New Marcellus and Utica Pipelines, On Time vs Pipeline Purgatory

Matthew Hoza, Senior Energy Analyst
February 8, 2017
Key Takeaways

- Appalachian production growth remains contingent on new infrastructure projects. Previously, when new projects came online wells from excess backlog were used to fill the new capacity relatively quickly.

- With backlog now exhausted, rig activity moving forward will be just as important for regional production growth.

- The timing and combination of infrastructure projects will not only be critical for individual operators, but for the larger market as well, especially in regions of growing demand.

- When all the announced greenfield projects come online integrating, Appalachia with the rest of the US, projects out of Western Appalachia will not fill as demand becomes a new constraint.

- Previously delineated inventory is finite and will play an increasingly important role in production growth and setting US natural gas prices.

Source: BTU Analytics (as of 2/6/2017)
FERC has been trending towards delaying projects, extending comment periods, environmental impact studies, and certificate decisions, however...

As of this past Friday, FERC no longer has the needed quorum of three commissioners to issue project approvals.

**February 3, 2017**

**Certificate Approvals**
- Rover
- Atlantic Sunrise
- TGP Orion
- NFG Northern Access

**Notable Mentions**
- Rayne Xpress

**Trouble?**
- NEXUS

Source: BTU Analytics (as of 2/5/2017)
Local concerns co-opted by national organizations…don’t underestimate the opposition

View: Pipeline's proximity to Indian Point raises concerns

BY JOHN BRUCE • STAFF WRITER
MONTEERY – Confiscation of private property by a Bath County landowner

Pipeline Operation
FOX 40 News WICZ TV

The 124-mile Constitution Pipeline is poised to run gas from Susquehanna County, to New York and New England. But one New Milford family is

WE'RE BUILDING A GLOBAL

Stop the Atlantic Coast Pipeline

/ ban fracking in the Delaware River Basin

years, the Delaware River Basin Commission (DRBC) has refused to allow gas drilling in the basin but we are seeing signs that the Delaware River is under attack. The Delaware Basin covers thousands of land in ...

#NODAPL

#stopthepipeline

source: BTU Analytics (as of 2/6/2017)
If major greenfield projects are able to overcome regulatory hurdles, they will bring an additional 11 Bcf/d of takeaway capacity to a market that has been desperately waiting.

Source: BTU Analytics (as of 2/2/2017)
Rover and NEXUS, both moving Appalachian gas into the Midwest, have a high risk of delay due to regulatory delays.

**Rover (3.25 Bcf/d)**
- Official ISD: July 2017 (Phase 1), November 2017 (Phase 2)
- Received FERC Certificate on 2/3/2017, 99 days after scheduled release
- Tree clearing windows ends March 31, 2017
- What to expect next:
  - Re-hearings
  - Migratory Bird Conservation Plan
  - Stoneman House
  - Notice to Proceed

**NEXUS (1.5 Bcf/d)**
- Official ISD: November 2017
- Received Final Environmental Impact Statement (FEIS) on 11/30/2016
- Only about 60% committed
- What to expect next:
  - FERC quorum?
  - Certificate approval scheduled for 2/28/2017
If major greenfield projects are able to overcome regulatory hurdles, they will bring an additional 11 Bcf/d of takeaway capacity to a market that has been desperately waiting.

Source: BTU Analytics (as of 2/2/2017)
Atlantic Coast Pipeline has already experienced delay, while public pressure is mounting against Mountain Valley Pipeline

Mountain Valley Pipeline (2.0 Bcf/d)
- Official ISD: November 2018
- Received Draft Environmental Impact Statement (DEIS) on 9/16/2016
  - EPA and Department of the Interior have concerns that the DEIS is insufficient
- What to expect next:
  - FEIS, scheduled for March 10, 2017
  - Certificate Decision, scheduled for June 8, 2017

Atlantic Coast Pipeline (1.5 Bcf/d)
- Official ISD: November 2019
- Received Draft Environmental Impact Statement (DEIS) on 12/30/2016
- What to expect next:
  - FEIS, scheduled for June 30, 2017
  - Certificate Decision, scheduled for September 28, 2017

Source: BTU Analytics (as of 2/6/2017)
If major greenfield projects are able to overcome regulatory hurdles, they will bring an additional 11 Bcf/d of takeaway capacity to a market that has been desperately waiting.

Source: BTU Analytics (as of 2/2/2017)
Atlantic Sunrise has seen recent success with an earlier than expected FERC approval, while PennEast continues to see intense opposition

Atlantic Sunrise (1.7 Bcf/d)
• Official ISD: June 2018
• Received FERC Certificate on 2/3/2017
• What to expect next:
  • Notice to Proceed (expected mid-2017)

PennEast (1.0 Bcf/d)
• Official ISD: November 2019
• Received DEIS on July 22, 2016
• Heavy public and regulatory opposition
• Schedule recently delayed an additional two months
• What to expect next:
  • FEIS, scheduled for April 7, 2017
  • Certificate Decision, scheduled for July 6, 2017

Source: BTU Analytics (as of 2/6/2017)
If major greenfield projects are able to overcome regulatory hurdles, they will bring an additional 11 Bcf/d of takeaway capacity to a market that has been desperately waiting.

Source: BTU Analytics (as of 2/2/2017)
The corridor to New England saw many setbacks in 2016 with the cancellation of NED, Access Northeast, and Constitution’s ongoing litigation.

**Constitution (0.65 Bcf/d)**
- Official ISD: ?
- Awaiting appeals court decision in New York State

**TGP: Northeast Energy Direct (NED) (1.3 Bcf/d)**
- Official ISD: Dead
- Canceled after lack of commercial support

**AGT: Access Northeast (1.0 Bcf/d)**
- Official ISD: ?
- Negative Massachusetts's Supreme Court Ruling

**AGT: AIM (0.34 Bcf/d)**
- Official ISD: November 2016
- Entered service after late, increased opposition

**AGT: Atlantic Bridge (0.1 Bcf/d)**
- Official ISD: November 2017
- Received Certificate Approval on January 25, 2017

Source: BTU Analytics (as of 2/6/2017)
Key greenfield projects in each corridor can be split into “supply push” backed by producers, and “demand pull” backed by LDCs and utilities.

### Supply Push

<table>
<thead>
<tr>
<th>Project</th>
<th>Rover</th>
<th>Atlantic Sunrise</th>
<th>Mountain Valley</th>
<th>Nexus</th>
<th>PennEast</th>
<th>Atlantic Coast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Official ISD</td>
<td>Nov-17</td>
<td>Jun-18</td>
<td>Nov-18</td>
<td>Nov-17</td>
<td>Nov-18</td>
<td>Nov-19</td>
</tr>
<tr>
<td>BTU Risked ISD</td>
<td>Nov-18</td>
<td>Nov-18</td>
<td>Nov-20</td>
<td>Nov-18</td>
<td>Nov-20</td>
<td>Nov-20</td>
</tr>
<tr>
<td>Capacity (MMcf/d)</td>
<td>3,250</td>
<td>1,700</td>
<td>2,000</td>
<td>1,500</td>
<td>1,000</td>
<td>1,500</td>
</tr>
<tr>
<td>Total Producer Commitments</td>
<td>3,100</td>
<td>1,573</td>
<td>910</td>
<td>425</td>
<td>95</td>
<td>0</td>
</tr>
</tbody>
</table>

### Demand Pull

| Ascent | 1,100 |
| AR     | 800   |
| COG    | 850   |
| CHK    | 200   |
| Chief  | 420   |
| EQT    | 910   |
| RRC    | 400   |
| NFG    | 189   |
| SWN    | 200   |
| Other  | 600   |
| Commitments by Utilities, LDCs, Marketers, etc. | 0 | 127 | 1,090 | 460 | 895 | 1,441 |
| Unaccounted For/Unsubscribed* | 150 | 0 | 0 | 615 | 10 | 59 |
| % Producer Commitments | 89% | 93% | 46% | 28% | 10% | 0% |

Note: Nexus is only 60% subscribed
Source: BTU Analytics, FERC, Producer Investor Relations Materials
11 Bcf/d of greenfield pipes out of the Appalachian region under intense environmental pressure and even regional pipelines facing challenges with delays

### Project Timing and State/Federal Progress

<table>
<thead>
<tr>
<th>Projects</th>
<th>Capacity (MMcfd)</th>
<th>Current Official ISD</th>
<th>BTU ISD</th>
<th>FERC Application</th>
<th>FERC Final EIS</th>
<th>FERC Certificate Approval</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>REX Zone 3 Capacity Enhancement</td>
<td>800</td>
<td>Q4 2016</td>
<td>Dec-16</td>
<td>3/30/2015</td>
<td>8/31/2015*</td>
<td>2/25/2016</td>
<td>Project is now fully operational as of 1/6/17</td>
</tr>
<tr>
<td>AGT - AIM</td>
<td>342</td>
<td>Nov-16</td>
<td>Nov-16</td>
<td>3/18/2014</td>
<td>1/23/2015</td>
<td>3/3/2015</td>
<td>Project is now fully operational as of 1/7/17</td>
</tr>
<tr>
<td>TCO - Leach Xpress</td>
<td>1,500</td>
<td>Nov-17</td>
<td>Nov-17</td>
<td>6/5/2015</td>
<td>9/1/2016</td>
<td>1/19/2017</td>
<td>Received FERC certificate</td>
</tr>
<tr>
<td>CGT - Rayne Xpress</td>
<td>1,000</td>
<td>Nov-17</td>
<td>Nov-17</td>
<td>7/29/2015</td>
<td>9/1/2016</td>
<td>1/19/2017</td>
<td>Received FERC certificate</td>
</tr>
<tr>
<td>ET Rover</td>
<td>3,250</td>
<td>Jun-17 (Ph 1)</td>
<td>Nov-18</td>
<td>2/20/2015</td>
<td>7/29/2016</td>
<td>(10/27/2016)</td>
<td>Awaiting its FERC certificate approval; year-long delay becoming more likely</td>
</tr>
<tr>
<td>Nexus</td>
<td>1,500</td>
<td>Nov-17</td>
<td>Nov-18</td>
<td>11/20/2015</td>
<td>11/30/2016</td>
<td>(2/28/2017)</td>
<td>Received FERC is scheduled on 11/30/16</td>
</tr>
<tr>
<td>Atlantic Sunrise</td>
<td>1,700</td>
<td>Mid-18</td>
<td>Nov-18</td>
<td>3/31/2015</td>
<td>12/30/2016</td>
<td>(3/30/2017)</td>
<td>Received FERC is scheduled on 12/30/16; In-service delayed; partial in-service 2H 2017, full in-service mid 2018.</td>
</tr>
<tr>
<td>PennEast</td>
<td>1,000</td>
<td>Nov-18</td>
<td>Nov-20</td>
<td>9/25/2015</td>
<td>(4/7/2017)</td>
<td>(7/6/2017)</td>
<td>FERC revised their scheduled release of PennEast’s FERC and FERC Certificate by two months; this is the second time the schedule has been delayed</td>
</tr>
<tr>
<td>Atlantic Coast Pipeline</td>
<td>1,500</td>
<td>Nov-19</td>
<td>Nov-20</td>
<td>9/18/2015</td>
<td>(6/30/2017)</td>
<td>(9/28/2017)</td>
<td>Official ISD delayed from Q4 2018 to Q4 2019 due to prolonged FERC review process; received DEIS on 12/30/16</td>
</tr>
<tr>
<td>Mountain Valley Pipeline</td>
<td>2,000</td>
<td>Nov-18</td>
<td>Nov-20</td>
<td>10/23/2015</td>
<td>(3/10/2017)</td>
<td>(6/8/2017)</td>
<td>EPA and Department of the Interior submitted comments expressing concern that the DEIS is insufficient</td>
</tr>
</tbody>
</table>

Source: BTU Analytics’ Northeast Gas Outlook (as of 1/27/2017)
Production receipts in Appalachia have quadrupled in the past five years thanks to displacement of inbound gas, increasing Appalachian demand, and increasing takeaway capacity out of the region.

Appalachian Production Receipts

Appalachian Takeaway Additions By Corridor

Source: BTU Analytics, Genscape Flow Data, EIA (as of 2/3/2017)
Northeast production growth by state highlights pipeline capacity expansions (or lack there of)

Source: BTU Analytics, DrillingInfo (as of 2/3/2017)
Marcellus & Utica activity declined 75% as low prices across commodities and lack of new takeaway stem activity, but has started to pick up. However activity still needs to increase to stave off declines.

**Marcellus & Utica Drilling Activity**

- **West PA**
- **Central PA**
- **Northeast PA**
- **South PA**
- **Appalachia Ohio**
- **WV Wet**
- **WV Dry**

**Appalachian Dry Gas Production Cases**

- **History**
- **BTU Forecast**
- **PDP**
- **Projection**

Note: Projected rigs as of 2/3/2017; 39 Marcellus rigs, 23 Utica rigs
Source: BTU Analytics, RigData (as of 2/3/2017)
As drilling slowed down in 2015 and 2016, the rate of permit filings did not, leaving an excess of permits outstanding today.

Appalachian Cumulative Wells Drilled and Drilling Permits Filed

Note: Permits filed in PA and OH are for original drilling locations; Permits and Wells Drilled are horizontal
Source: BTU Analytics, RigData, DrillingInfo (as of 2/5/2017)
Excess backlog has all but been exhausted and will not be able to immediately fill new projects...

Note: Assumes a rig efficiency of 1.99 wells/rig/month
Source: BTU Analytics' Northeast Gas Outlook, RigData (as of 2/2/2017)
...as we have seen with the recent REX expansion.

Source: BTU Analytics, Genscape flow data (as of 2/2/2017)
Canceling one project from each corridor still leaves open capacity out of Appalachia.

<table>
<thead>
<tr>
<th>Pipelines Removed</th>
<th>Capacity (Bcf/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEXUS</td>
<td>1.5</td>
</tr>
<tr>
<td>PennEast</td>
<td>1.0</td>
</tr>
<tr>
<td>Mountain Valley Pipeline</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4.5</strong></td>
</tr>
</tbody>
</table>

Note: Projects removed for this scenario were chosen to be illustrative, rather than BTU’s judgment if the project is completed.

Source: BTU Analytics (as of 2/5/2017)
Pipelines under a cancellation scenario will be more utilized leading to a weakening of basis, more so in Western Appalachia than Eastern Appalachia.

Source: BTU Analytics, Bloomberg
The Atlantic Seaboard and Transco Zone 5 are targets of new capacity coming online; cancelation of MVP and ACP would leave growing demand in the Atlantic Seaboard starved for gas.

Source: BTU Analytics, Bloomberg (as of 2/6/2017)
Producers have committed to only about 60% of total incremental takeaway capacity beyond 2019, with LDCs and marketers making up the rest.

Incremental Northeast Takeaway Capacity

- **Production Forecast**
- **Producer Commitments**
- **Total Capacity**

Note: Assumes BTU risked in-service date for takeaway projects
Source: BTU Analytics, [Northeast Gas Outlook December 2016](http://www.btuanalytics.com/info/btuanalytics.com)
Southwest Appalachia production has trended drier through 2016 after the fall in liquids prices, though wet production still makes up a meaningful percent.

Note: Map includes wells drilled after 1/1/2012; Wet production includes wells with modeled GPM>0
Source: BTU Analytics, Drilling Info
Wellhead economics will be challenging as new greenfield projects come online and high quality acreage is depleted.

Drilling Location Use By Breakeven

Note: Breakevens assume futures strip as of 12/30/2016; 5-yr wellhead oil avg $56.23/Bbl, NGLs $24.74. Does not include about 9,000 locations that breakeven over $5.00. Assumes drilling locations are used from lowest to highest breakevens, no mid-stream constraints.

Source: BTU Analytics (as of 2/5/2017)
There still remains promising portions of Pennsylvania, West Virginia, and Ohio that have not been developed that could increase inventory.

Incremental Locations by Average Breakeven

Note: Breakeven map assumes futures strip as of 12/30/2016; 5-yr wellhead oil avg $56.23/Bbl, NGLs $24.74

Source: BTU Analytics’ Northeast Gas Outlook (as of 2/5/2017)
Dry Utica has the possibility to add additional drilling locations, however so far results have been inconsistent and costs prohibitive.

Source: BTU Analytics (as of 2/6/2017), DrillingInfo, Consol Energy (12/13/2016), EQT (2/3/2017)
Much of the acreage in Western Appalachia will be heavily influenced by liquids pricing, with West Virginia adding the most sub $2.50 locations with rising liquids prices.

Note: Breakeven map assumes futures strip as of 12/30/2016; 5-yr wellhead oil avg $56.23/Bbl, NGLs $24.74

Source: BTU Analytics’ Northeast Gas Outlook (as of 2/5/2017)
Key Takeaways

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