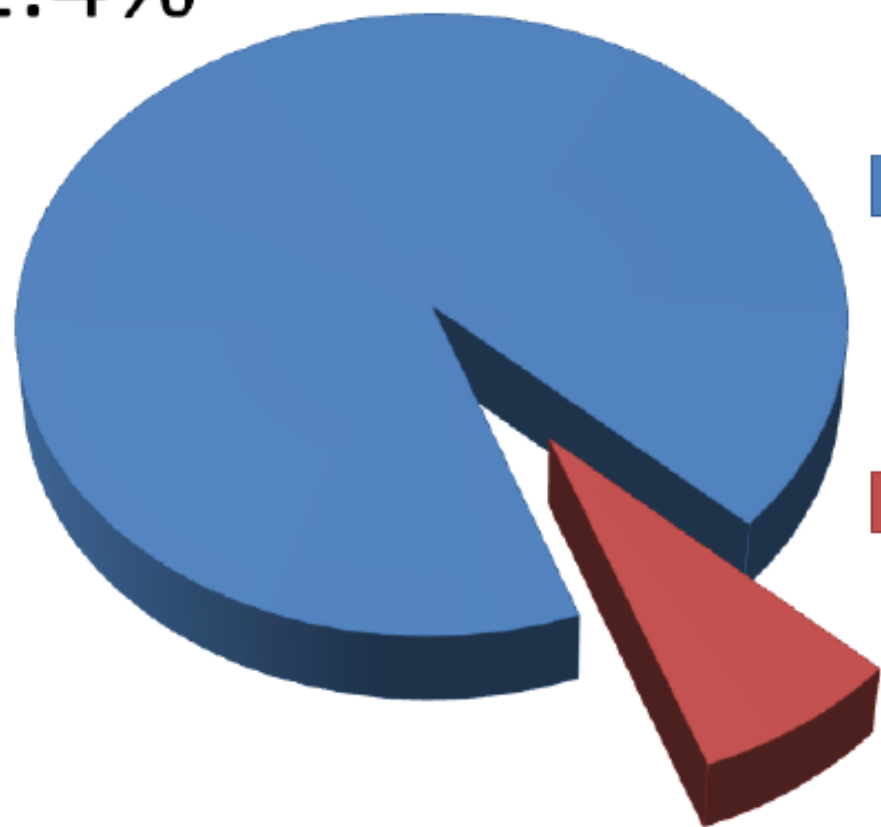


North Dakota Monthly Gas Flared



ND Oil & Gas Development Efficiency

92.4%



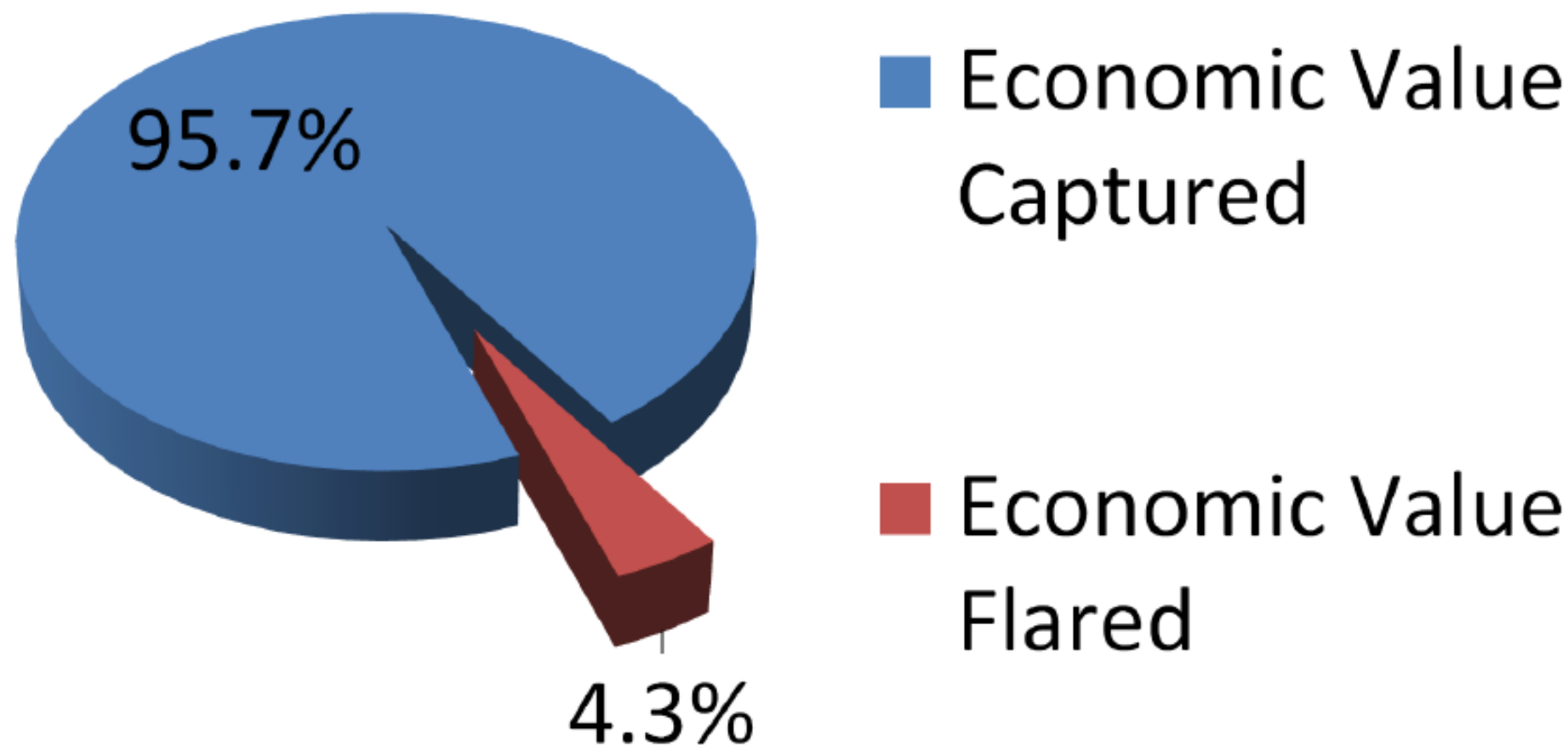
■ BTU's Captured

■ BTU's Flared

7.6%

July 2011 Data

ND Oil & Gas Development Efficiency



July 2011 Production Data, Oil Price of \$91.79/bbl,
Natural Gas/NGL Wellhead Price of \$12.00/MCF

38-08-06.4. FLARING OF GAS RESTRICTED - IMPOSITION OF TAX - PAYMENT OF ROYALTIES - INDUSTRIAL COMMISSION AUTHORITY.

As permitted under rules of the industrial commission, gas produced with crude oil from an oil well may be flared during a one-year period from the date of first production from the well. Thereafter, flaring of gas from the well must cease and the well must be capped, connected to a gas gathering line, or equipped with an electrical generator that consumes at least seventy-five percent of the gas from the well. An electrical generator and its attachment units to produce electricity from gas must be considered to be personal property for all purposes. For a well operated in violation of this section, the producer shall pay royalties to royalty owners upon the value of the flared gas and shall also pay gross production tax on the flared gas at the rate imposed under section 57-51-02.2. The industrial commission may enforce this section and, for each well operator found to be in violation of this section, may determine the value of flared gas for purposes of payment of royalties under this section and its determination is final. A producer may obtain an exemption from this section from the industrial commission upon application and a showing that connection of the well to a natural gas gathering line is economically infeasible at the time of the application or in the foreseeable future or that a market for the gas is not available and that equipping the well with an electrical generator to produce electricity from gas is economically infeasible.

Source: N.D. Century Code.

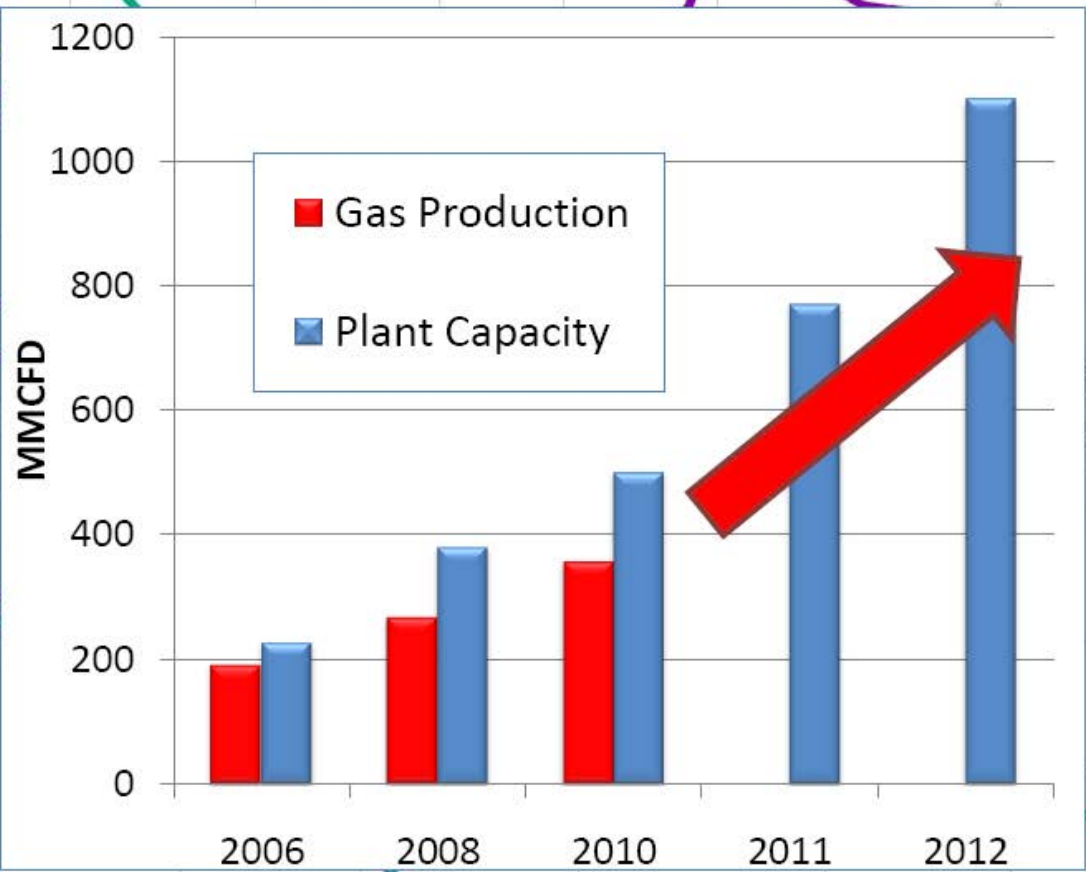
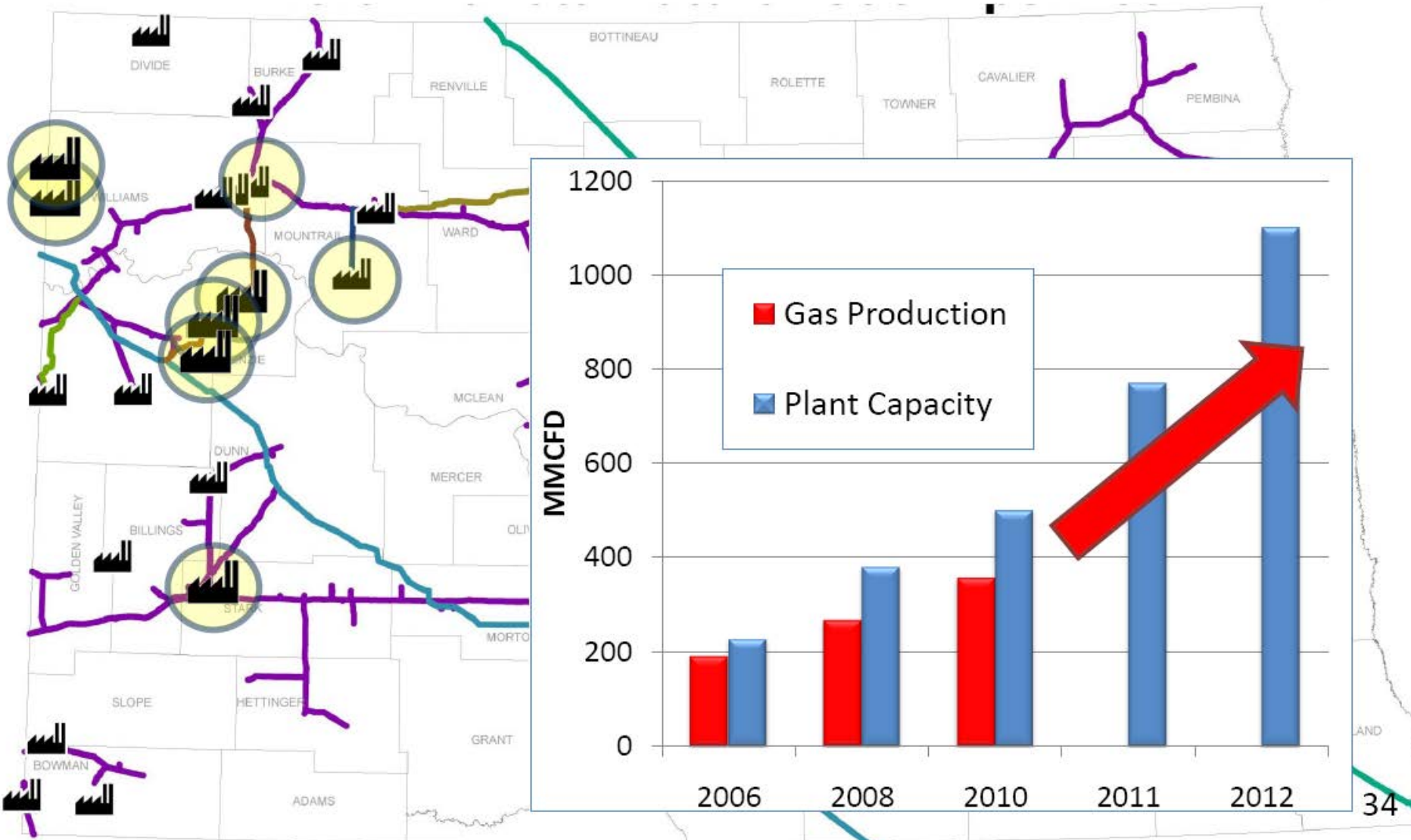
IT IS THEREFORE ORDERED:

(58) All wells in the Banks-Bakken Pool shall be allowed to produce at a maximum efficient rate for a period of 60 days commencing on the first day oil is produced through well-head equipment into tanks from the ultimate producing interval after casing has been run; after that, oil production from such wells shall not exceed an average of 200 barrels per day for a period of 60 days; after that, oil production from such wells shall not exceed an average of 150 barrels per day for a period of 60 days, thereafter, oil production from such wells shall not exceed an average of 100 barrels of oil per day; if and when such wells are connected to a gas gathering and processing facility the foregoing restrictions shall be removed, and the wells shall be allowed to produce at a maximum efficient rate. The Director is authorized to issue an administrative order allowing unrestricted production at a maximum efficient rate for a period not to exceed 120 days, commencing on the first day oil is produced through well-head equipment into tanks from the ultimate producing interval after casing has been run, if the necessity therefor can be demonstrated to his satisfaction.

Case No. 15689

Order No. 17944

New or Expanding Gas Plants



- **Contract No. G-020-043**
- **“Flare Gas – Power Generation Commercial Viability Pilot”**
- Submitted by **Blaise Energy, Inc.**
- Principal Investigator: Pascal Boudreau
- **PARTICIPANTS**
- **Sponsor Cost Share**
- Blaise Energy \$6,740,000
- Blaise Energy (in-kind) \$ 360,000
- North Dakota Industrial Commission \$ 375,000
- Total Project Cost \$ 7,475,000

“Wellhead Gas Capture Via CNG Technologies”

Applicant: Bakken Express, LLC

BUDGET

Request for \$873,300 NDIC OGRP funding; Total Project Cost: \$2,108,200

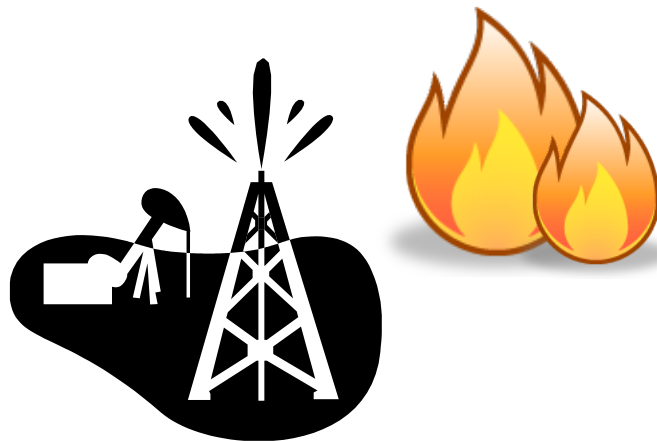
WELLSITE GAS CAPTURE & TRANSPORT										
12 Month Project: Capture & Transport Gas from 5 Wells with Peak Rate 2500 mcfd										
Expense Type	Total	NDIC	%	BX Cash	%	BX In-Kind	%	Other	%	%
Well Skids Capital	\$ 1,500,000	\$ 750,000	50%	\$ 750,000	50%	\$ -	0%	\$ -	0%	100%
Tube Trailer Leasing	\$ 220,000	\$ 110,000	50%	\$ 110,000	50%	\$ -	0%	\$ -	0%	100%
Discharge Facility Leasing	\$ 26,600	\$ 13,300	50%	\$ 13,300	50%	\$ -	0%	\$ -	0%	100%
Operator & Maintenance	\$ 69,400	\$ -	0%	\$ 69,400	100%	\$ -	0%	\$ -	0%	100%
Supervisory, Engineering and Mgmt Consult	\$ 61,800	\$ -	0%	\$ 61,800	100%	\$ -	0%	\$ -	0%	100%
Principals	\$ 230,400	\$ -	0%	\$ -	0%	\$ 230,400	100%	\$ -	0%	100%
TOTAL	\$ 2,108,200	\$ 873,300	41%	\$ 1,004,500	48%	\$ 230,400	11%	\$ -	0%	

Bakken Express, LLC will secure their portion of funding (\$1,004k in cash, \$230k in-kind) through contract financing and collateral bank loans.

The capital investment is the well compression/dehydration skids. The CNG tube trailers and discharge facility can be leased for a 12 month term.

- A project is under way in North Dakota to test using flare gas instead of diesel fuel to power drilling rigs, said the state's top oil and gas regulator.
- Gas flaring is a widely used practice for the disposal of natural gas in petroleum-producing areas where there is no infrastructure to make use of the gas.
- "We have been pouring money into every kind of project that we can think of to capture that gas and use it. The newest one is we're going to test this fall, is using it to power drilling rigs instead of using diesel fuel. It looks like there's a lot of potential," said Lynn Helms, Bismarck, director of the North Dakota Department of Mineral Resources.

Natural Gas Flaring and North Dakota



Trisha Curtis

Research Analyst, Energy Policy Research Foundation, Inc. (EPRINC)

North Dakota Pipeline Authority Webinar

November 10th, 2011

Introduction

Who is EPRINC? What do we do?

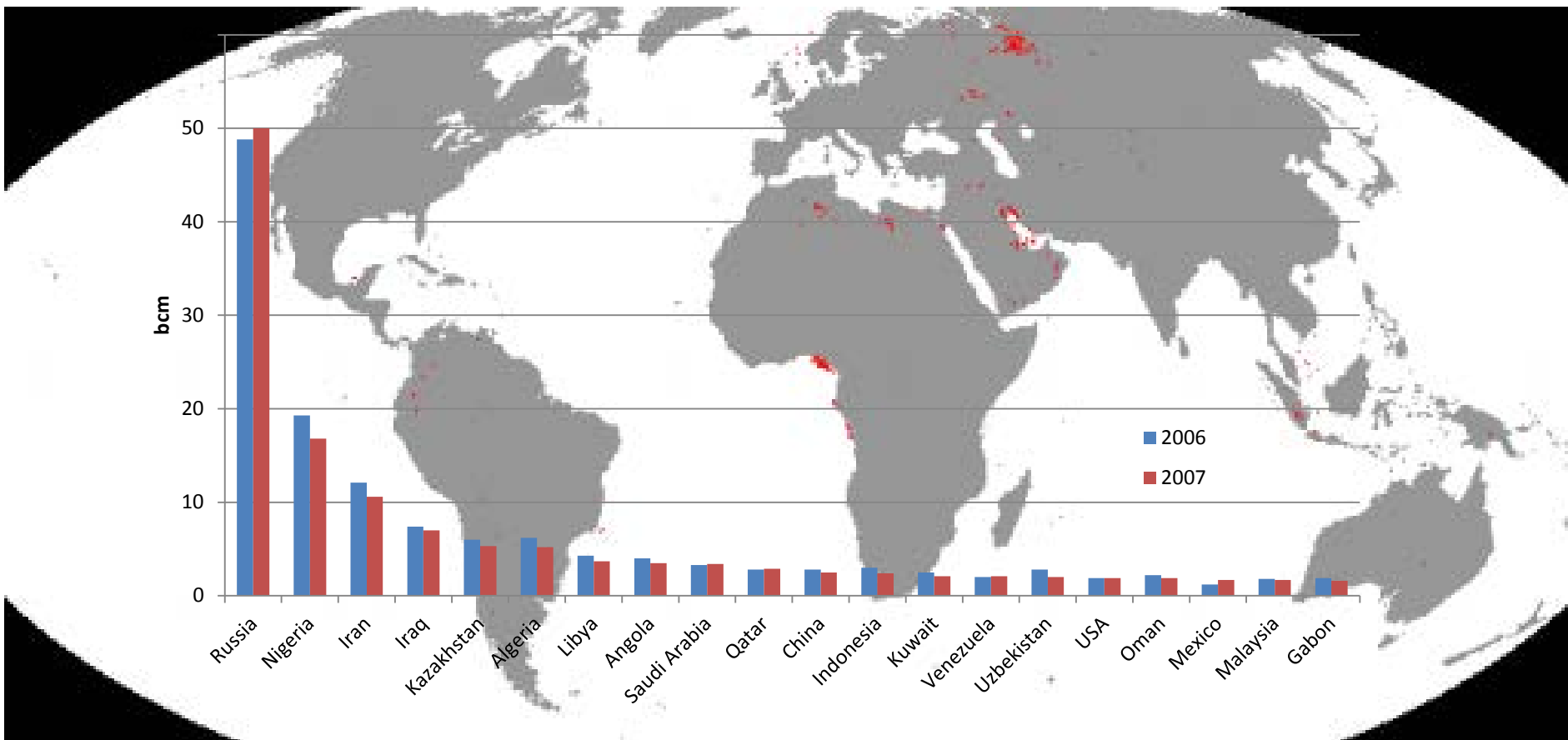
Presentation

- What is natural gas flaring and why is it an issue?
- What is going on in North Dakota
- What is the perception of this flaring outside of North Dakota and why does it matter?
- What the articles are missing

Natural Gas Flaring

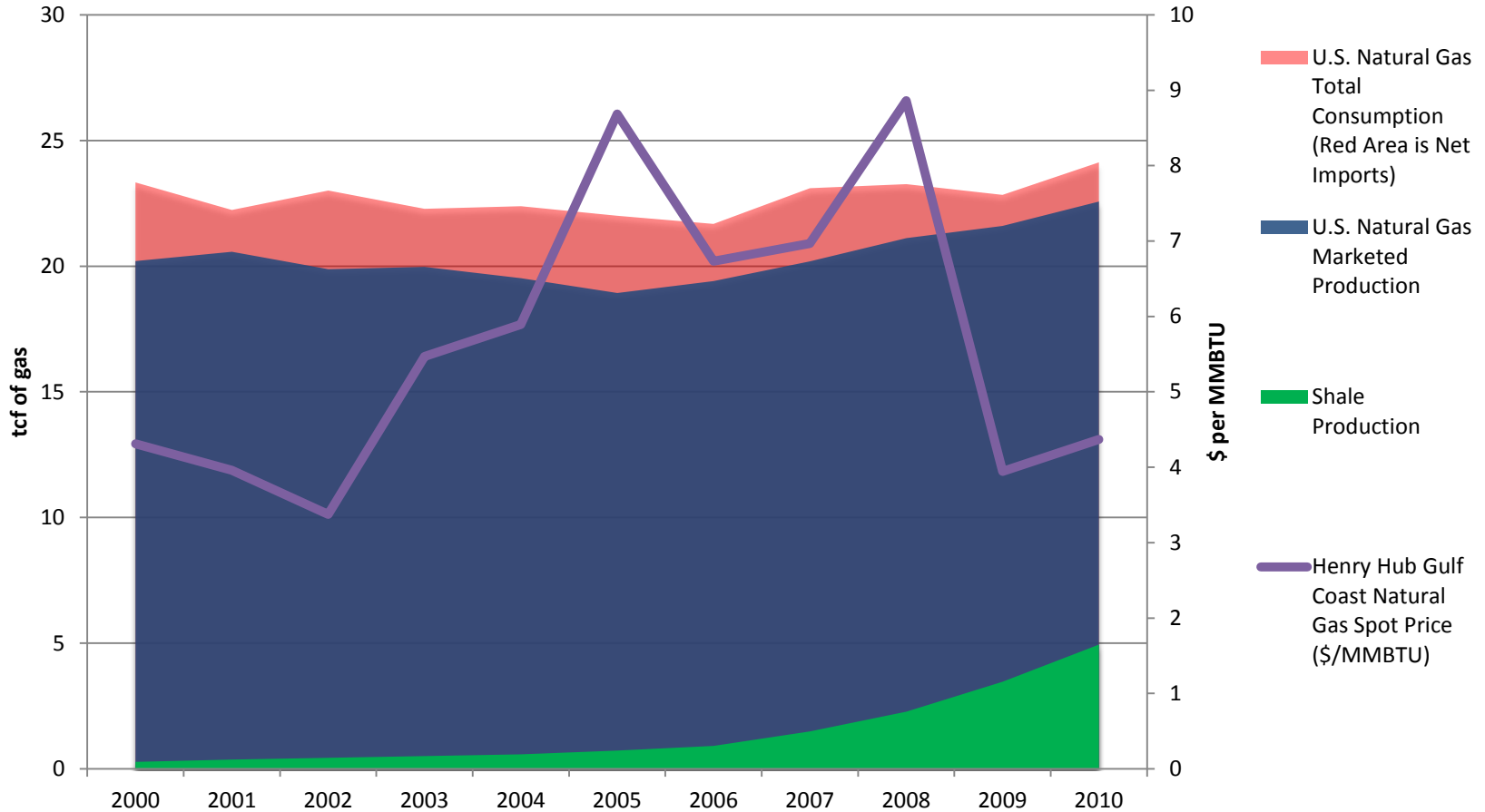
- **Flaring** (and or venting) is typically used in modern oil and gas facilities either for safety and pressure reasons or for the disposal of associated gas (natural gas produced as a byproduct of oil production) due to the lack of capturing and processing facilities for the natural gas
- Safety. It is necessary to have the option to flare for safety purposes in case there is a power outage or risk of explosion
- Flaring is most commonly seen in countries like Russia and Nigeria due to lack of enforced regulation or incentive to capture the gas
- Unlike oil, gas cannot be trucked or railed out, it must be captured, processed, and piped to consumers
- It is an **issue** for health and environmental reasons. Flaring produces mainly CO₂ emissions and venting produces mainly methane emissions. Methane is thought to be significantly more harmful to the environment than CO₂ in terms of emissions.
- Nigerian crude has higher GHG emissions than Canadian oil sands.

Top Gas Flaring Countries 2006 and 2007



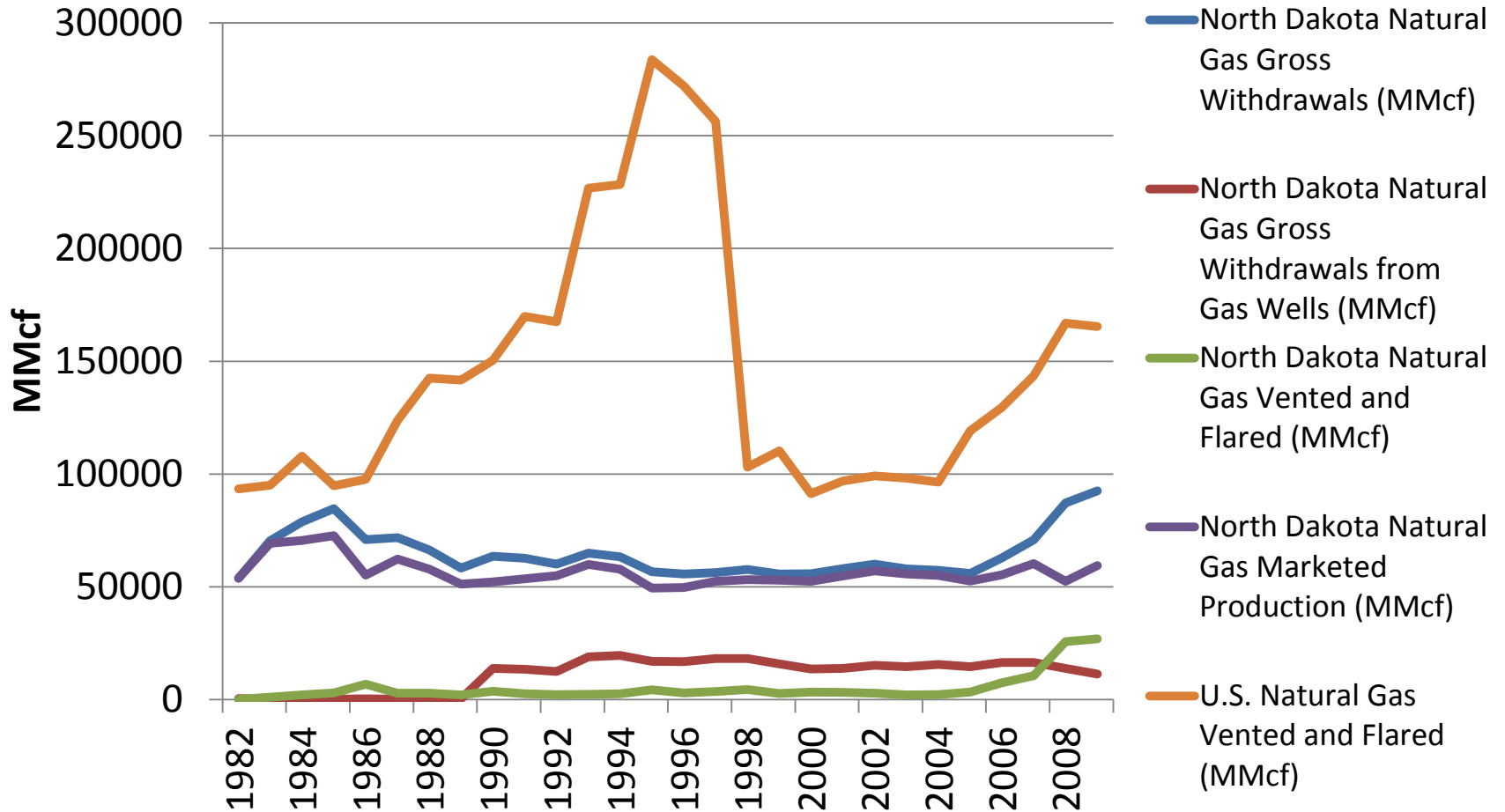
Source: Graph data taken from "Russian Associated Gas Utilisation: Problems and Prospects," 2009. Picture from Global Gas Flaring Reduction (GGFR) data from "A Twelve Year Record of National and Global Gas Flaring Volumes Estimated Using Satellite Data." Final Report to the World Bank - May 30, 2007. Christopher D. Elvidge et al.

U.S. Natural Gas Prices, Production, and Consumption



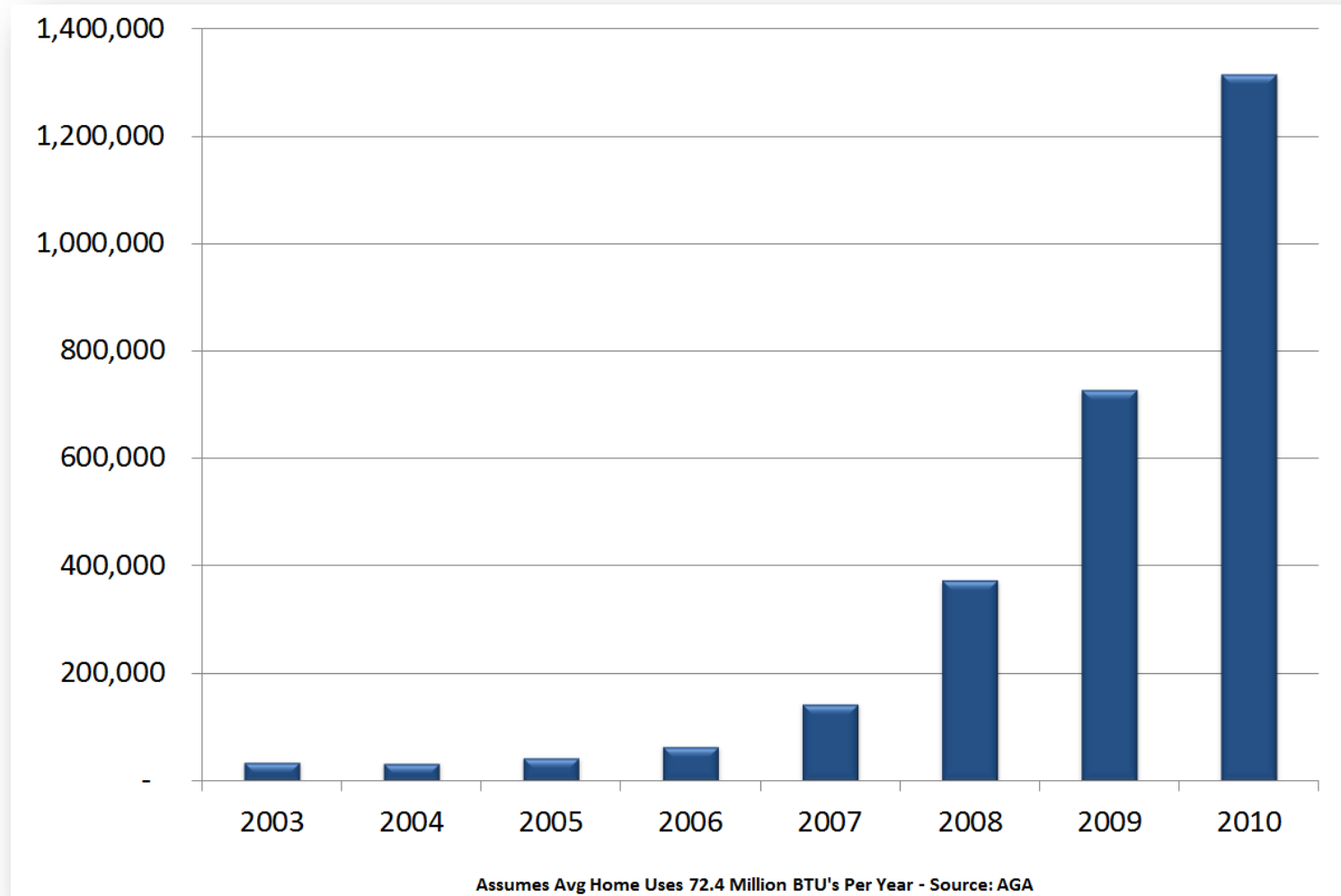
Source: EIA Data

North Dakota and US Flaring

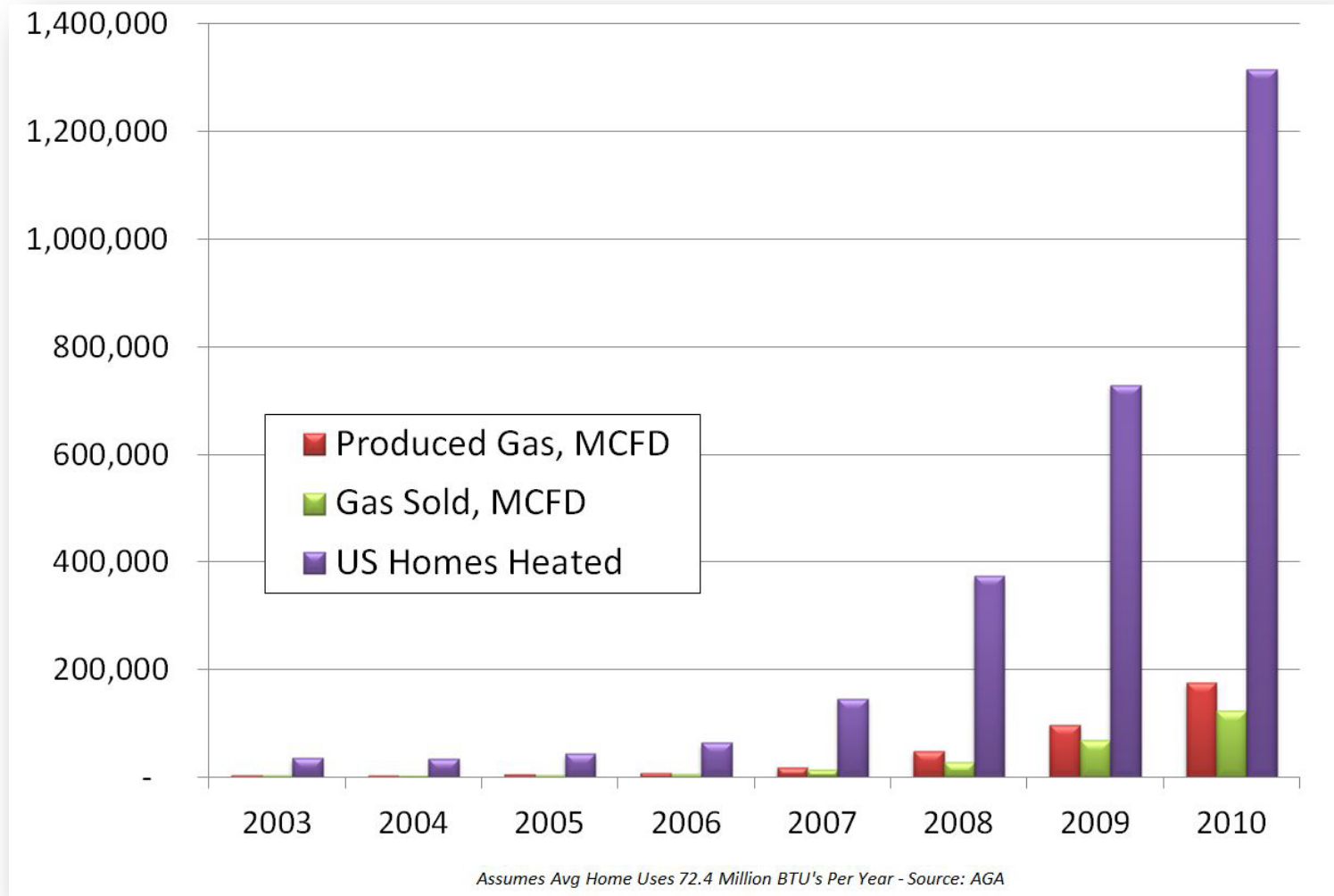


Source: EIA Data

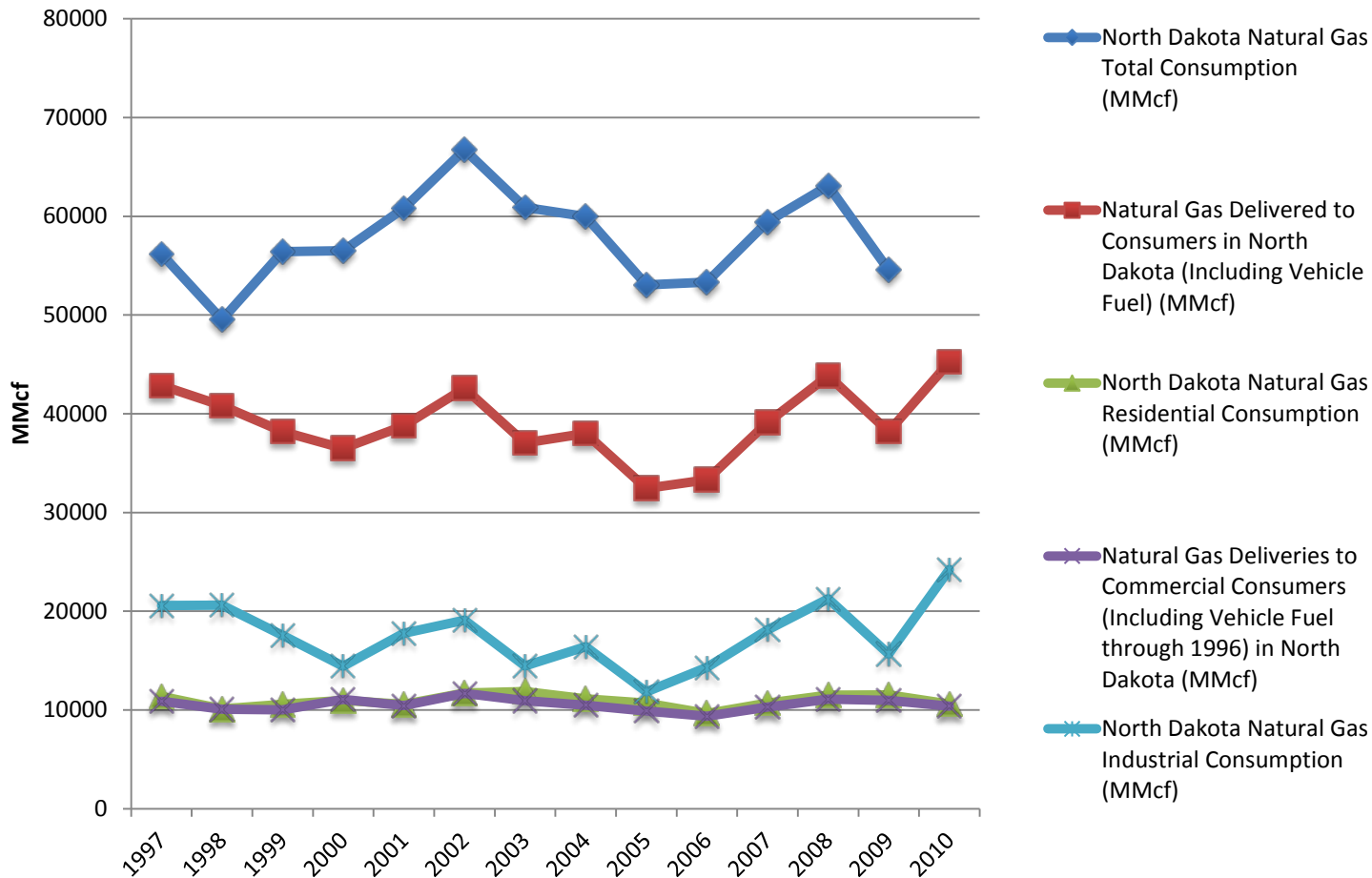
US Homes Heated with ND Bakken and Three Forks Natural Gas



Bakken and Three Forks Natural Gas



North Dakota Natural Gas Use



U.S. natural gas use in 2010:

- Electrical Power 31%
- Industrial 27%
- Residential 21%
- Commercial 13%
- Oil and Gas Industry Operations 6%
- Pipeline Fuel 3%
- Vehicle Fuel <1%

Source: EIA Data

What is Happening Outside of North Dakota?

In North Dakota, Flames of Wasted Natural Gas Light the Prairie

The New York Times

Sep 27, 2011

N. Dakota gas flaring raises energy, pollution concerns

USA TODAY

Green

A Blog About Energy and the Environment

September 27, 2011, 7:34 AM

Flames Light the Prairie and Warm the Planet

By CLIFFORD KRAUSS

Natural Gas is a Burning Issue

Wasting gas when we are energy starved

Ken Silverstein | Oct 05, 2011

energy**biz**

Political and Policy Impacts

House Dems press for inquiry into Bakken natural gas flaring

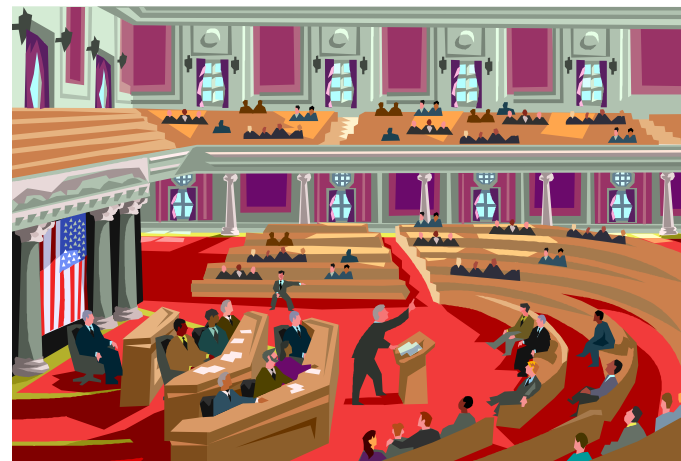
Mike Soraghan, E&E reporter

Published: Friday, October 14, 2011 EEnews

Oil and gas industry at the center of controversy...Gulf spill, pipeline leaks, **GHG emissions**, Keystone XL and oil sands “dirty oil”

Purposed ozone rules on fracking postponed and in comment period, but flaring part of regulations

Significant legislation on GHG emissions regarding Cap and Trade did not pass, no massive oil spill legislation, all out battle on Keystone XL



What the New York Times article did *not* mention...What needs to be explained...

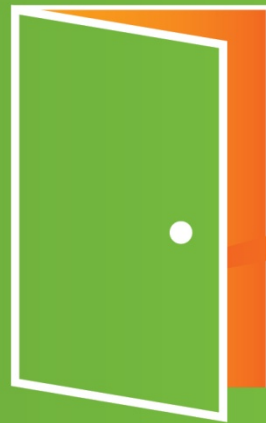
1. **Feasibility and economic viability of immediately getting gas to market.** Most of these wells will in time will be hooked up to gas processing facilities; however, there are some wells in North Dakota that are decades old and so far from any other existing well or facility that it may never be feasible to capture the gas from that single well.
2. **Severe weather limitations in North Dakota**
3. **Size and Maturity of the Play.** New play with rapid development (partially because of leasing requirements) and spread across over 15,000 sq. miles.
4. **VALUABLE natural gas that is high in NGLs.**
5. Over \$3 billion is being invested by the industry for gathering and processing in the next few years. **Significant gathering and processing growth** has taken place over the past several years, but has simply been unable to keep up with such strong production growth.

Understanding How Natural Gas is Processed

Understanding how natural gas is captured and processed is also something the articles have missed. Unlike crude oil which can be transported via rail in tank cars, by truck, or by pipeline, natural gas *must* be transported via pipeline and then sent to a proper facility to separate the products in the natural gas. Plant capacity construction is currently keeping up with production, but....

- ❑ Building gathering capabilities is not done by the producer, but rather by a third party and requires manpower, capital investment, and compliance with regulatory requirements

Associated gas with Bakken oil is rich in NGLs and therefore more valuable than current Henry Hub nat gas prices. But this gas must be connected and processed to separate and sell the different components in the NGL stream



North Dakota Pipeline Authority Flaring Webinar

November 10, 2011

A decorative graphic consisting of a thick, wavy purple line that starts from the bottom left, rises to a peak, and then descends before rising again towards the right edge. The background is a solid orange color.

David Scharf

President, Natural Gas Gathering and Processing

What We'll Cover

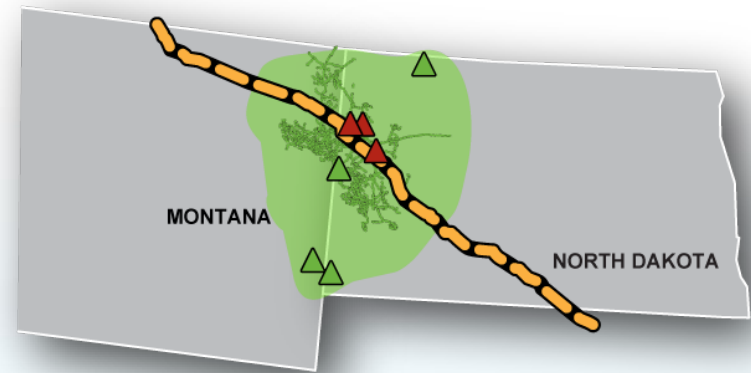
Key Points

- ONEOK Partners is a diversified, midstream natural gas and natural gas liquids company
 - Large existing gathering and processing presence
 - Strong commitment to expand infrastructure
- Why is natural gas flaring?
- Our \$1.5 - \$1.8 billion in growth projects will accommodate prolific supply growth
 - Natural gas gathering infrastructure
 - Natural gas processing plants
 - New NGL pipeline and related infrastructure expansions

ONEOK Partners Bakken Presence

Strategic Fit

- Nearly 5,000 miles of gathering pipelines
- 1 large processing plant (95 MMcfd) and 3 small satellite plants
- 3 large (100 MMcfd) plants under construction
- Long term presence
 - Knowledgeable workforce and contractors in place
 - Strong producer relationships
- 1.8 million acres dedicated
- Integrated value chain with NGL segment
- 50% interest in Northern Border residue natural gas pipeline



- ▲ Existing OKS Processing Plants
- ▲ New Processing Plants
- Bakken Shale
- Natural Gas Gathering Pipelines
- Northern Border Pipeline

Garden Creek Plant – 100 MMcfd

Expected to be operational by the end of 2011



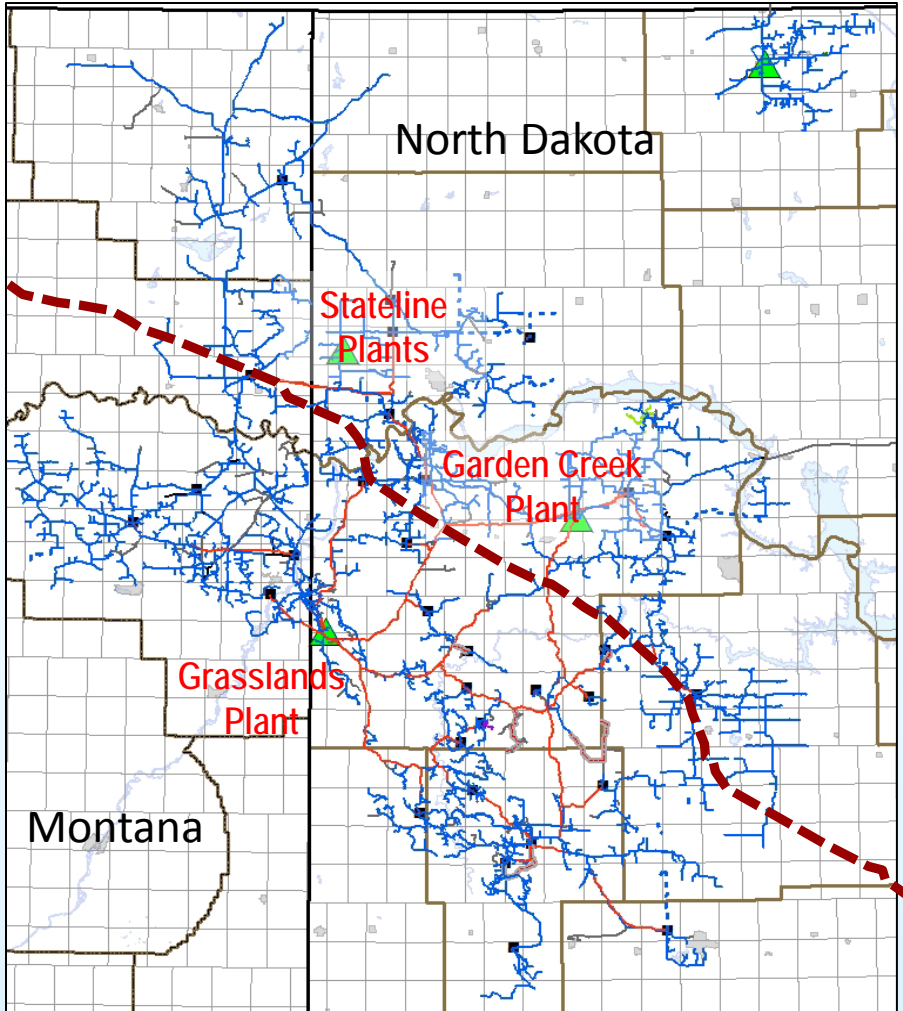
Why is Gas Flaring?

- Dramatic surge in drilling rigs, wells drilled and gas produced
 - Improved well-completion techniques increasing initial production rates
 - Strong producer economics driven by crude oil prices
- Low pressure gas that must be processed for removal of NGLs
- Lag in construction of necessary natural gas gathering, compression and processing infrastructure



Why Does Infrastructure Lag Drilling?

ONEOK Gas Gathering and Processing Facilities



- Widely scattered wells
 - Large area
 - Drilling to hold leases
- Existing facilities designed for smaller volume wells
- Time needed to design, permit and construct new facilities
- Manpower, equipment and housing shortages
- Weather challenges
- Difficulties in obtaining rights-of-way

Stateline 1 and 2 Plants – 200 MMcfd

Operational by 3rd qtr 2012 and 1st half of 2013, respectively



ONEOK Compression Projects

Approved and in various stages of construction

Facility	Location	Capacity	Target In-Service
• Garden Creek Compressor Station	McKenzie County	30 MMcfd	In Service
• Stateline Compressor Station	Williams County	25 MMcfd	In Service
• Lodgepole/16" Trunkline	Dunn/Stark Counties	10 MMcfd	In Service
• Blue Buttes Units 5&6	McKenzie County	10 MMcfd	October 2011
• Alexander Booster Expansion	McKenzie County	5 MMcfd	October 2011
• Charlson Compressor Station	McKenzie County	30 MMcfd	November 2011
• Cherry Creek Compressor Station	McKenzie County	30 MMcfd	December 2011
• Epping Compressor Station	Williams County	15 MMcfd	January 2012
• Twin Valley Compressor Station	McKenzie County	30 MMcfd	March 2012
• Epping Station Expansion	Williams County	15 MMcfd	2Q 2012
• Cooperstown Station Expansion	McKenzie County	10 MMcfd	2Q 2012
• Tree Top Station Expansion	Billings County	5 MMcfd	3Q 2012
• Bear Den Compressor Station	McKenzie County	30 MMcfd	3Q 2012
• Alamo Compressor Station	Williams County	<u>15 MMcfd</u>	3Q 2012

Total Capacity of Field Compression Expansions-

260 MMcfd

Natural Gas Liquids Investments

- **Bakken Pipeline**
 - \$450-\$550 million
 - 12" diameter NGL pipeline from Bakken Shale to Overland Pass Pipeline
 - Initial capacity to transport 60,000 bpd of unfractionated NGLs, expandable to 110,000 bpd with more pumps
- **Overland Pass Pipeline expansion**
 - \$35-\$40 million (50% interest)
 - Expansion of existing pump stations
 - Additional pump stations
- **Fractionator expansion at Bushton**
 - \$110-\$140 million
 - Increase capacity to 210,000 bpd from 150,000 bpd
- **Additional NGL pipeline from Mid-Continent to Gulf Coast***
 - Sterling III
- **Mt. Belvieu fractionator expansion***
 - MB-2



- Overland Pass Pipeline Expansion (50% interest)
- Bakken Pipeline
- Bushton Fractionator Expansion

\$595 million to \$730 million

* Project amount not included in total on slide

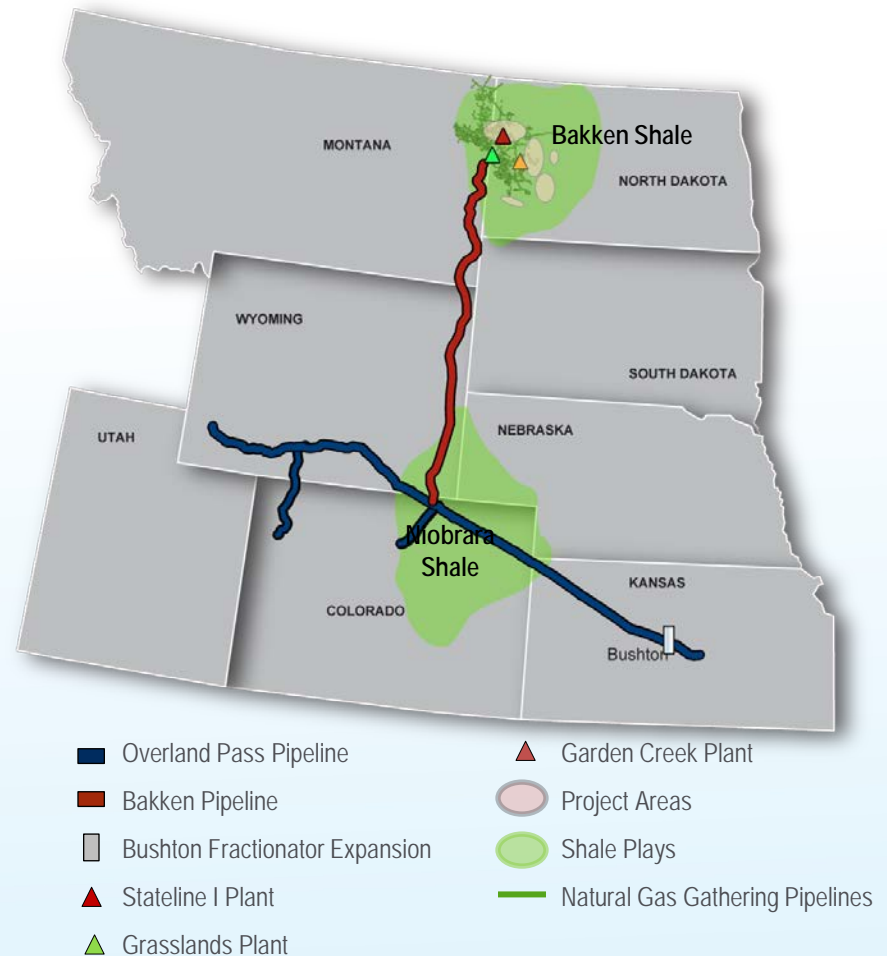
Recap of ONEOK Growth Projects

- Gathering and Processing

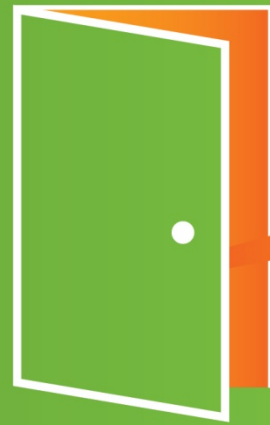
- Expansion of Grasslands from 55 to 95 MMcfd (completed in 2009)
- ~\$1.0 billion in new projects
 - Garden Creek
 - Stateline 1 and 2
 - Compression, pipelines, well-connects

- Natural Gas Liquids

- Approximately \$700 million
 - Construct Bakken Pipeline
 - Overland Pass Pipeline expansion
 - Expand Bushton fractionator
- Additional infrastructure to Mt. Belvieu (not included in total)



Approximately \$1.5 to \$1.8 Billion



Questions



North Dakota

oil & gas research program

Mission

The Mission of the Oil and Gas Research Program is to promote the growth of the oil and gas industry through research and education.

About Us



- State-Industry Program established by the legislature in 2003
- Funded from the state share of the oil and gas production tax and oil extraction tax
- Two percent, up to \$4 Million is available each biennium for research & educational grants

Highlighted Projects

- EERC
- Bakken Express
- Blaise Energy

Environmental Energy Research Center (EERC)

- Project will explore, identify, and demonstrate technologies for utilizing wellhead gas. Results will provide producers with a technical evaluation of gas fired biofuel (firing of natural gas and diesel fuel simultaneously in a diesel engine) diesel power for drilling operations, a demonstration of compressed natural gas (CNG) transport and delivery, and expanded markets for Bakken Formation associated gas.
- Program Funding :\$750,000
- Total Project Costs: \$1,900,000

Bakken Express

- Evaluation of compressed natural gas (CNG) technologies as an economic method to capture and transport produced natural gas and gas liquids to market.
- Program Funding: \$873,300
- Total Project Costs: \$2,108,200

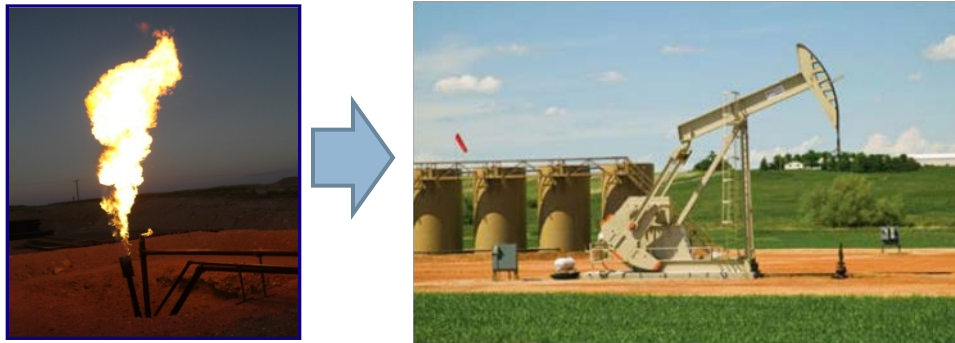
Blaise Energy

- To demonstrate the commercial viability of using otherwise wasted associated gas as fuel for on-site electrical power generation and its subsequent sale to the grid of the electricity as an alternative to flaring.
- Program Funding: \$375,000
- Total Project Costs: \$7,475,000

Gas Capturing Summary

3 Research Grants

- Program Funding: \$1,998,300
- Total Project Costs: \$11,483,200



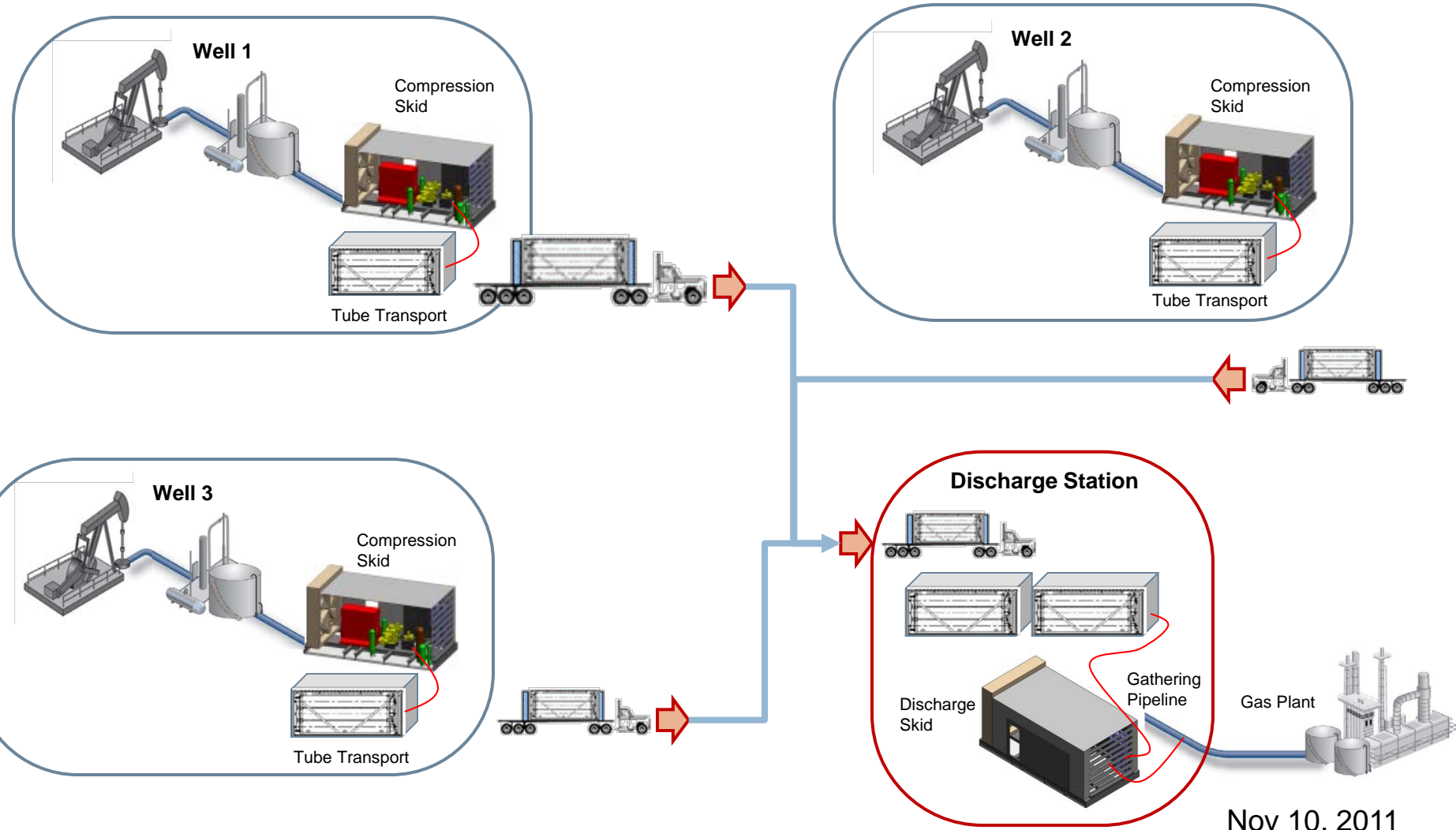
STRANDED GAS CAPTURE & TRANSPORT

Nov 10, 2011

Webinar - ND Pipeline Authority

Process: Wellsites To Pipeline

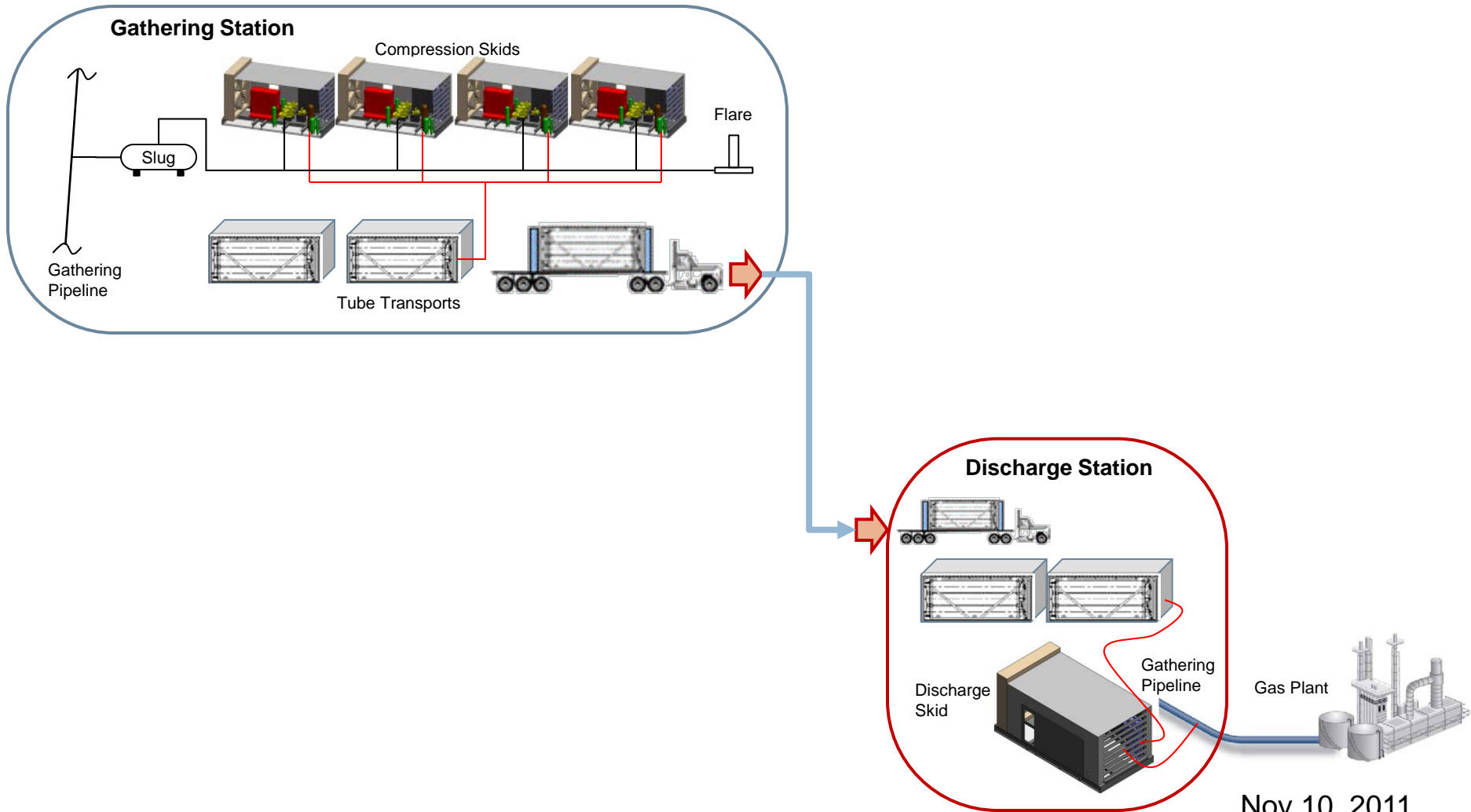
2



Nov 10, 2011

Gathering Station To Pipeline

3



Nov 10, 2011

Delivering Compressor Skid

4



First Three Skids Operating

5



Loading Tube Containers

6



Unloading Tube Containers

7



Selling Gas To Pipeliner

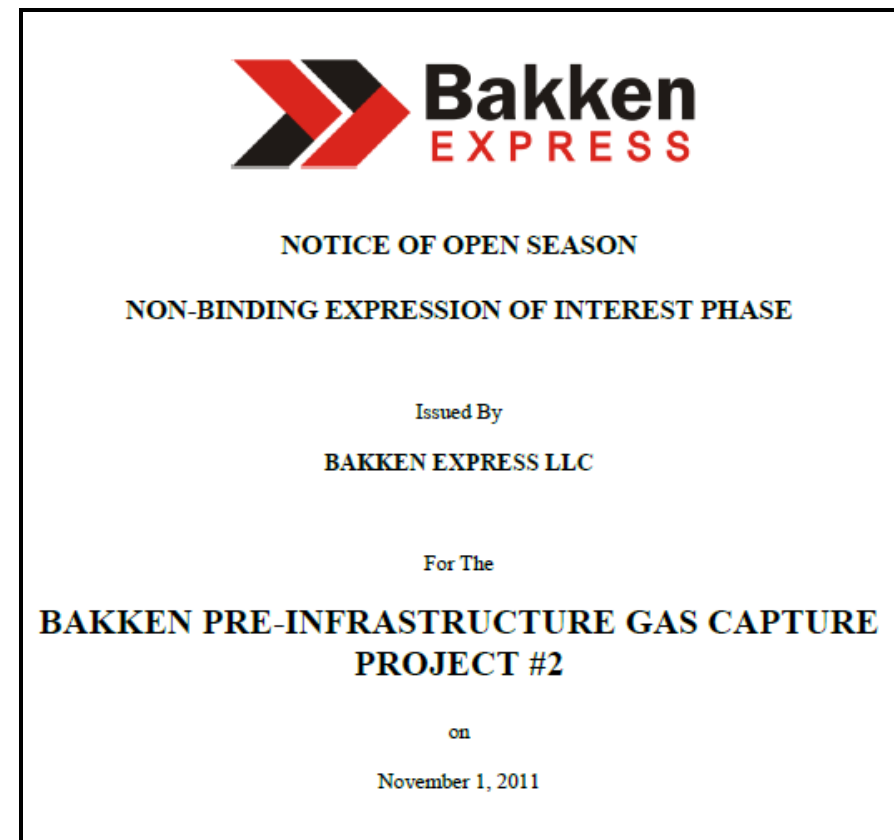
8



Open Season Project

9

- **Project #2 Scope**
 - Total of 95 compressor skids to capture 66 mmscfpd
- **Fee Structure**
 - No upfront capital
 - In-kind fee based on term
- **Non-Binding Period**
 - Expressions of Interest due by Dec 15, 2011
- **Contact**
 - Tim Maloney
 - tmaloney@bakkenexpress.com
 - 701-347-1602
 - bakkenexpress.com/openseason





BLAISE ENERGY

Tomorrow's Energy Solutions



Agenda:

- **Blaise Energy Solution**
- **Resolving Challenges**
- **Data Collection**
- **Moving Forward**
- **Partners**



The Blaise Solution

Overview:

- Flare Gas to Electricity
- No Cost Alternative to Flaring
 - Market Based solution
 - Carrot vs. Stick
- No Cost & Easy way to reduce waste
- Complete Outsourced Solution:
 - All work performed and paid by Blaise
- Use as much of the flare gas as possible
- Gas Monetization Options
- Significant emission reduction
 - Proactive Environmental Stewardship
- Proactive Self Regulation

The Blaise Solution

OGRC Grant Site 1

- Small “Clean” Footprint
- 1st in North America using Flared Gas in the Recycled Energy category generating Renewable Energy Credits (RECs)
- Easy Installation – 2 connections:
 1. “T” off flare line with any unused gas going to flare
 2. Electrical connection to on-site utility power



Blaise Energy Inc. Confidential

The Blaise Solution

OGRC Grant Site 1



Resolving Challenges

- Creating 1st time boilerplates
 - WAPA, Basin, Burke-Divide Electric Coop, Dept of Health
- Varying gas flow & composition
- Unknown Market for Grid Power
- Grid Connectivity
- North Dakota electric price
- WAPA approval is longest pole in the tent
- H2S

Improving the Design:

- Scalable Power Modules (85kW, 125kW & 200 kW)
- Mass production engine
- Stack in Parallel Operation
- Sized to available amount of associated gas
- Automatic air/fuel ratio adjustments for minimum emissions



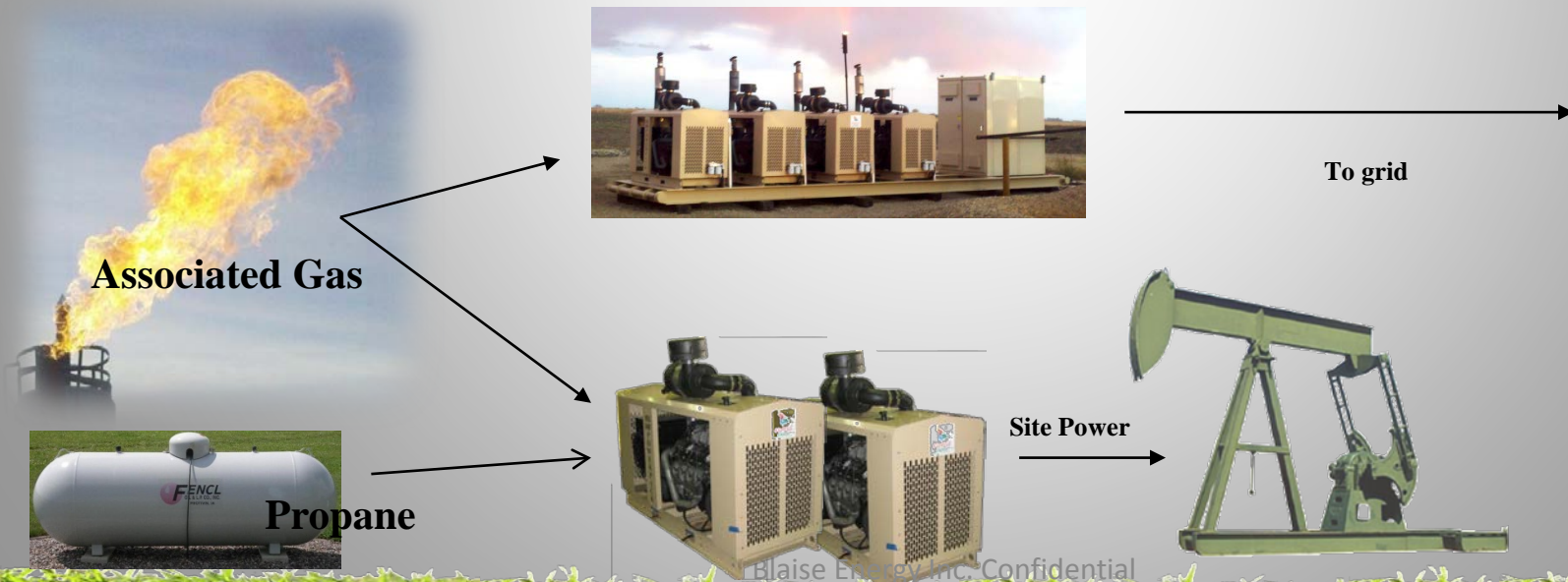
Skid Mounted:

- Paralleling capability
 - 32 Modules
- Scalable
 - Gas Decline
- Easily Transportable
- Enhanced Redundancy



The Blaise Solution

- Grid Power or Site Power
- Reduction or elimination of flare gas and emissions
- Leveraging available on-site fuel
 - Propane as backup (with priority to Associated Gas)
- Seamless transition and blending of fuels



The Blaise Solution

- Piloting proven GM Vortec Engine
 - Low cost / kW
 - Low Maintenance
- Advanced fuel control
- Remote Monitoring



IRON Control - C05 - Quick opened Controller

ParaOper No Timer

Ubat 27.4 V
0.0 36.0

AC Measurements			Values		
Name	Value	Dim	Name	Value	Dim
Mains PF	-0.98	L	M kWh E	126477	kWh
Mains V L1-N	288	V	M kWh I	32	kWh
Mains V L2-N	289	V	Sum MWh	128	MWh
Mains V L3-N	286	V	TotRunPact	159	kW
Mains freq	60.0	Hz	TotAvlbPnomAll	160	kW
Mains curr L1	191	A	TotAvlbPnom	0	kW
Mains curr L2	189	A	Act Reserve	157	kX
Mains curr L3	196	A	ActRes rel	0	%
Bus V L1-N	288	V			
Bus V L2-N	288	V			
Bus V L3-N	287	V			
Bus freq	60.0	Hz			

Alarm list 1
Wm SEL Alarm

IRON Values - C05 - Quick opened Controller

Groups	Name	Value	Dimension
Mains values	Sys BaseLoad		250 kW
Bus values	Derate		250 kW
Object	Fuel P Avg		22 PSI
Gen-sets	PLC-BOUT 1	10100010	
Control loops	PLC-BOUT 2	01000000	
Mains protect			
Pwr management			
Sync/Load ctrl			
Volt/PF ctrl			
Force value			
Load shedding			
Analog CU			
Bin inputs CU			
Bin outputs CU			
Log Bout			
Info			
Statistics			
PLC			
SHBOUT			
SHAIN			

Data Collection for Workshops

- Fuel Consumption
 - *To better assess future potential and Operator monetization*
- Maintenance Costs
 - *To better assess service long term viability in North Dakota*
- Emission Reduction
 - *To better assess Environmental benefits and positive impact*

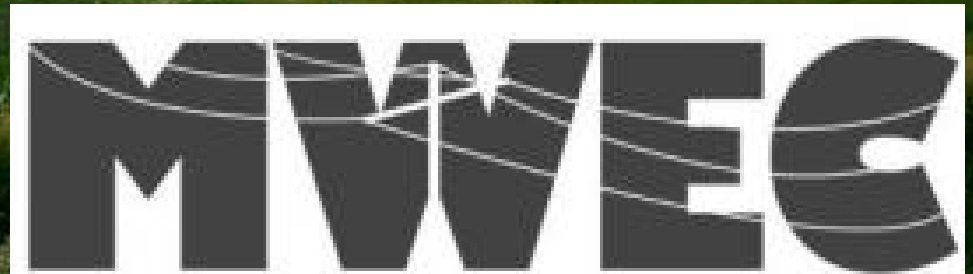


Blaise Energy *Snapshot*

- Headquartered in North Dakota
- Classified as “Recycled Energy” in North Dakota
- Public / Private Partnership
- Testing new Ideas
- Putting a Dent in Flaring:
 - 4 MW of grid connected agreements
 - 15 MW of active target sites
 - Power ~15,000 Homes
 - Emission reduction (compared to flaring)
 - CO₂e ~3600 tons per year
 - Equivalent to taking ~600 cars off the road

Thank You!

- ND Oil & Gas Research Council
- ND Industrial Commission
 - Dept Mineral Resources
- Member Coops
- NDPC
 - Member Operators



Questions?

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