CPV Valley Comments on the Gas Hub Mapping for the Lower Hudson Valley Reference Plant

NYISO 2020 Demand Curve Reset

ICAP Working Group

May 19, 2020

SILVER SPRING | BRAINTREE

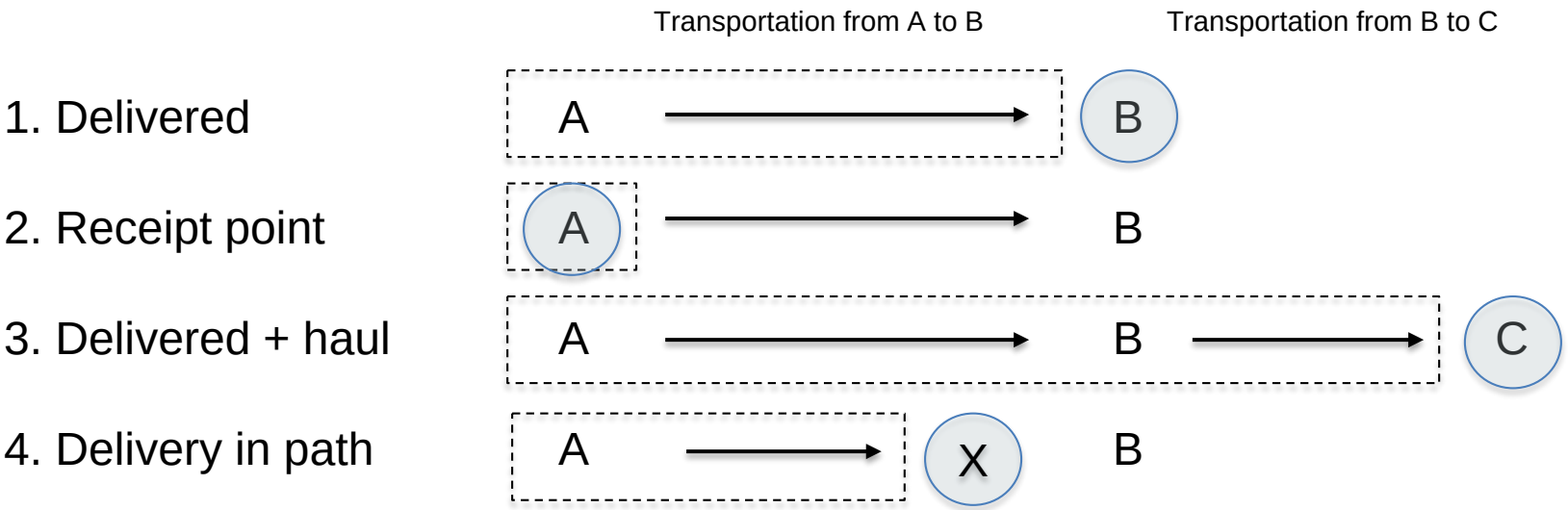
CPV Comments

- Analysis Group has recommended TETCO M3 as the gas hub for Rockland County (Zone G). AG's rationale is that TETCO M3 has a suitable geography for Rockland County, is sufficiently traded, and has a strong correlation with market prices.
- **It is not possible to get delivered gas solely at the TETCO M3 price in Rockland County** or the entire LHV, for that matter. On top of the TETCO M3 price, a power plant must pay transportation charges on the mainline pipeline, either explicitly through pipeline tariff rates or implicitly by purchasing a delivered gas product. The power plant must also pay for transportation charges to flow gas on the lateral to the plant.
- The cost of gas at CPV Valley is a direct reflection of these facts.
  - ✓ CPV Valley interconnects to the Millennium Pipeline and pays for gas transportation east to the plant's lateral and pays again for transportation along the lateral to the plant.
  - ✓ CPV Valley's cost of gas in 2019 was **$3.03/MMBtu** whereas TETCO M3 averaged $2.36/MMBtu and **$2.39/MMBtu** over the year when weighting daily gas prices by CPV Valley's daily volumes (an apples-to-apples comparison).
  - ✓ The $0.64/MMBtu cost difference would have equated to **$16 million** for CPV Valley in 2019 alone.
- Geography – The Texas Eastern Pipeline does not pass through New York, nor does the tariff definition of the TETCO M3 market zone encompass delivery points accessible from the Lower Hudson Valley. Analysis Group's recommendation is contrary to their determination in the 2016 Reset that TETCO M3 *does not* meet the geography criterion.
- Liquidity – while TETCO M3 has high trade volumes, so does Henry Hub. TETCO M3 deliveries are in a different geographic region outside the LHV, and the associated price is not accessible without procuring pipeline transportation. Liquidity is important inasmuch as there needs to be a market to buy gas without driving up price, but a more important threshold criterion is whether there is pipeline capacity to serve the proxy plant.
- Correlation – the correlation between power and gas prices is used to support the TETCO M3 recommendation, yet, Iroquois Z2, Algonquin CG, and TGP Z6 *all* have stronger correlations with Zone G power prices. The stronger correlation of Iroquois Z2 versus alternatives was a critical argument made at FERC in the 2016 Reset, which FERC accepted.
- A viable gas hub pricing option is one that is geographically accessible, reflects the costs of delivered gas, and for which transportation is available (or can be purchased economically). These options are laid out on slides 6 and 8.

Gas Pipeline Fundamentals

What does it take to get gas to a power plant?

Gas Product	Receipt Point	Delivery Point(s)



Denotes location of gas

Gas Pipeline Fundamentals (cont'd)

1. *Commodity purchase*
    - Gas can be purchased as a delivered product where the seller has transportation and price is inclusive of all transportation, or purchased upstream and the buyer has the responsibility and cost of transportation from that location to the end use location.
        - **Delivered** – the price is inclusive of transportation and applicable in the region specified in the pipeline company's tariff. Examples include a city gate index where the price represents gas delivered off of an interstate pipeline into the LDC city gate. Also, TETCO M3, Iroquois Z2, Algonquin CG, or TGP Z6 300 Leg.
        - **Upstream supply plus transportation** – the price is for receipt onto the pipeline, typically in a gas pooling area. To get delivery off of the pipeline, a shipper must reserve pipeline capacity (provided that it is available) and incur the tariff transportation rate. An example is Millennium East receipts + Millennium Pipeline tariff rates.
2. *Transportation from mainline to lateral*
    - **Transportation costs cannot be avoided.** Pipeline companies recover their capital and fixed costs through demand charges assessed to capacity holders. This capacity is sold forward to help finance the pipeline.
    - An end user such as a power plant must procure capacity to get service on the pipeline. The procurement can be through an open auction or bilateral purchase from a holder that is releasing capacity.
    - Contractual paths can be forward haul or back haul – in a direction opposite to the actual flow of gas in the pipeline.

Gas Pipeline Fundamentals (cont'd)

3. *Pipeline interconnection*

- Lateral from interstate pipeline to power plant
  - B&M has assumed a $13 MM for a 5-mile lateral in Zone G. However, interconnecting to an interstate pipeline is far more expensive (particularly in NY) and entails more than simply building a lateral.
- Alternatively, connection to the LDC's gas network
  - Requires additional transportation charges and has an increased risk of curtailment, which diminishes the net E&AS revenue potential.
  - There are few LDCs with robust networks that can support the gas demands of a new peaking facility the size of the reference technologies.

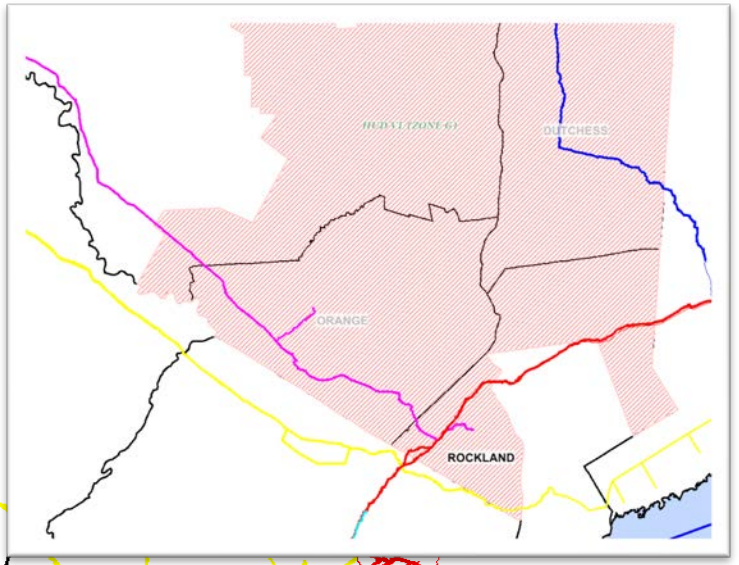
It is extremely difficult and costly to acquire pipeline capacity in New York State

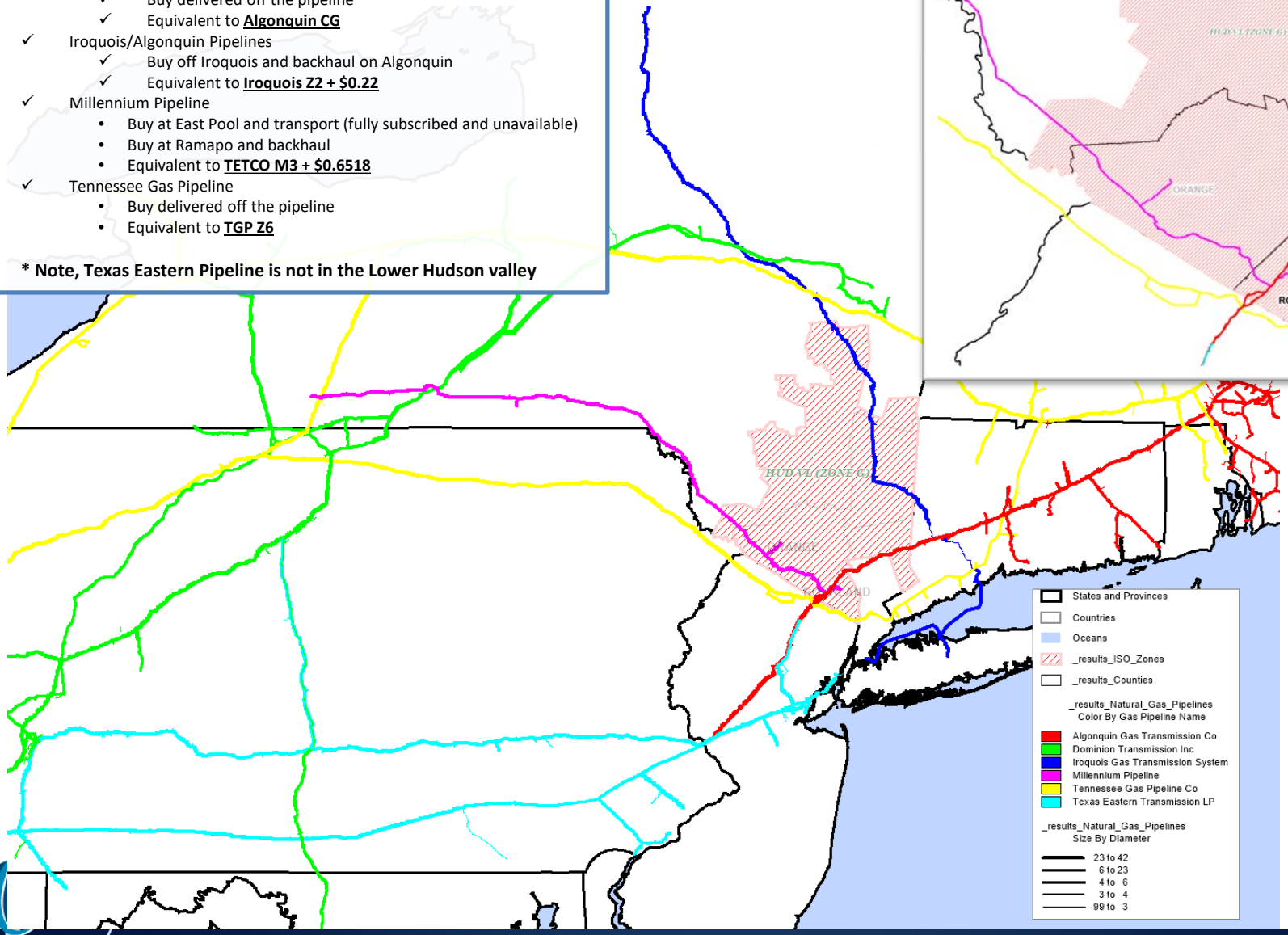
- In New York, gas demand for power generation and residential heating has increased while pipeline capacity has remained constant. The imbalance has led to pipeline congestion (price differentials), frequent operational restrictions on the pipelines, and Con Edison imposing a moratorium on new natural gas interconnections in Westchester County.
- Most attempts to expand NY pipeline capacity have failed, notable recent examples being Williams' Constitution and the Northeast Supply Enhancement.
- New York is transected by five interstate pipelines. The three pipelines that go through Rockland County do not have available transportation capacity flowing east (Algonquin, Millennium, and Tennessee).

Natural Gas Delivery in Rockland County, NY

- ✓ Algonquin Pipeline
  - ✓ Buy delivered off the pipeline
  - ✓ Equivalent to **Algonquin CG**
- ✓ Iroquois/Algonquin Pipelines
  - ✓ Buy off Iroquois and backhaul on Algonquin
  - ✓ Equivalent to **Iroquois Z2 + $0.22**
- ✓ Millennium Pipeline
  - Buy at East Pool and transport (fully subscribed and unavailable)
  - Buy at Ramapo and backhaul
  - Equivalent to **TETCO M3 + $0.6518**
- ✓ Tennessee Gas Pipeline
  - Buy delivered off the pipeline
  - Equivalent to **TGP Z6**

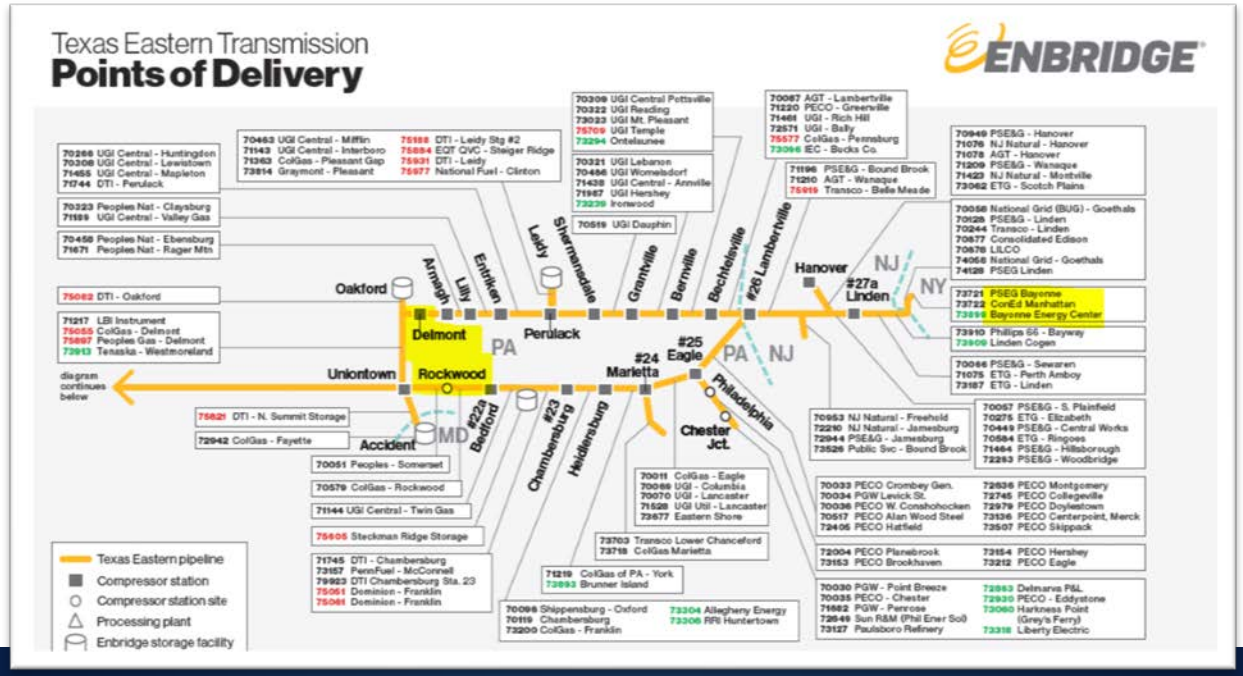
*** Note, Texas Eastern Pipeline is not in the Lower Hudson valley**





Texas Eastern Pipeline

- **There are no delivery points on Texas Eastern into Rockland County, NY, or the Lower Hudson Valley capacity zone.**
- The TETCO M3 is defined by the Texas Eastern Pipeline tariff and the Platts Gas Daily pricing index.
  - ✓ **Tariff definition:** Market Zone 3: Point(s) of Receipt east of and including the Delmont, Pennsylvania compressor station and east of the station site located at Rockwood, Pennsylvania.
  - ✓ **Platts Gas Daily definition:** Texas Eastern, M-3 (daily and monthly market) Deliveries from Texas Eastern Transmission beginning at the outlet side of the Delmont compressor station in Westmoreland County, PA, easterly to all points in the M3 market zone, except for deliveries to Transcontinental Gas Pipe Line at Lower Chanceford.
  - ✓ The delivery points span from the Delmont and Rockwood compressor stations in Pennsylvania and terminate at ConEd's gas distribution system.



Options to Access Delivered Gas in Rockland County, NY

No.	Interstate Pipeline	Delivered Gas	Forward Haul	Back Haul
1	Algonquin Gas Transmission	✓ **Algonquin Citygate**	✗ Fully subscribed moving east; no available capacity to forward haul at tariff rate	✓ Buy off Iroquois Z2 at the Brookfield interconnect with Algonquin; back haul west through Stony Point (19.5k Dth/d) **Iroquois Z2 + $0.22**
2	Millennium Pipeline Company	✗ No gas index for the east side of Millennium	✗ Fully subscribed; no available capacity from west to east to flow along pool points	✓ 375k Dth/d is available for backhaul from Ramapo at tariff rate of $0.6518/MMBtu **TETCO M3 + $0.6518**
3	Tennessee Gas Pipeline	✓ There is no delivered product for the 300 leg of TGP Z5. However, TGP Z6 (delivered) can be purchased and delivery taken in the path in Zone 5. **TGP Z6**	✗ Fully subscribed; no available capacity flowing east to Rockland County	✓ 204k available to backhaul from Station 261. **TGP Z6 + $0.0804 backhaul rate**
4	Iroquois Pipeline	Iroquois Z2 is a delivered gas hub; however, the market zone is not directly accessible within Rockland County, NY (but is available and used for Dutchess County). Iroquois Z2 gas can be back hauled on AGT; see above.	✗ Fully subscribed moving south; no available capacity at tariff rate to forward haul	✗ There is no delivered index further downstream from Iroquois Zone 2 (Zone 2 is the end of the pipe)

Note: in lieu of a direct connection to an interstate pipeline, the reference plant could interconnect to the LDC and purchase gas on one of the routes above. The plant would pay the commodity cost per the table above plus transportation costs (LDC charges) and would have an increased risk of gas interruption (hence lower expected net E&AS revenues).

Market Dynamics

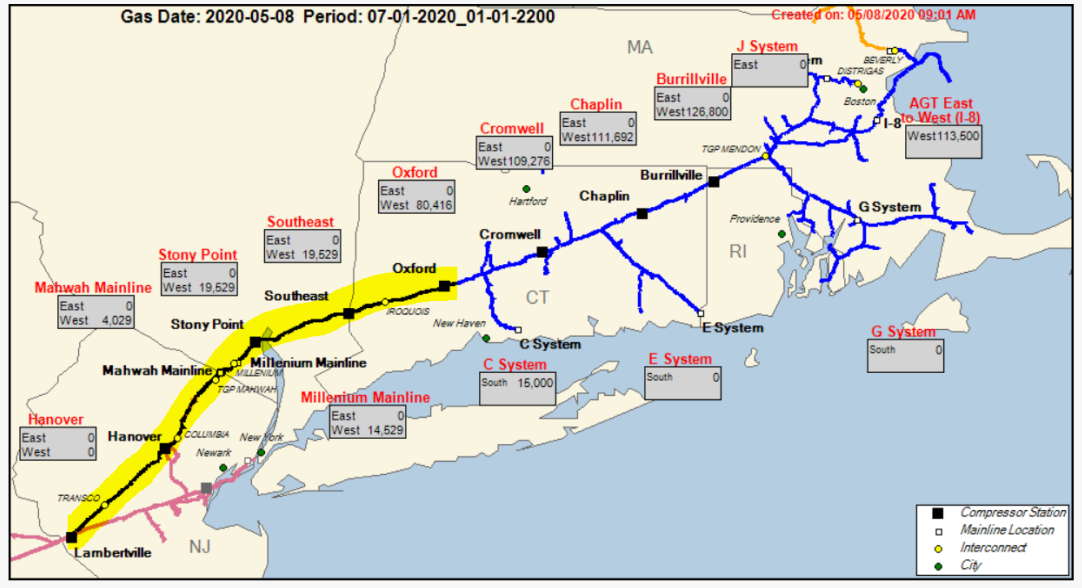
- In the 2016 Reset, Analysis Group recommended Iroquois Z2 for Zone G and TETCO M3 for Zone C, because these gas hubs were well-correlated with power prices and thus most reflective of the power/gas market dynamics in the capacity zone.
- The table below shows the correlation coefficients of NYISO day-ahead power prices with eight different gas hubs over varying historical periods.
  - ✓ Zone G power is more strongly correlated with Iroquois Z2, Algonquin CG, and TGP Z6 than TETCO M3.
  - ✓ This trend is more prevalent in winter months when pipeline constraints drive greater price differentials amongst the Northeast hubs.
- For Zone G, this analysis supports use of the more-strongly correlated hubs over TETCO M3. (Similarly, Dominion North is a poor proxy for Zone C.)

Correlation Coefficients - DA ATC Power vs. Gas Daily Gas Price (%)

	Henry Hub	Tetco M3	Transco Z6 NY	Iroquois Z2	TGP Z6	Algonquin CG	Millennium East Receipts	Dominion North
Zone G								
2013-present	51%	77%	56%	86%	87%	88%	30%	51%
2015-present	41%	76%	51%	81%	83%	84%	30%	30%
last 2 years	38%	77%	51%	81%	83%	85%	32%	31%
Zone C								
2013-present	55%	76%	48%	81%	80%	80%	31%	53%
2015-present	44%	72%	43%	74%	75%	75%	31%	32%
last 2 years	40%	74%	44%	75%	76%	77%	28%	28%
Zone J								
2013-present	50%	77%	54%	85%	86%	87%	32%	51%
2015-present	41%	76%	50%	80%	82%	83%	32%	31%
last 2 years	40%	77%	51%	80%	83%	84%	35%	34%
Zone K								
2013-present	52%	71%	56%	82%	85%	85%	29%	51%
2015-present	43%	69%	50%	75%	78%	80%	29%	28%
last 2 years	38%	70%	52%	75%	78%	80%	27%	26%

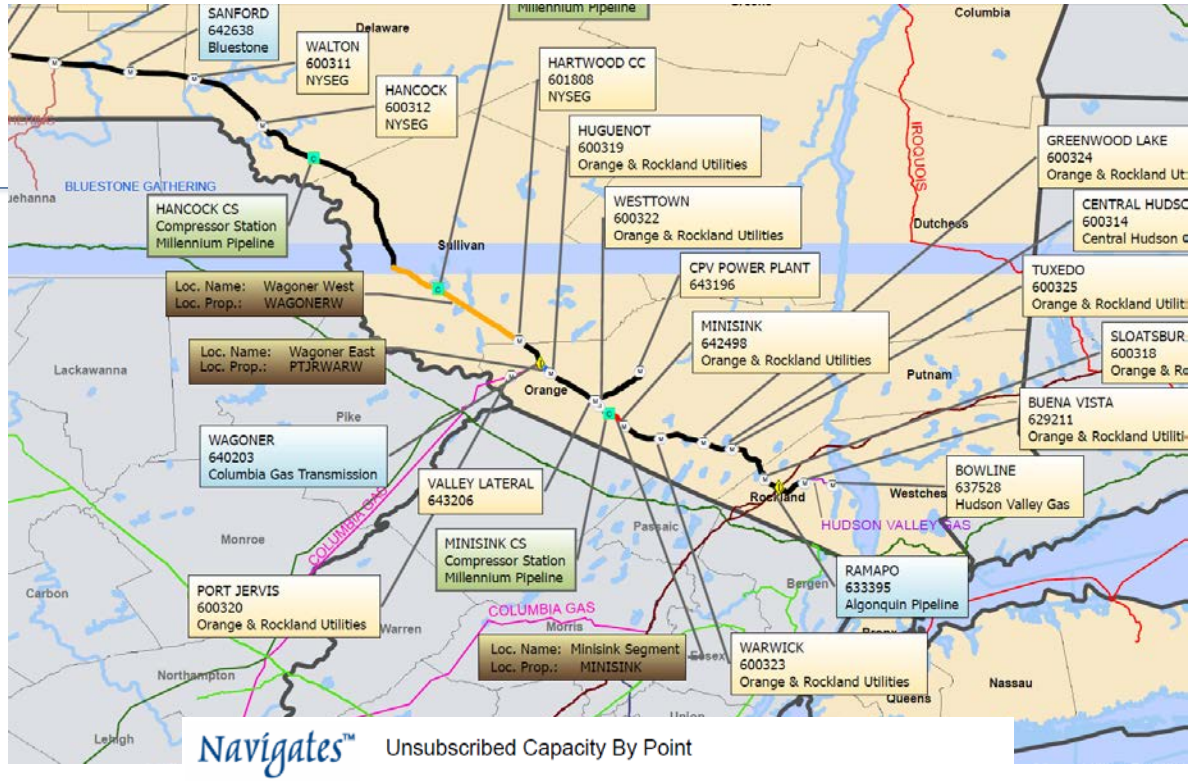
Appendix: Interstate Pipeline Detail

Algonquin



- Platts Gas Daily definitions
  - ✓ **Algonquin, city-gates:** deliveries from Algonquin Gas Transmission to all distributors and end-use facilities in Connecticut, Massachusetts and Rhode Island.
  - ✓ **Algonquin, receipts:** deliveries into Algonquin Gas Transmission from Texas Eastern Transmission at the Lambertville and Hanover, NJ, interconnects; from Transcontinental Gas Pipe Line at the Centerville, NJ, interconnect; from Columbia Gas Transmission at the Hanover, NJ, and Ramapo, NY, interconnects; from Millennium Pipeline at Ramapo, NY; from Tennessee Gas Pipeline at the Mahwah, NJ, Cheshire, CT., and Mendon, MA., interconnects; from Iroquois Gas Transmission System at the Brookfield, CT., interconnect; and from Maritimes & Northeast Pipeline at the Beverly, MA., interconnect.
- Capacity
  - ✓ Forward haul – there is no pipeline capacity to flow gas from west to east along Algonquin. Therefore, it is not possible to buy at the Algonquin receipt locations and forward haul to the reference plant in Rockland County, NY.
  - ✓ Back haul – there is 19,529 MMBtu/day of capacity in the reverse direction. It would be possible to buy Iroquois Z2 gas at the Brookfield interconnect and back haul it through Stony Point, paying the Algonquin tariff transportation rate of $6.57 per Dth-month, which equates to $0.22/MMBtu.
- Sources
  - ✓ S&P Global Platts North American gas hub definitions
  - ✓ Algonquin website showing capacity availability. Click Capacity > Unsubscribed > Unsubscribed Capacity Map
  - ✓ AGT transportation rates. Click Capacity > Unsubscribed > Unsubscribed Capacity Map > Unsubscribed Capacity Details, rate of $6.5734/ Dtm-mo from Everett, MA, to Mahwah, NJ

Millennium

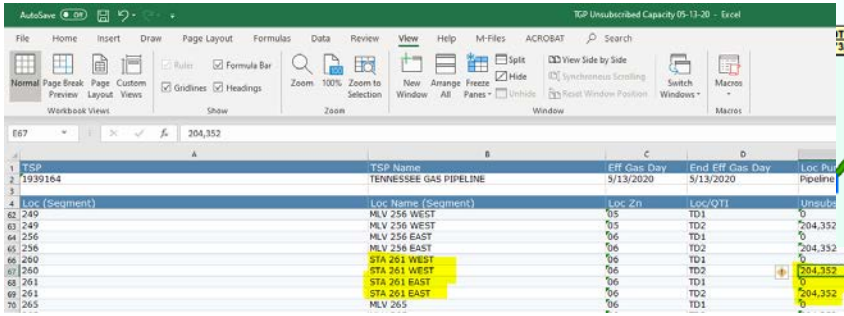


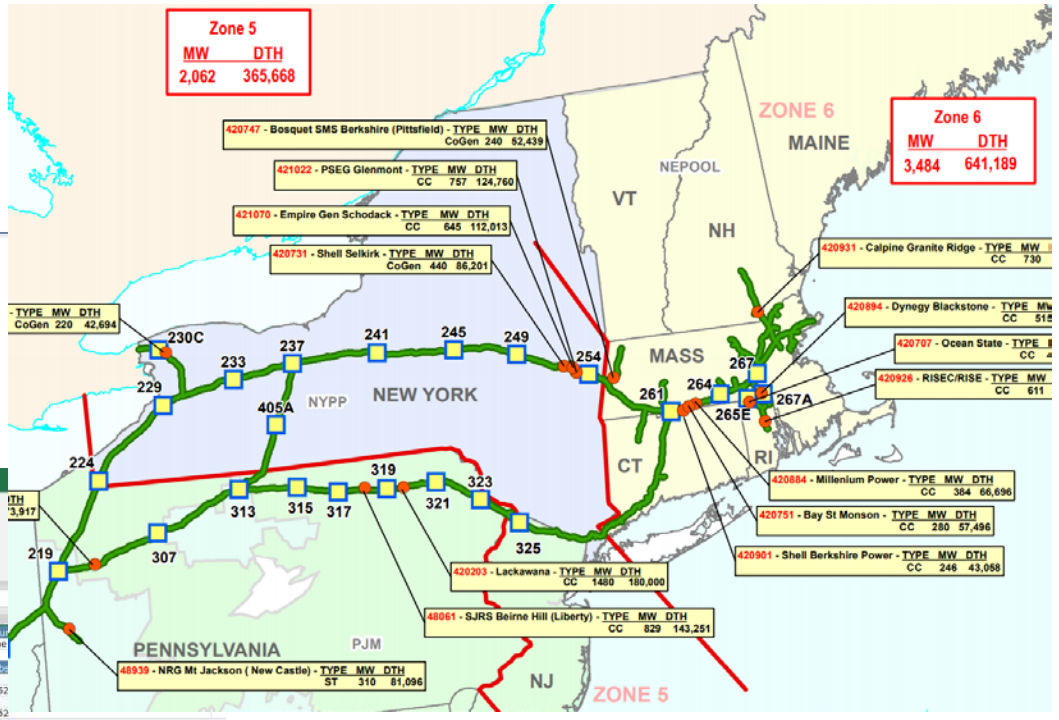
Navigates™ Unsubscribed Capacity By Point

Location	Location Name	Loc Purp Desc	Loc/QTI	Unsubscribed Capacity	ROFR Capacity
TMHOLDIN	TM Holding	Delivery Location	DPQ	200,000	0
TMRAMAPO	TM Ramapo	Receipt Location	RPQ	375,000	0
TMRAMAPO	TM Ramapo	Delivery Location	DPQ	375,000	0

- Platts Gas Daily definitions
  - ✓ **Millennium, East receipts:** receipts into Millennium Pipeline downstream of the Corning compressor station in Steuben County, NY, and upstream of the Ramapo Interconnect with Algonquin Transmission in Rockland County, NY.
- Capacity
  - ✓ Forward haul – there is capacity to get on or off the pipeline at various individual points, but there isn't capacity to flow along the pipeline through the pool points.
  - ✓ Back haul – there is 375k MMBtu/day of capacity available to backhaul from Ramapo.
- Sources
  - ✓ S&P Global Platts North American gas hub definitions
  - ✓ Millennium website showing capacity availability. Click Capacity > Unsubscribed > PDF icon
  - ✓ Millennium transportation rates. Millennium tariff reservation charge of $19.769 per Dth-month (daily rate of $0.6499/MMBtu) plus $0.0019/MMBtu commodity charge

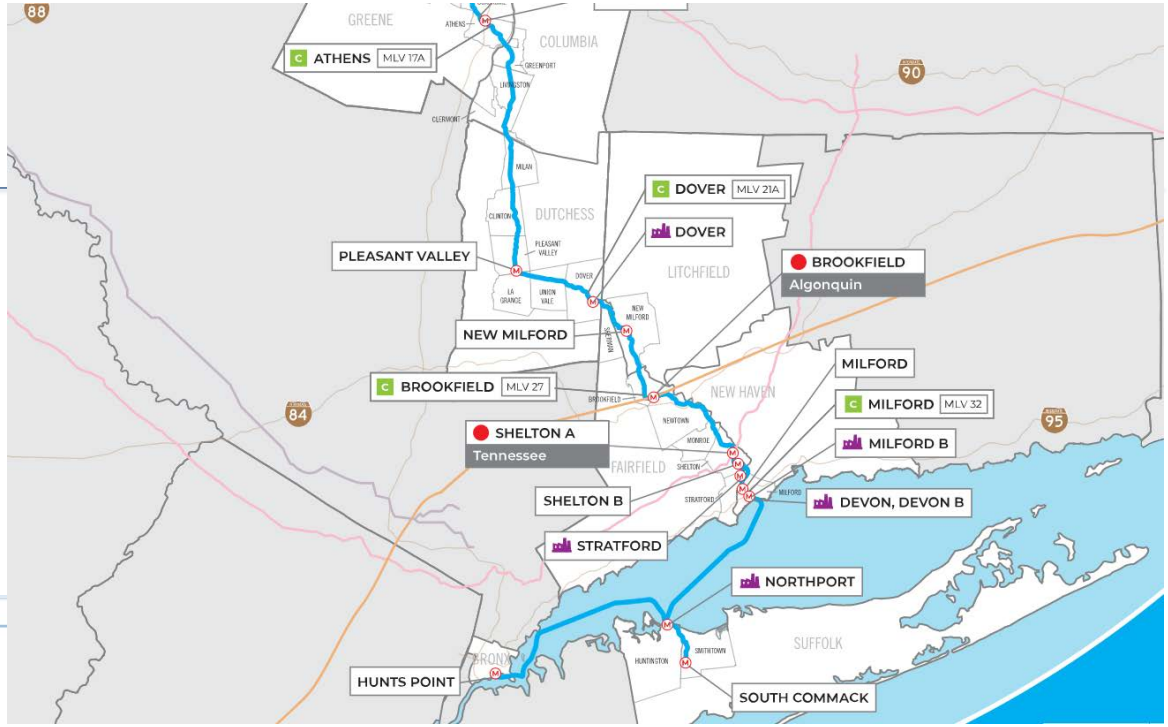
Tennessee





- Platts Gas Daily definitions
  - ✓ **Tennessee, zone 4-300 leg:** deliveries into TGP, zone 4-300 leg from, and including, station 315 in Tioga County, PA, to, and including, station 321 in Susquehanna County, PA.
  - ✓ **Tennessee, zone 4-313 pool:** transactions at Station 313 in Potter County, PA, on TGP's Zone 4 300 Leg.
  - ✓ **Tennessee, Zone 5 (200 leg):** deliveries from TGP Zone 5, downstream of compressor station 245 extending to and including station 254.
  - ✓ **Tennessee, zone 6 delivered:** deliveries from TGP on the 200 leg in Connecticut, Massachusetts, Rhode Island and New Hampshire.
  - ✓ **Tennessee, Zone 6, delivered North:** deliveries from TGP on the 200 leg on all legs east of Station 267 in Massachusetts and New Hampshire excluding the Hopkinton to Gloucester Lateral which begins in Hopkinton, passes through Lexington, Burlington, Wilmington, Somerville, Beverly Salem and ends in Gloucester, Massachusetts.
  - ✓ **Tennessee, Zone 6, delivered South:** deliveries from TGP on the 200 leg on all legs west of Station 267 in Massachusetts and New Hampshire
  - ✓ **Tennessee, Zone 6 (300 leg):** deliveries from TGP on 300 leg in Connecticut
- Capacity
  - ✓ There is no defined market zone for the TGP Z5 300 leg, which passes through Rockland County, downstream of compressor station 325. Gas on the 300 leg must be transported from an adjacent zone.
  - ✓ Forward haul from TGP Z4 – there is no forward haul (TD1) capacity available
  - ✓ Back haul from TGP Z6 – there is 204k MMBtu/day of capacity available to backhaul west from Station 261.
- Sources
  - ✓ S&P Global Platts North American gas hub definitions
  - ✓ TGP website showing capacity availability. Click Capacity > Unsubscribed > Segment Capacity
  - ✓ TGP currently-effective tariff transportation rates. Site includes links to forward and backhaul transportation

Iroquois



Unsubscribed Capacity Report

TSP Name: Iroquois Gas Transmission System, L.P.
TSP: 603955949
Search Criteria Used
Date (valid dates include current and 90 day history): 05/13/2020 Retrieve Download
Eff Gas Day: 05/13/2020
End Eff Gas Day: 05/14/2020

Sorting order:

Loc Name	Loc	Loc/QTI Desc	Unsub Cap	Meas Basis Desc	Loc Purp Desc
Athens	2366	Delivery Point Quantity	360,000	MMBtu	Delivery Location
Boonville	2345	Delivery Point Quantity	2,558	MMBtu	Delivery Location
Brookfield	2256	Delivery Point Quantity	213,965	MMBtu	Delivery Location
Brookfield	2256	Receipt Point Quantity	0	MMBtu	Receipt Location
Burdicks Crossing	2307	Delivery Point Quantity	44,000	MMBtu	Delivery Location
Canajoharie	2261	Delivery Point Quantity	300,000	MMBtu	Delivery Location

- Platts Gas Daily definitions
  - ✓ **Iroquois, zone 2:** deliveries from Iroquois Gas Transmission System starting at the Athens, NY, power plant downstream to the terminus of the pipeline at Hunts Point and South Commack.
- Capacity
  - ✓ The Iroquois pipeline does not pass through Rockland County. However, delivered gas can be purchased at the Brookfield interconnection and backhauled on Algonquin, paying the Algonquin tariff rate. There is 213,965 MMBtu of capacity available at the Brookfield interconnection.
- Sources
  - ✓ S&P Global Platts North American gas hub definitions
  - ✓ Iroquois website showing capacity availability. Click Capacity > Unsubscribed > retrieve
  - ✓ See previous slide for AGT tariff rates. Iroquois tariff rates (N/A in this application).