



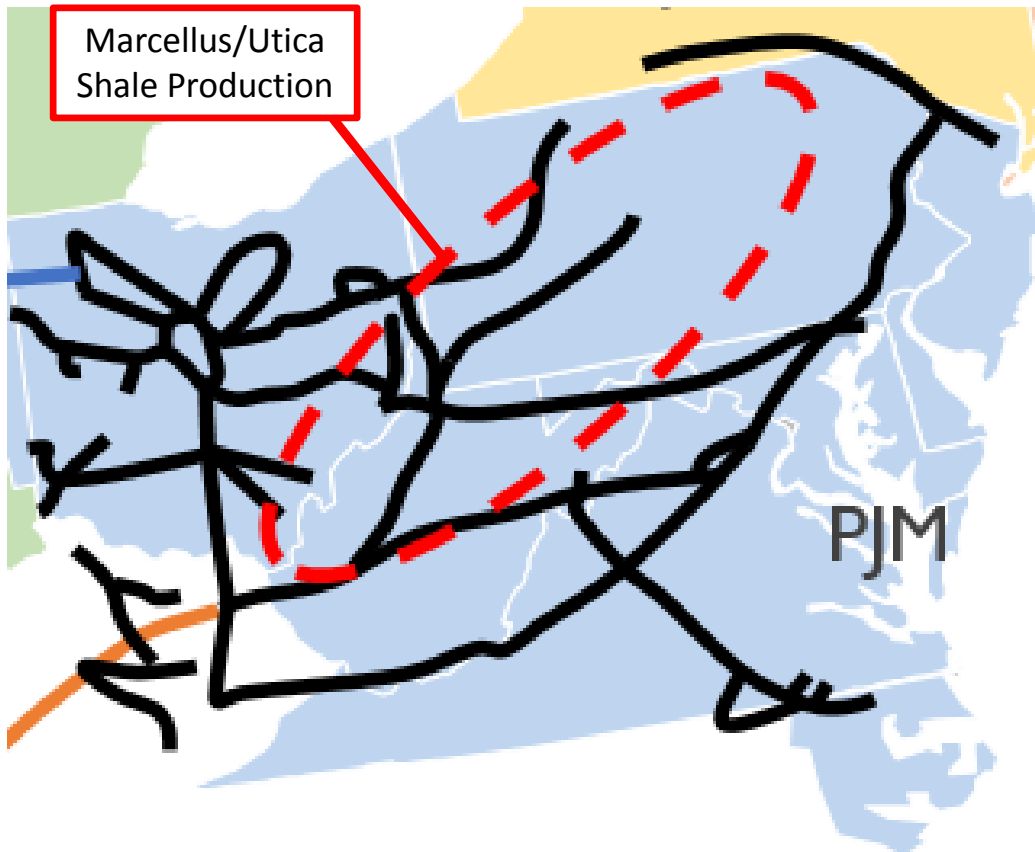
Showcase Roundtable: Gas – Electric Integration Issues in PJM

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CPG Overview

Offers Unique Access to Plentiful Gas Supplies within PJM



15,000+ Miles of Pipeline Assets

- Columbia Gas: 12,000 miles
- Columbia Gulf: 3,400 miles
- Millennium: 180 miles
- Crossroads: 200 miles

Delivers Approximately 1.3 Tcf Per Year

- ~5.5% of U.S. market
- Serves customers in 16 states

1.1 Million Horsepower of Compression 104 Stations

- Columbia Gas: 316 units
- Columbia Gulf: 77 units
- Millennium: 2 units

~300 Bcf of Working Storage Capacity

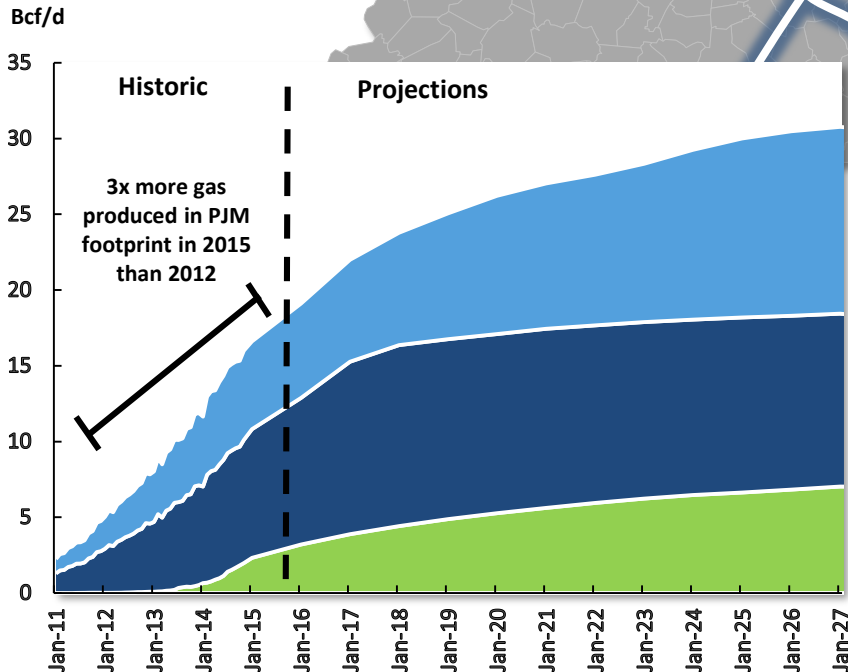
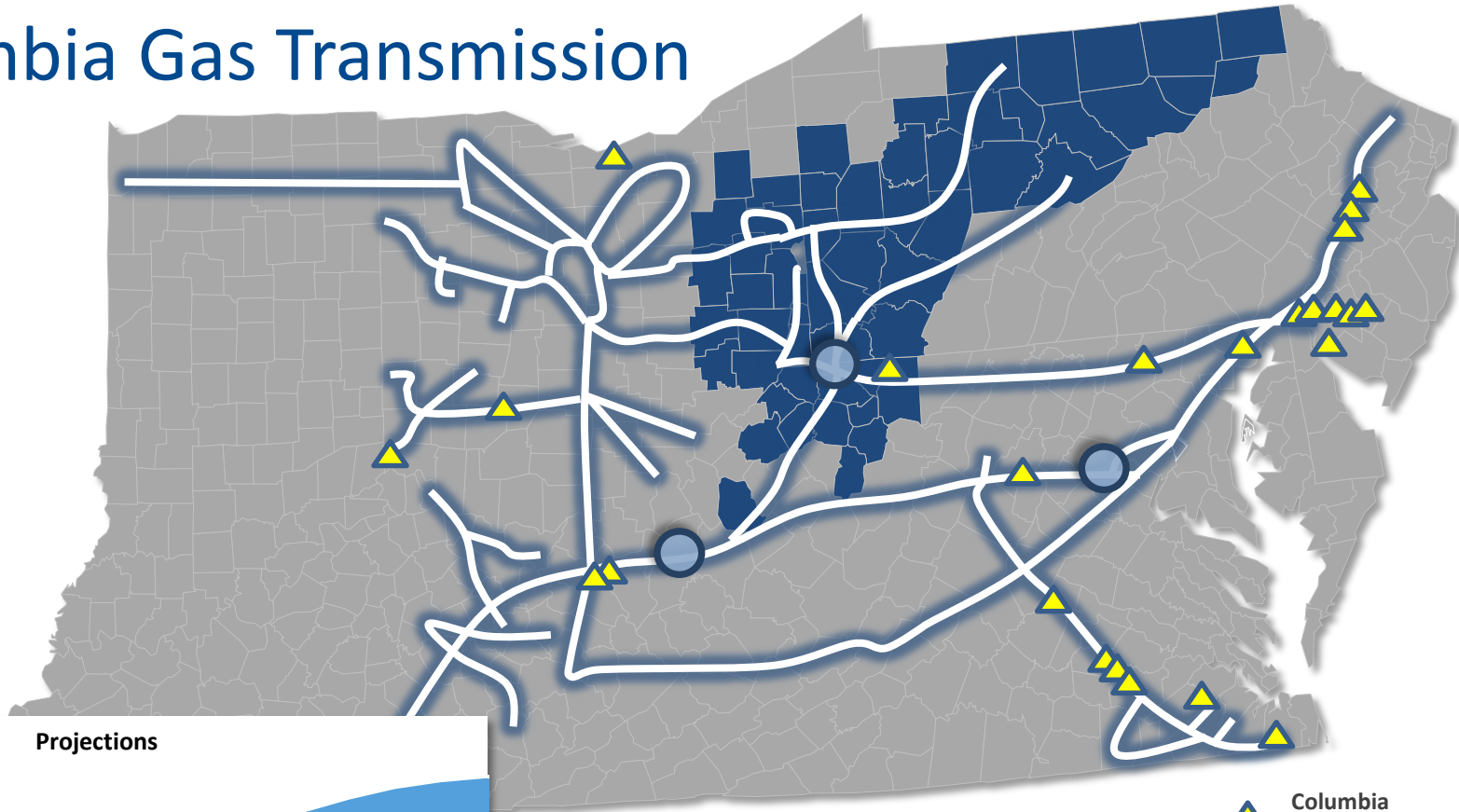
- ~ 4.5 Bcf/deliverability
- 37 storage fields in 4 states

32 Power Plants on System

- Columbia Gas: 23 in PJM
- Columbia Gas: 1 in NYISO
- Columbia Gulf: 7 in MISO-South
- Millennium: 1 in NYISO
- 19.8 GW capacity (12.7 GW in PJM)
- CPG peak day power usage ~1.0 Bcf



Columbia Gas Transmission



Source: CPG Analytics, EIA, FERC

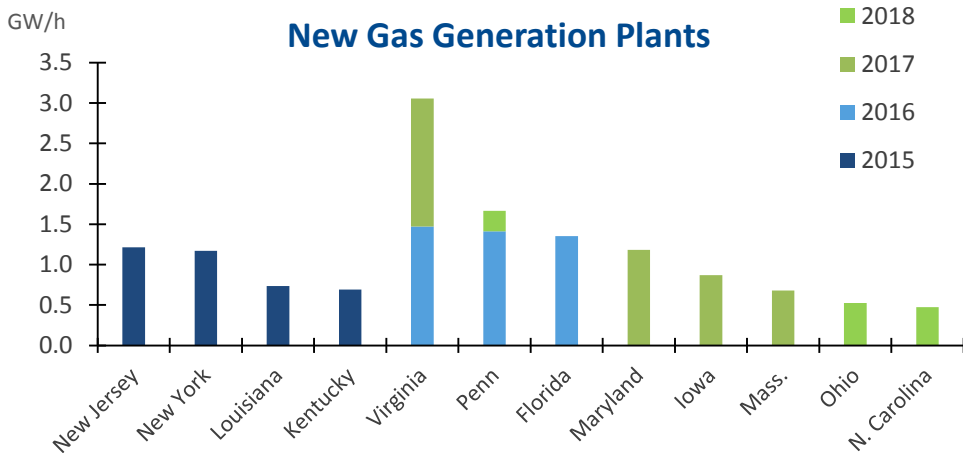
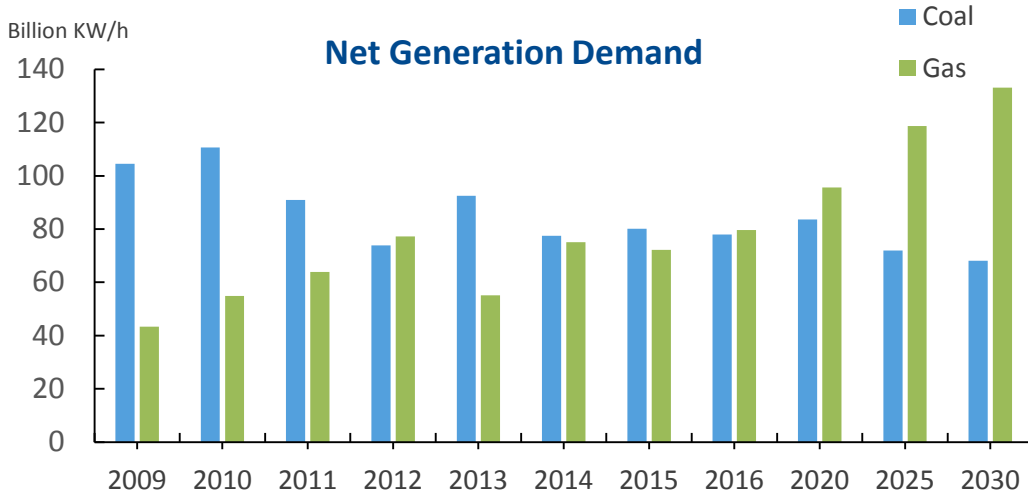
- Columbia Power Plants
- Columbia Supply Hubs

Abundance of Gas Supply on PJM's Doorstep



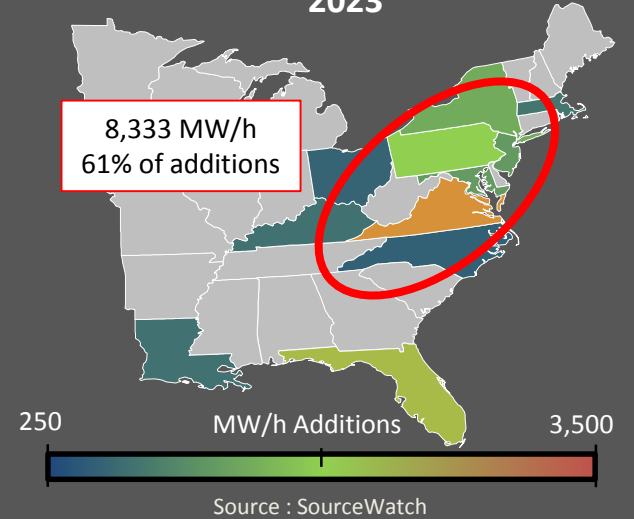
Natural Gas Generation

Gas Gains Market Share Over Coal for Power Generation in PJM



Source : EIA

Gas Fired Generation Addition Through 2023

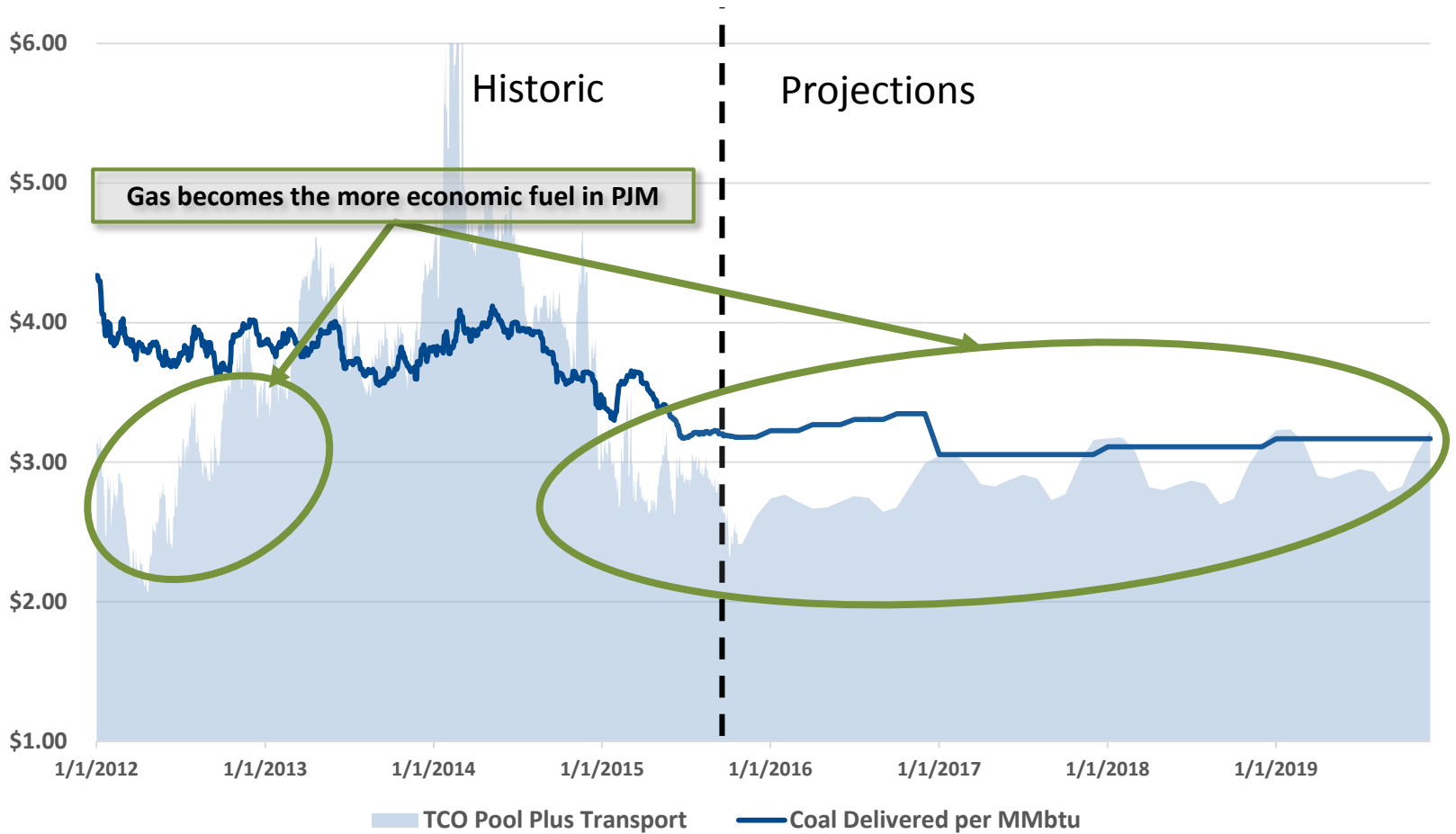


“Gas surpassed coal for July power generation”
- Gas Daily



Price Trends

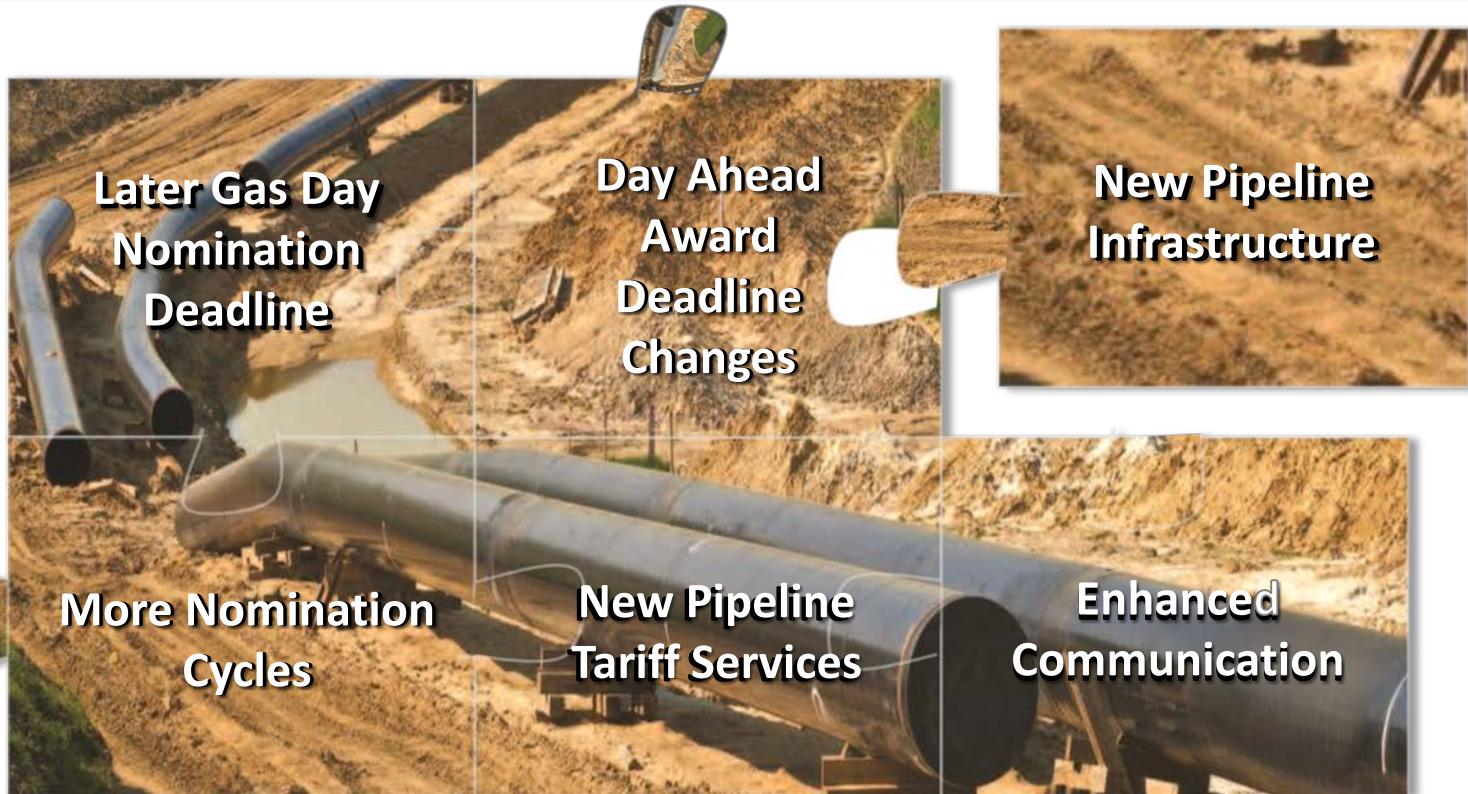
Prices Favor Gas Fired Power Generation



Source: CPG Analytics, Bloomberg, EIA

Shift Focus to Tangible Solutions

Puzzle is Incomplete Without Development of NEW Pipeline Capacity



Gas – Electric Harmonization Issues

- Lack of adequate (or any, in some cases) firm transportation
 - Not nominating proper quantities & primary receipt points
 - Swings on pipeline assets
 - Unauthorized gas takes
- Penalties may not incentivize desired behavior
- Availability of pipeline capacity & proper suite of services
- Daily vs. hourly scheduling
- Gas day vs. electric day
- Communications between participants

Limited Firm Capacity Available



- Fully Contracted
- Partially Contracted
- Zero Contracted
- ➔ Capacity Unavailable

- Most power generators do not hold adequate pipeline capacity
- Pipeline grid is capacity constrained
- Pipeline expansions need long-term (10 Year +) fee based contracts
- Many generators require volumetric, short-term contracts
- Change paradigm to allow flow-through of pipeline demand charges

2015 PJM Peak Power Price
\$275/MWh = ~ 150 days of
pipeline capacity*

*\$4 gas cost; HR=8000



Proposed Solutions

Additional Firm Capacity Needed to Meet PJM Demands

- Allow for flow through of pipeline costs; or
- PJM to hold capacity and release to generators

Address Communication & Operational Disconnects

Encourage Targeted Dispatch Questions

- What type of transport (FT or IT)?
- What priority of transport (in the path or out of the path)?
- Is supply nominated for your transport?
- Have you submitted a burn profile template?
- Have you coordinated a request for daily/hourly operational flexibility?

Maintain Dialogue Among Power Gen, ISO & Pipelines