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North Dakota Industrial Commission

NDPC Flaring Task Force

January 29, 2014

Key Factors for Flaring

- Shale Oil production profile – high surge of initial production followed by steep declines
- Unique Liquids-Rich Gas
- Time Needed to Build Infrastructure & Weather Constraints
- Size of the Bakken
- Technology Outpaced Production Expectations
- Easements and ROWs are Challenging

NDPC Flaring Task Force

- 500 member companies of NDPC
  - Responsible and efficient development of ND natural resources
- NDPC completely supports the State flaring goals
  - Reduce flare volumes
  - Reduce the number of wells flared, and
  - Reduce connect time period from first gas production to marketing gas sales

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Infrastructure and Investment

Unique, Very Focused

- Unique for Industry to work holistically
  - Not normal, companies are fierce competitors – upstream and midstream
- Started the task force last September
- Consists of 35 Industry experts in natural gas gathering, processing, and transport
- Met over 20 times since Sept. – very focused
- Tribal subcommittee has met 8 times since Nov

Current Infrastructure Statistics

New Infrastructure Since 2006

- 9,555 miles of gas gathering pipe
- 1.259 BCFD of gas processing
- Export capacity (downstream of plant)
  - Residue gas – 2.0+ BCFD
  - NGLs – 120-150,000 bbls/day

Industry Investment to Date

- Industry Investment in North Dakota
  - **Over $6 Billion**
- Preliminary numbers since January 2006
  - Gas gathering – wellhead to plant
  - Plant Processing – stand alone
  - Export capacity for residue gas and natural gas liquids (NGLs)

Entire State Flaring Statistics

- North Dakota Pipeline Authority data (Nov)
- Entire State
  - –Flaring 29%, 306 MMCFD of state gas production
    - Hess Tioga plant startup
  - –60% is from 216 well sites

Future Investment

- Approved, publically announced (approx.)
- 2014-2015
- Over $1.7 Billion new infrastructure announced
- 1,000+ miles of gas gathering pipe
- 400 MMcfd gas processing
- 75,000 bbls NGL export
- 400 MMcfd gas export
- 400 miles of export pipe

Non-FBIR/FBIR Flaring Statistics

- Private and State Lands (excludes FBIR)
  - –238,228 MCFD
  - –Flaring 27% of non-FBIR production
- Ft. Berthold Indian Reservation lands
  - –57,832 MCFD
  - –Flaring 40% of FBIR production

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Flaring Statistics

Unique challenges on the FBIR

- ROWs are very slow to get – consent from landowner, Tribe
- More permit scrutiny - 3 federal agencies must approve (BLM, BIA, USFWS)
- Tribal policies conflict with getting pipelines to well locations
  - Developing a conditionally-assignable ROW form – 13 pages long
  - ½ mile setback for all pipelines and compressors from any occupied structure
- Topography and Lake Sakakawea make gas gathering systems challenging to operate

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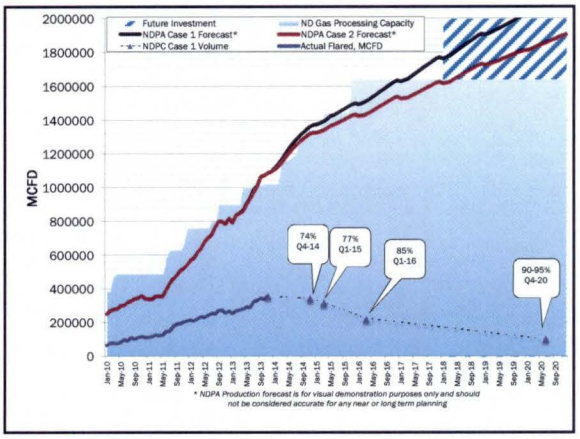
Future Capture Targets



85% Capture in Two Years

- **Capture 74% by 4th Qtr. 2014**
  - Recent processing expansion, BMPs
- **Capture 77% by 1st Qtr. 2015**
  - Continue capacity build out
  - Operational efficiencies
- **Capture 85% by 1st Qtr. 2016**
  - New recently announced processing plants
  - Value added North Dakota markets

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Time Delays to Connect

90% Capture by 2020

.....with potential for 95% capture

- This plan allows for increased future oil production while reducing flaring
- Achieving this goal, requires full engagement by the industry, state, counties, NDIC, tribe, and landowners to implement this plan

Example Connect Times

- The typical process and time for connecting a well or multi-well pad to the gas plant is as follows:
  - Identify well(s), negotiate and execute gas processing agreement: **90 days** (try to negotiate the agreement before the well is spud and during drilling so facilities are ready to capture the first production after well stimulation)
  - Once agreement is executed, apply for county permit: **30 days**
  - Once permit is received, acquire right of way: **30-180 days**
  - Upon ROW acquisition, construct gathering lines and appurtenant facilities: **30 days**

Total time: up to **180 days, if no problem with ROW**.

Note: Typically, can connect a well in 90 days (weather permitting) if the contract is already in place.

Delays to Gas Connection

- **Single Biggest Challenge to connect gas**
  - Securing landowner permission for connection activities – **up to 180 days or longer**
- **Biggest obstacles and time delays**
  - Delays in zoning by counties and townships for midstream facilities
  - Short construction season/weather
  - Limited number of available construction crews
  - Review of permits for natural gas fueled equipment

NDPC Flaring Reduction Recommendations

- Gas Capture Plan
- Regulatory Consequences
- Midstream Planning and Tracking
- Gathering Line Oversight
- Rights of Way
- State Actions
- Remote Capture Technologies
- Monitoring and Reporting

New Focus on Flaring Reduction

- Management focus to reduce flaring
- Focused internal effort to reduce flaring
  - Better drilling, completions, and facilities coordination to reduce flaring
  - Communication with midstream
  - Evaluation of gas utilization before midstream
  - Increased emphasis on obtaining ROW

New Permit Requirement

- **Gas Capture Plan (GCP)**
  - Forces gas capture planning prior to drilling
  - GCP may include at the discretion of NDIC:
    - Location map gathering system connection, processing plant(s) identified
    - Flowback strategy (rate, duration, plan for multi-well start up)
    - Current system capacity and utilization
    - Time period for connection

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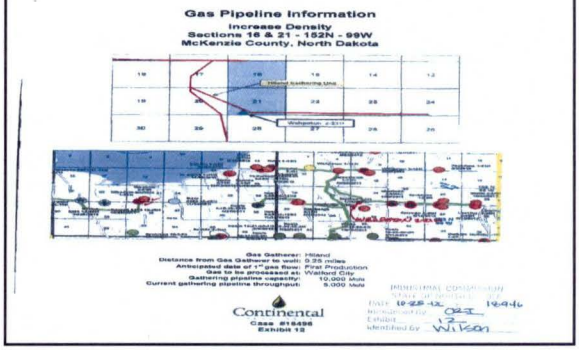
Proposal to Meet Reduction Targets

Sample Gas Capture Plan



Gas Capture Plan Milestones

- June 1, 2014: All new APDs must have a GCP
- For all existing flaring wells, the producer will submit a GCP
  - September 1, 2014: large volume wells (based on Nov NDPA data) 60% is from 216 wells >300 MCFD, 50% connected to sales
  - March 1, 2015: all other wells flaring longer than 90-days, excluding marginal wells

Gathering Line Oversight

- North Dakota will be the first in the nation to regulate gathering systems, effective April 1, 2014 (House Bill 1333)
  - 18,000 miles of existing gathering line will be regulated
  - New electronic mapping requirements
  - $75 MM cleanup fund
  - Pipeline mediation

Regulatory Consequences

- At the discretion of NDIC, penalty for failure to comply
  - Failure to submit GCP
    - New wells – suspension or denial of permit
    - Existing wells – curtail production where no detriment to well or reservoir
  - Failure to comply with GCP
    - Curtail production
    - Not meeting flowback strategy
    - Mitigating circumstances may allow extension (i.e., economic evaluation, operator's overall capture rate, ROW, safety, weather, work crews, etc.)

Pipeline Hotline

- NDIC develop and manage "hotline" for reporting surface owner issue related to pipelines
- Establish follow-up mechanism with company and surface owner to ensure quality control
- Provide landowner with easy notification system for problems and concerns

Midstream Planning and Tracking

- Midstream companies meet with NDIC on a regular basis (i.e., annual, bi-annual) to status operations and updates
- Suggested reporting to include:
  - Percent gas captured by gathering system
  - Gathering forecast by gathering system
  - Status plant processing capacity and gathering capacity with future obligations and capture targets
  - Utilization and downtime/interruptions of service
    - Field compression downtime / Plant downtime/maintenance

ROW Task Force

- ROW Task Force to address biggest time delay challenge
  - Discuss and review potential energy corridors, section line easements,legislation to improve ROW access to reduce flaring
  - Stakeholders to include:
    - NDIC, North Dakota Pipeline Authority
    - Attorney General due to legal issues
    - State Energy Impact Coordinator
    - Counties
    - Landowners groups
    - Industry members, both upstream and midstream

State Actions

- Incentivize rapid build out capacity for gas infrastructure
  - Property tax incentive, payment in lieu of taxes
  - Low interest loans (electrical transmission), etc.
  - Production tax credits for producers
- Incentivize intrastate value added markets
  - LNG, CNG, petrochemical, fertilizer plants, technology innovation
  - Develop Infrastructure Development Fund
- Support dense phase, high pressure export pipeline
  - Major investment – approximately $3 billion
  - Long lead time – approximately 3 years construction time to mid-continent markets
  - NDPA is authorized by statute to take up to 10% of firm capacity

90% Capture by 2020

- This plan allows for increased oil production while reducing flaring
- **Possible target of 95% capture**

Incentivize Remote Capture Tech

- EERC evaluation process
- EERC pilot and scalability testing
- Increase funding for the Oil & Gas Research Council, focus on value added markets
  - Utilize Empower Commission Value Added Natural Gas Study

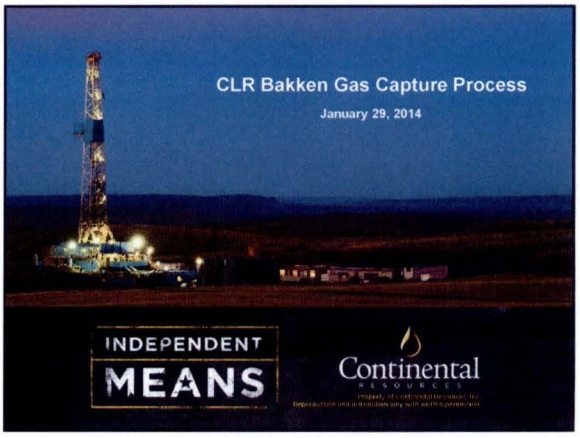
Up To 95% Capture Possible

However,

achieving these targets, requires full engagement by the state, counties, NDIC, tribe, landowners, and industry, to implement this plan

Flare Reporting and Monitoring

- Non-FBIR/FBIR flaring tracked separately
- Revise current NDIC gas production and sales report to include:
  - Non-routine flaring operations - safety, power outages, pressure control, pigging, etc.
  - Well testing and flowback operations
- NDPA report on target capture status to NDIC
  - 4rd Qtr. 2014
  - 2nd Qtr. 2015
  - 1st Qtr. 2016



Insure Clear, Continuous Communication

- Internally
  - Geology
  - Land
  - Operations (Drilling, Completion, Production)
  - Resource Development
  - Marketing
  - Project Development
  - Planning/Finance
- Externally
  - Regulatory Agencies
  - Local Agencies
  - Surface Owners
  - Gas / Oil / Water gatherer and/or purchaser

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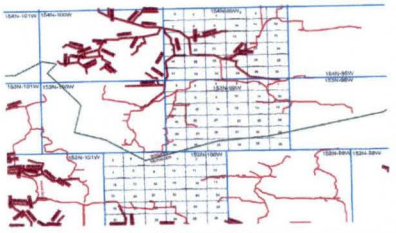
Gas Pipeline Information

Increased Density - Crazy Man Field
Township 153N - Range 99W
McKenzie/Williams Counties, North Dakota



Gas Gatherer: OneOk/Hiland
Distance from Gas Gatherer to well: < 1.0 Mile
Anticipated date of 1st gas flow: 1st Production
Gas to be processed at: Watford or Garden Creek I
Gathering pipeline capacity: Watford 100 MMcfd and Garden Creek I 100 MMcfd
Current gathering pipeline through put: Watford 50 MMcfd and Garden Creek I 79 MMcfd

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Planning

- Construct and maintain rig schedule to meet corporate goals
  - Exploration or "step-out" testing
  - Well density testing (both horizontal and vertical separation)
  - Full field development
- Prepare "Gas Capture Plan" exhibit identifying pertinent information for use at regulatory hearings
  - Determine market status (Dedicated to mid-stream or not)
  - Determine mid-stream's ability to meet timeline and production rates
- When feasible, adjust drilling timeline to accommodate connection or compression/plant capacity timing
- Provide periodic production forecasts* to mid-stream gatherer for existing and planned wells or well pads

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* Volume forecast information is furnished under confidential status.

Track Performance

- Establish metrics to quantify performance
  - Percent and volume flared from wells that are connected to a purchaser
  - Percent and volume flared requiring connection to a purchaser
- Work with mid-stream provider to analyze issues affecting connected wells
  - Plant capacity
  - Compression capacity
  - Gathering system sizing
  - Operational issues (i.e. fluid buildup in lines, power outages, etc.)
  - New well IP's overcoming planned or available capacity

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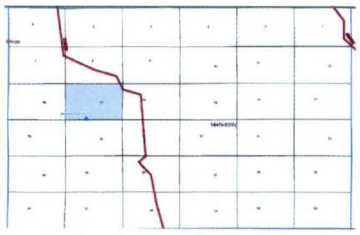
Gas Pipeline Information

640 Acre Spacing
Section 17 - Township 144N - Range 99W
Billings County, North Dakota



Gas Gatherer: OneOk
Distance from Gas Gatherer to well: 0.75 Miles
Anticipated date of 1st gas flow: 1st Production
Gas to be processed at: Grasslands
Plant capacity: 90 MMcfd
Current Plant through put: 71 MMcfd

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Track Performance (continued)

- Analyze issues with wells needing a connection
  - Issues outside CLR's control
    - ROW/Landowner
    - Non-commercial volume
    - Gas Quality
  - Issues within CLR's control
    - Pipeline connected and pending activation
    - Pipeline connection scheduled for future date
    - Request contract release (stranded well on dedicated acreage)
    - Seek new mid-stream market
    - No timeline or resolution determined
- Develop solutions with timelines

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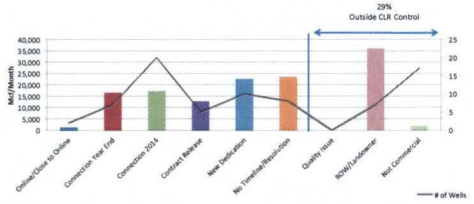
ND Bakken Non-Connected Well Analysis

- August 2013 Operated Wells
  - 133,434 mcf
  - 75 wells



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Success Gained Through…

- Clear communication
  - Engaging all stakeholders
  - Providing immediate notification of delays or changes to plans
  - Understanding one-another's limitations
- Planning
  - Providing development plans for a 2+ year period to meet design and construction lead-time requirements
  - Reviewing volume forecasts by specific gathering areas
- Tracking performance and progress
  - Hosting quarterly performance review meetings
  - Engaging CLR and mid-stream teams in open dialogue
  - Reviewing performance metrics and modifying plans
  - Discussing new developments and/or changes
  - Assisting gatherer with problematic issues, such as ROW acquisition and reasonable surface use within the lease boundary

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Solicited Technical Information Regarding Remote Capture Technologies

- Prepared and distributed a request for information (RFI) describing the nature of North Dakota flare gas and soliciting participation from vendors.
- RFI describes the quality, quantity and distribution of flared gas in North Dakota, providing vendors the information needed to tailor their offering to the unique conditions. Offers must:
  - Accommodate high concentrations of natural gas liquids.
  - Turn down capacity and mobility to accommodate production decline.
  - Be operable in extreme climates.
  - Account for large geographic area.

But, If We Go Too Far with Restrictions, we may…

- Limit development with multi-well pads, which are critical to:
  - Reducing environmental footprint
  - Reducing truck traffic
  - Reducing dust
  - Improving safety of the community
- Discourage private investment (O&G support operations, housing, hotels, restaurants, retail, etc.)
- Decrease the reservoir recovery efficiency
- Lose substantial revenue for the mineral interest owner, operator and the State of North Dakota

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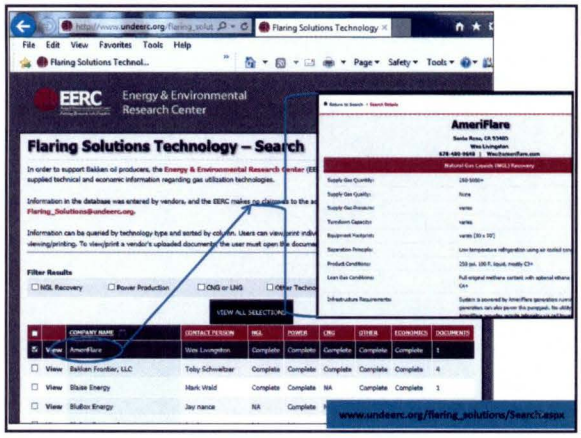
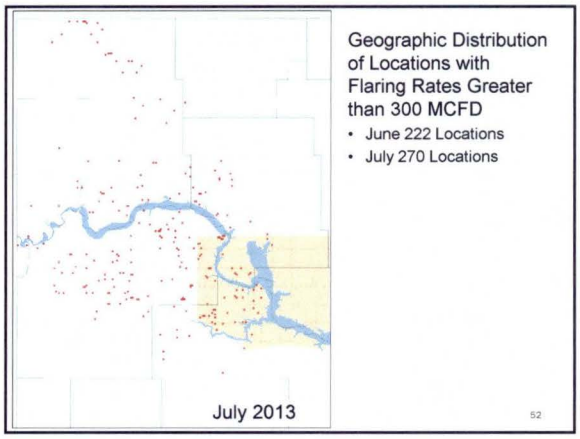
EERC Remote Capture Evaluation

- Created a database to assemble technical information about vendor technologies and services. Thirty companies have responded to the RFI to date.
- Review of technology information is ongoing:
  - Match technology with conditions.
  - Combine complementary technologies.
  - Adapt technologies, operations, and business models to accommodate conditions.
- Web-based database is available to view company and technical information.
  www.undeerc.org/flaring_solutions/Search.aspx





Summary of Flared Gas Statistics
November nonconfidential locations

	<1 MCFD	1-299 MCFD	300-599 MCFD	600-1199 MCFD	1200+ MCFD
TOTAL LOCATIONS					
Locations	1925 (42%)	2501 (54%)	103 (2%)	69 (1%)	44 (1%)
Monthly Gas Flared, MCF	4504 (<1%)	3,135,152 (40%)	1,056,163 (14%)	1,448,272 (19%)	2,111,337 (27%)

216 Locations Flaring 60% of Total Flared Gas at Rates of >300 MCFD.

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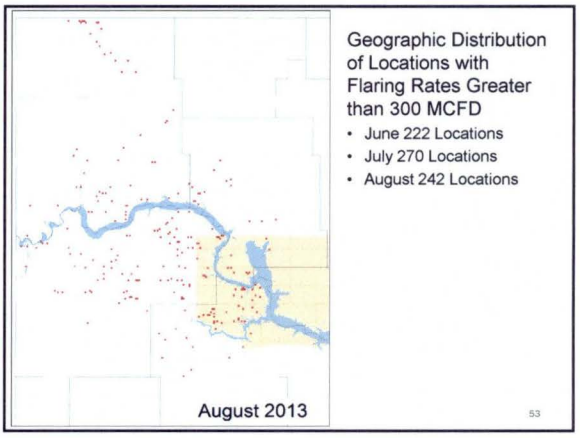

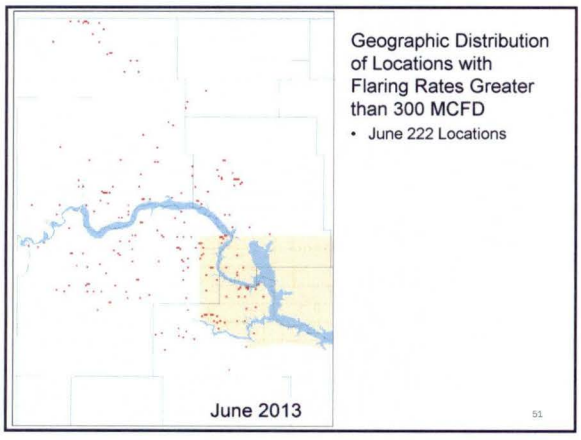

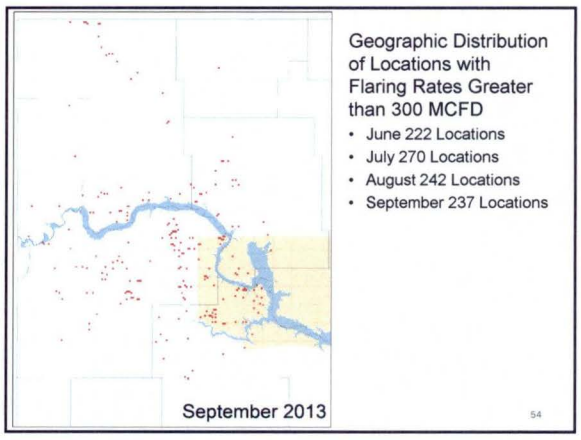

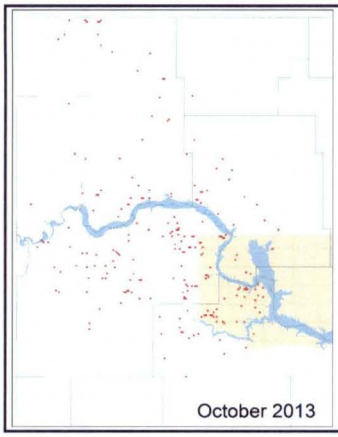

Geographic Distribution of Locations with Flaring Rates Greater than 300 MCFD

- June 222 Locations
- July 270 Locations
- August 242 Locations
- September 237 Locations
- October 227 Locations

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Flaring Statistics Summary Points

- Understanding the quantity, quality, and distribution of flares is critical to selecting effective remote capture technology.
- 60% of the total flared gas is coming from locations flaring at a rate of 300 MCFD or greater.
- 216 locations (4% of total locations) flare at a rate of 300 MCFD or greater.
- Historically 50% of flaring is occurring at locations with gas gathering and 50% at stranded locations.
  - Production has exceeded expectations, leading to constrained gathering systems and flaring from connected locations.

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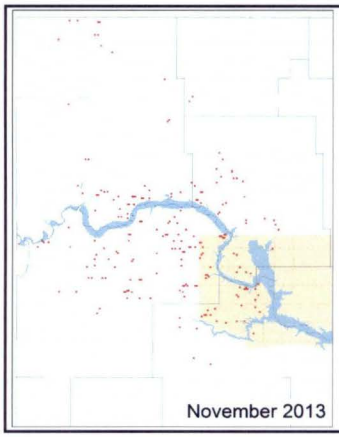

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- November 216 Locations

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Technology	Possible Impact to Flared Volume	Pros	Cons
NGL Removal	7% reduction deployed at the 216 largest flaring locations	• Ease of deployment • Ease of operation • Extracts highest-value product from rich gas	• Best deployed during first 12 months of operation • Increases truck traffic, liquids storage
Power Diesel Replacement	0.5% reduction Power production at 100 one-well locations	• Fuel cost savings • Ease of deployment • Ease of operation	• Limited applicable sites
Power Local Load, Diesel Replacement	9% reduction Power production at 100 1-MW locations	• Reduces overall electrical load growth • Ease of deployment • Ease of operation	• Limited applicable sites
CNG/LNG	0.1% reduction 25,000-mile/day fleet	• Fuel cost savings	• Low demand for fuel • Infrastructure and vehicle conversion takes time
Truck Transport	31% reduction 100 1-MMCFD sites	• Significant flaring impact	• 900 trucks • 9 trucks/day/MMCFD
GTL	8% reduction 2500-bpd production	• Conversion of gas to a higher-value liquid product	• Immature at relevant scale • High capital cost • Complex operation • Requires large, consistent gas supply

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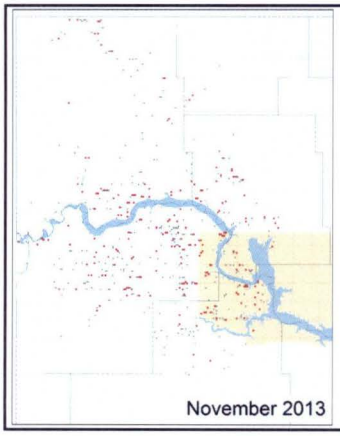

Geographic Distribution of Locations with Flaring Rates Greater than 300 MCFD

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- November 216 Locations

Location Where Flare Rate Was >300 MCFD in Previous 5 Months

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Remote Capture Implemented

- ECO-AFS has installed bifuel systems on 30 drilling rigs to date. Gas use of up to 100 MCFD during active drilling.
- Statoil is demonstrating GE's technology to recover NGLs and compress/deliver lean gas to bifuel drilling rigs.
- Hess, EOG, and Halcon have worked with GTUIT for NGL recovery at flared locations.
- Whiting is working with BX Energy to haul rich gas from flaring location to gas plant.

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Technology Summary Points

- Technologies exist that can be deployed to utilize flared gas, providing small incremental benefit to gas utilization.
- Gas flaring is a result of many factors. Each technology can address different challenges and improve gas capture under certain conditions.
- Distributed-scale technology alone cannot be economically deployed widely enough to achieve 90% gas capture.
- Remote capture can contribute to the target when coupled with increased gathering and improved gas capture planning.
- Demonstration of technologies in North Dakota can allow evaluation of technology in a relevant environment, ensure desired outcome, and assess ancillary impacts (truck traffic, safety risk).

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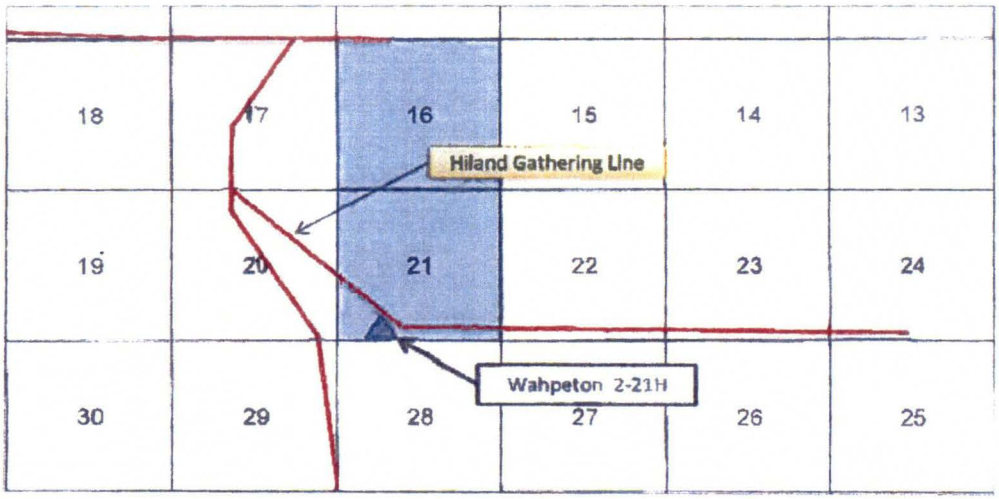
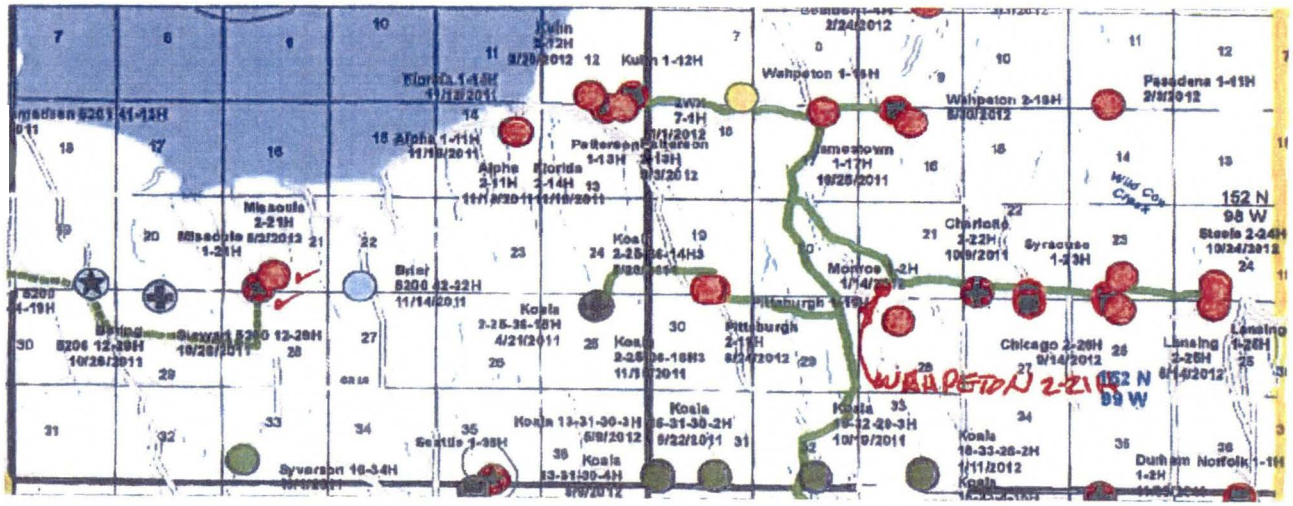
Questions?

Gas Pipeline Information

Increase Density
Sections 16 & 21 - 152N - 99W
McKenzie County, North Dakota





Gas Gatherer: Hiland
Distance from Gas Gatherer to well: 0.25 miles
Anticipated date of 1st gas flow: First Production
Gas to be processed at: Watford City
Gathering pipeline capacity: 10,000 Mcfd
Current gathering pipeline throughput: 5,000 Mcfd