North Dakota Industrial Commission

NDPC Flaring Task Force

January 29, 2014
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
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
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
Infrastructure and Investment
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
  o **Over $6 Billion**

• Preliminary numbers since January 2006
  o Gas gathering – wellhead to plant
  o Plant Processing – stand alone
  o Export capacity for residue gas and natural gas liquids (NGLs)
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
• 375 miles of natural gas pipe
Flaring Statistics
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
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
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
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
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
* NDPA Production forecast is for visual demonstration purposes only and should not be considered accurate for any near or long term planning.
Time Delays to Connect
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
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
Proposal to Meet Reduction Targets
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 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
Sample Gas Capture Plan

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 Mscfd
Current gathering pipeline throughput: 5,000 Mscfd

INDUSTRIAL COMMISSION
STATE OF NORTH DAKOTA
DATE 10-25-12 EXHIBIT 12
Introduced By CRJ
Exhibit 12
Identified By Wilson
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
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.)
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
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
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
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
• 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
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
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
  - 4^{rd} Qtr. 2014
  - 2^{nd} Qtr. 2015
  - 1^{st} Qtr. 2016
90% Capture by 2020

• This plan allows for increased oil production while reducing flaring

• Possible target of 95% capture
However, achieving these targets, requires full engagement by the state, counties, NDIC, tribe, landowners, and industry, to implement this plan.
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.
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
Flaring Solutions Technology – Search

In order to support Bakken oil producers, the Energy & Environmental Research Center (EERC) supplied technical and economic information regarding gas utilization technologies.

Information in the database was entered by vendors, and the EERC makes no claims as to the accuracy of the information. For more information, please contact Flaring_Solutions@undeerc.org.

Information can be queried by technology type and sorted by column. Users can view, print, or download individual vendor documents. To view, print, or download a vendor’s uploaded documentation, the user must open the document and click on the appropriate link.

Filter Results
- NGL Recovery
- Power Production
- CNG or LNG
- Other Technologies

VIEW ALL SELECTIONS

<table>
<thead>
<tr>
<th>COMPANY NAME</th>
<th>CONTACT PERSON</th>
<th>NGL</th>
<th>POWER</th>
<th>CNG</th>
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AmeriFlare
Santa Rosa, CA 95405
Wes Livingston
678-480-9648 | Wes@ameriflare.com

Natural Gas Liquids (NGL) Recovery
Supply Gas Quantity: 250-5000+ m^3/day
Supply Gas Quality: None
Supply Gas Pressure: varies
Turndown Capacity: varies
Equipment Footprint: varies (30 x 50')
Separation Principle: Low temperature refrigeration using air cooled condensers
Product Conditions: 250 psi, 100 F, liquid, mostly C3+
Lean Gas Conditions: Full original methane content with optional ethane C4+
Infrastructure Requirements: System is powered by AmeriFlare generators running on C3+ rich wellhead gas. Generators can also power the pumpjack. No utility connection is needed. AmeriFlare provides remote telemetered via cell tower
## Summary of Flared Gas Statistics

### November nonconfidential locations

<table>
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<tr>
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<th>&lt;1 MCFD</th>
<th>1–299 MCFD</th>
<th>300–599 MCFD</th>
<th>600–1199 MCFD</th>
<th>1200+ MCFD</th>
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<tbody>
<tr>
<td>Locations</td>
<td>1925 (42%)</td>
<td>2501 (54%)</td>
<td>103 (2%)</td>
<td>69 (1%)</td>
<td>44 (1%)</td>
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<tr>
<td>Monthly Gas Flared, MCF</td>
<td>4504 (&lt;1%)</td>
<td>3,135,152 (40%)</td>
<td>1,056,163 (14%)</td>
<td>1,448,272 (19%)</td>
<td>2,111,337 (27%)</td>
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</tbody>
</table>

216 Locations Flaring 60% of Total Flared Gas at Rates of >300 MCFD.
Geographic Distribution of Locations with Flaring Rates Greater than 300 MCFD

- June 222 Locations
Geographic Distribution of Locations with Flaring Rates Greater than 300 MCFD

- June 222 Locations
- July 270 Locations
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- October 227 Locations
- November 216 Locations

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

November 2013
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.
<table>
<thead>
<tr>
<th>Technology</th>
<th>Possible Impact to Flared Volume</th>
<th>Pros</th>
<th>Cons</th>
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</table>
| 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 |
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.
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).
Questions?