Technical Session

MAOP / Hydraulic Modeling / Vulnerable Areas

Cases:
20-G-0131
23-G-0437

01/04/2024

Agenda:

1. Discussion on Maximum Allowable Operating Pressure

2. Review Gas System Hydraulic Modeling

3. Vulnerable Areas

NYSEG · RG&E
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Maximum Allowable Operating Pressure - MAOP

What is it?

Why is it Important?

How is it a Measure of Reliability?

16 CRR-NY Part 255.3 Definitions

Maximum Allowable Operating Pressure ("MAOP"):

"means the maximum pressure at which a pipeline or segment of a pipeline may be operated"

NYSEG/RG&E operate pipelines and gas distribution systems ranging from 1,440-psig MAOP to Low-Pressure 12" Water Column (0.43-psig).

Common Gas Distribution System MAOP's:

- Low Pressure, 12" WC
- Medium Pressure 15-psig to 60-psig

(Note: 1-psig = 27.7" water column)

Maximum Allowable Operating Pressure - MAOP

What is it?

Why is it Important?

How is it a Measure of Reliability?

The **MAOP** of a gas distribution system represents the upper-pressure bounds that the system may be operated at. Each component of each individual gas system is designed and tested to be able to operate at this maximum pressure value.

Further, per Federal & State regulations, LDC's go to great lengths to prevent gas systems from over-pressurizing above the **MAOP**. Overpressure-protection devices are installed to protect gas systems and customers from accidental over-pressurization.

Maximum Allowable Operating Pressure - MAOP

What is it?

Why is it Important?

How is it a Measure of Reliability?

The pressure at any point within a gas distribution system be can expressed in terms of percentage-MAOP [%MAOP = (Pressure /MAOP) x 100].

For a gas distribution system that has ZERO demand, all points within that system will be at 100% MAOP.

As demand increases, and gas flows through the distribution system, the friction caused by the flow of the gas against the wall of the pipe causes the pressure to decrease. The greater the demand, the greater the flow and the greater the pressure loss.

Generally, the system 'endpoints' (those points furthest from the source of gas into a distribution system, the District Regulator Stations), will have the lowest %MAOP.

So, what is the lowest %MAOP that will ensure safe and reliable delivery of the natural gas? Two factors to consider...

Maximum Allowable Operating Pressure - MAOP

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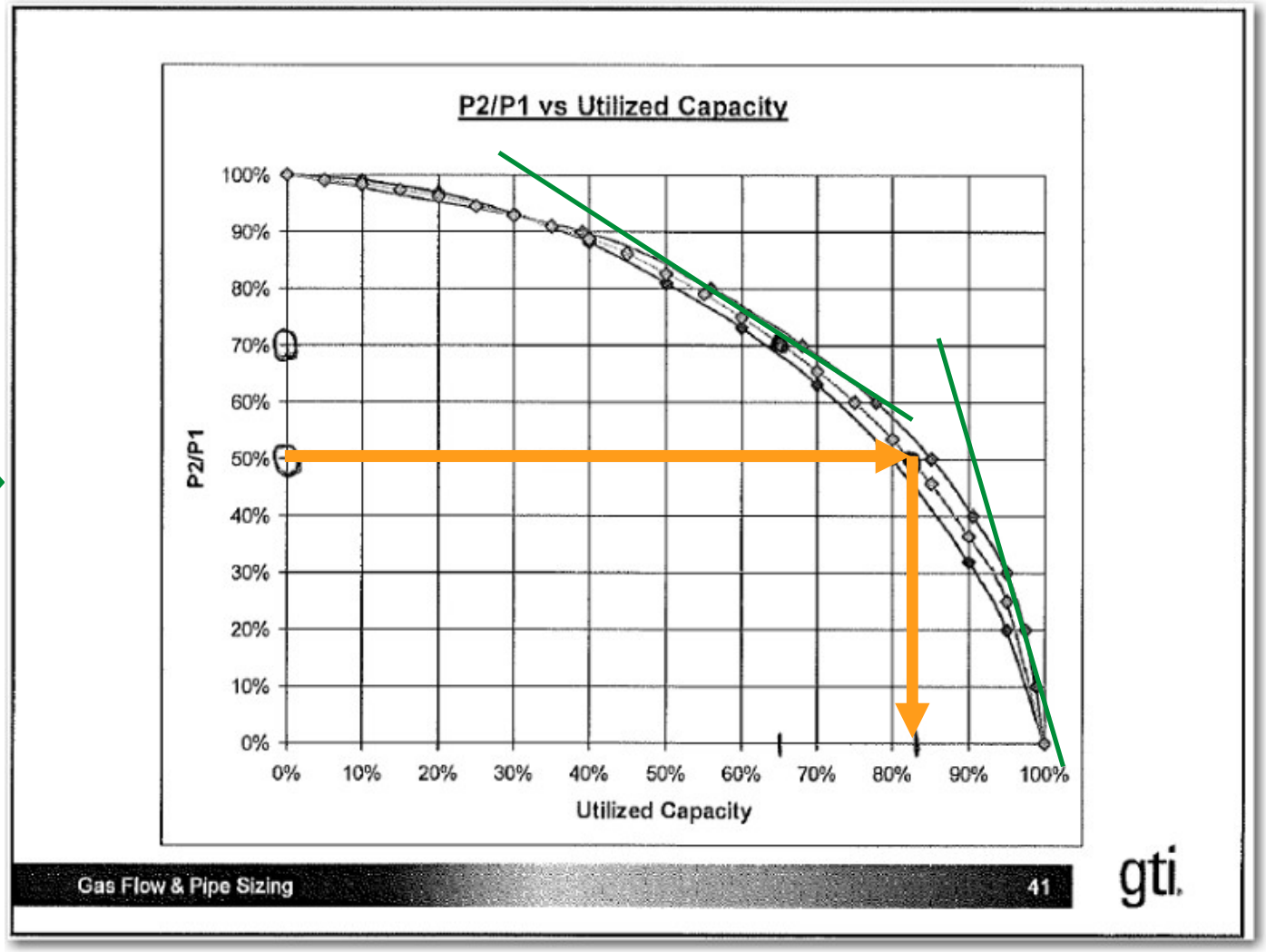


Maximum Allowable Operating Pressure - MAOP

How is it a Measure of Reliability?

Recall, NYSEG and RG&E combined serve approximately 593,000 gas customers. Every customer has a connection to the gas distribution system known as a gas service. For pressures greater than Low-pressure, customers will have a gas regulator to reduce delivery pressure to 7-8" WC.

The high and low pressure bounds are required in order to size, select, stock and standardize on the components required to build a gas service, service regulator and meter set. The 100%-MAOP and 50%-MAOP thresholds provide those limits and allows:

- For adequate differential pressure for the proper operation of regulator equipment
- Operational flexibility to standardize and inventory equipment

Maximum Allowable Operating Pressure - MAOP

%MAOP as a Measure of System Reliability*	
> 70% MAOP	Healthy System. No imminent concerns.
70% - 50% MAOP	Reliability Concern. Start to identify potential traditional solution projects.
< 50% MAOP	Reliability Risk. Limited ability to serve new load, increase risk of service to existing customers. Traditional and/or Non-traditional solution to be implemented.

*As established in the Avangrid Gas Transmission and Distribution Manual SOP.P.G.03.01 Rev 11

Gas System Hydraulic Modeling & Network Analysis

- Gas System Planning Group utilizes Synergi™ Gas for Hydraulic Modeling
- Build, Calibrate & Validate Hydraulic Models of NYSEG and RG&E Gas Distribution Systems
  - **13 Unique, non-contiguous Models for NYSEG**
  - **2 Unique, non-contiguous Models for RG&E**

- The Model Build process involves the input of assets/facilities and customer usage information from data sources including Geographic Information System (GIS) and SAP.
- Collect and calibrate against hundreds of pressure and flow data points. After calibration and verification using actual system data, the models are scaled to match Gas Supply Design Day HDD's.
- Utilize System Hydraulic Models to complete numerous studies and assist in troubleshooting system issues and emergent situations. The models help identify system vulnerabilities, including areas operating at and below 50%-MAOP as well as regulator station equipment that is at maximum capacity.

Vulnerable Location Analysis

- Generally, a system vulnerability, or an imbalance of supply and demand, falls into one of two (2) categories:

Those Caused by a Distribution Infrastructure Issue (Distribution-Side)

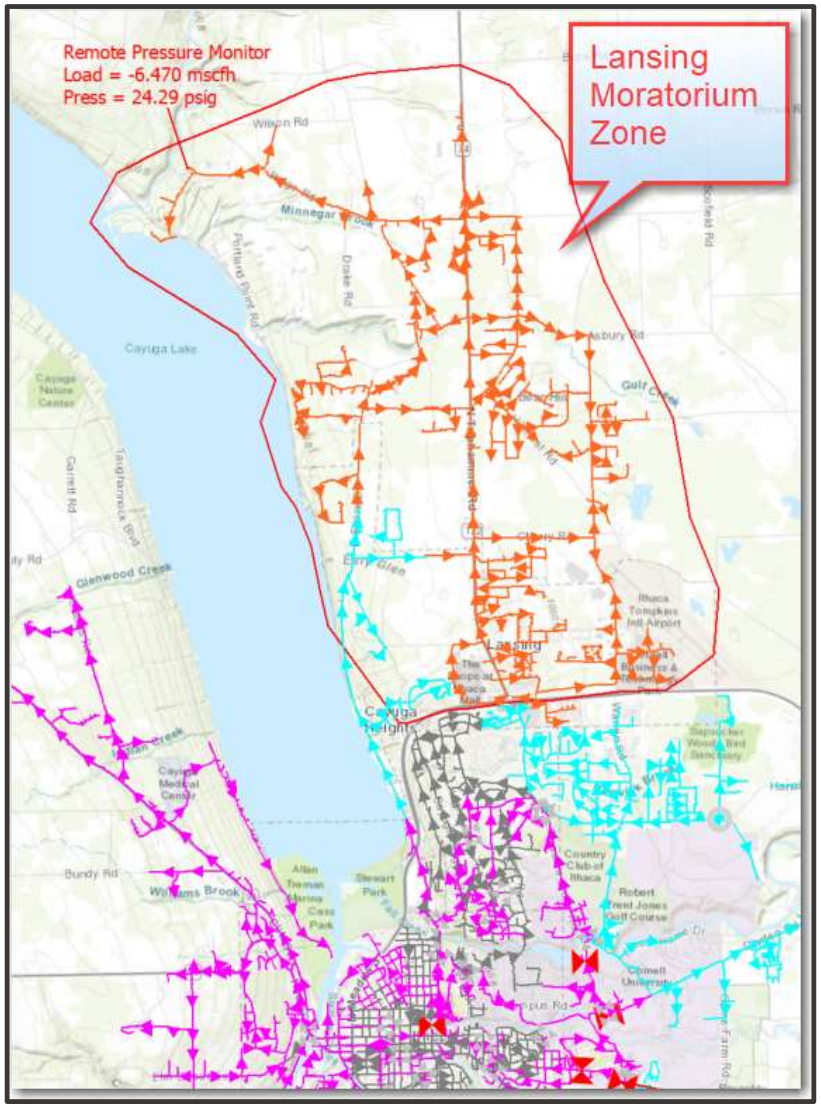
Those Caused by a Shortage of Pipeline Capacity Serving the Area (Supply-Side)

Distribution-Side Vulnerable Locations

- **NYSEG: Lansing**
  - Moratorium
  - Non-pipeline Alternatives being Implemented
- **NYSEG: Canandaigua**
  - District Regulator Stations feeding Distribution System at capacity
  - Area of active growth
  - Solicitation of NPA Request for Proposal (RFP)
- **NYSEG: Dix, Marshall, Seneca/Gorham, Vestal, Somerset/Barker, Newfane, Pendleton**
  - No imminent action required
  - Annually monitors and reviews area
  - Rural area with minimal growth
- **RG&E: Hamlin/Kendall, Greece (northerly portion)**
  - No imminent action required
  - Annually monitors and reviews area
  - Rural area with minimal growth

Gas System Hydraulic Modeling & Network Analysis

Snapshot of the Lansing Area (Ithaca Division/Model)



LEGEND

- 60-psig Ithaca/Lansing System <50% MAOP
- 60-psig Ithaca/Lansing System between 50-70% MAOP
- 60-psig Ithaca/Lansing System above 70% MAOP

Lansing Natural Gas System Status

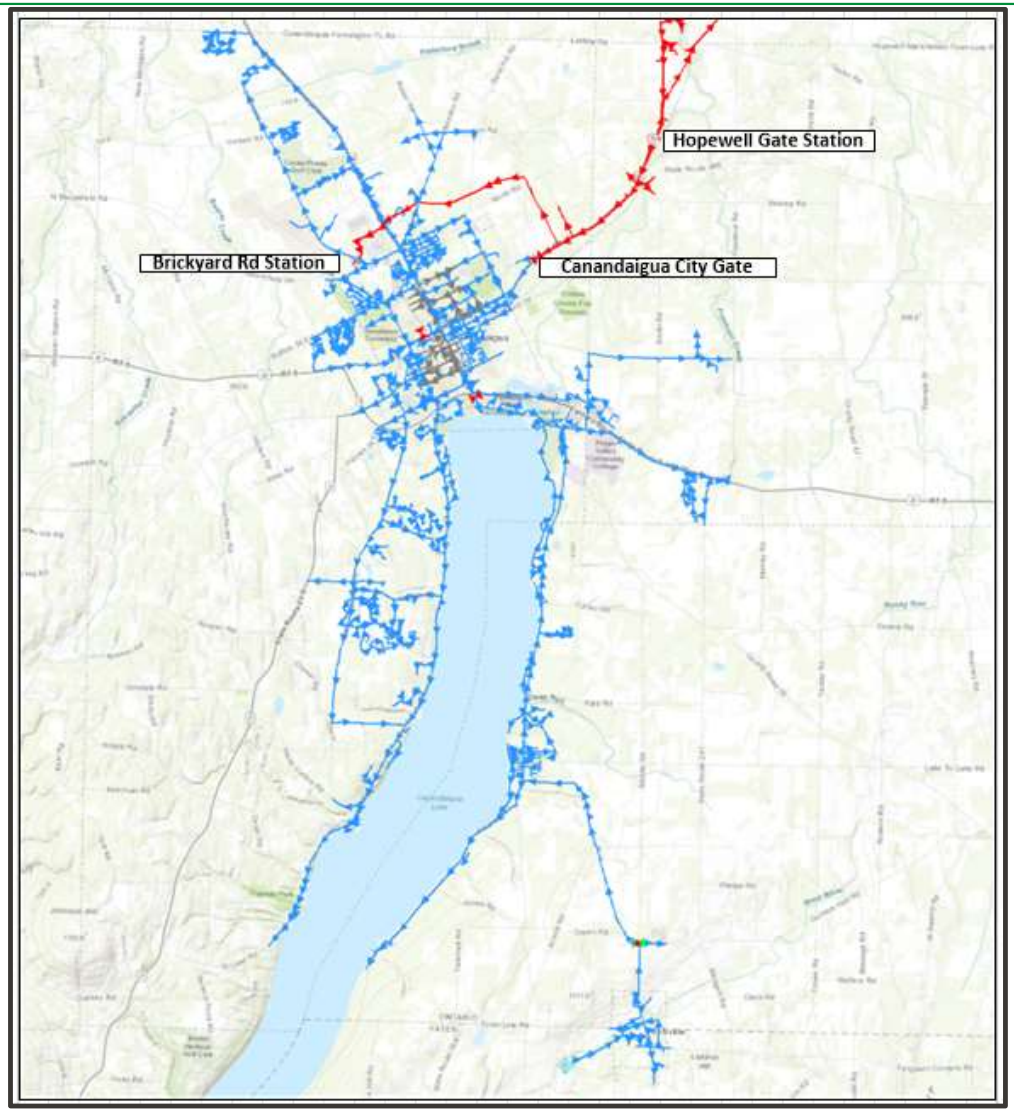
	2019 Synergi Model	2023 Synergi Model	%Δ
Total Ithaca System Demand	1,778 MCFH	1,663 MCFH	-6%
Moratorium Zone Demand	268 MCFH	256 MCFH	-4%
Lansing Endpoint Pressure	7 PSIG (11.7% MAOP)	21.5 PSIG (35.8% MAOP)	+24.1% MAOP

Additional considerations:

- The increase in Lansing Endpoint Pressure is mostly attributed to the East Shore Drive (NYS Rte. 34) Project.
- NYSEG files monthly pressure and temperature data (for November through March) to the Commission.

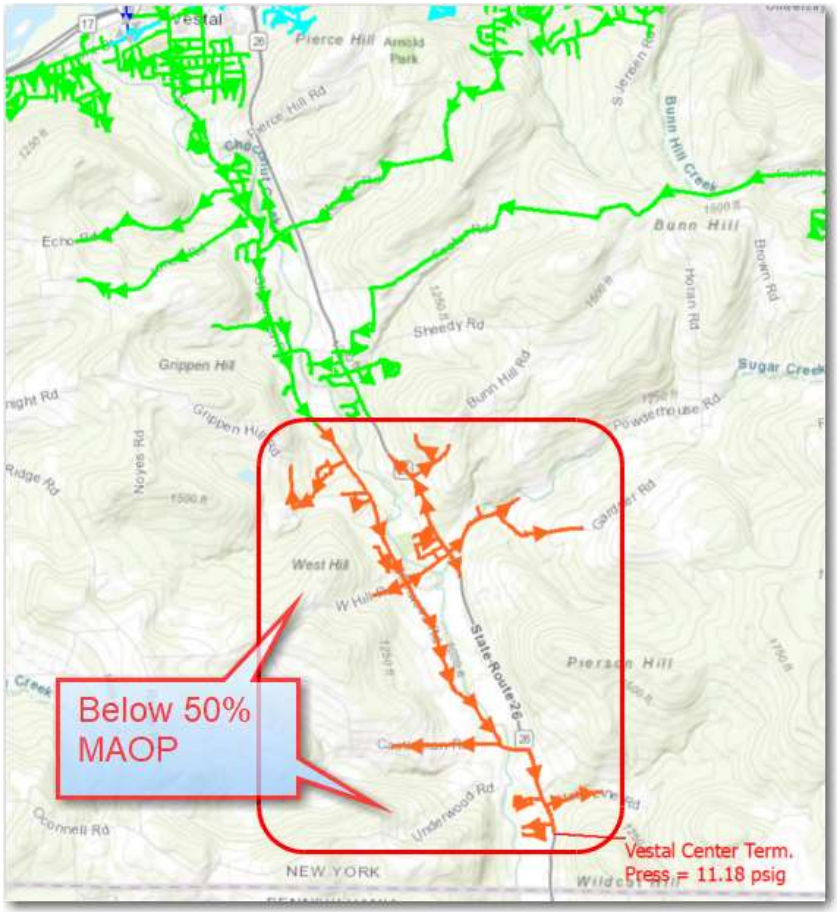
Gas System Hydraulic Modeling & Network Analysis

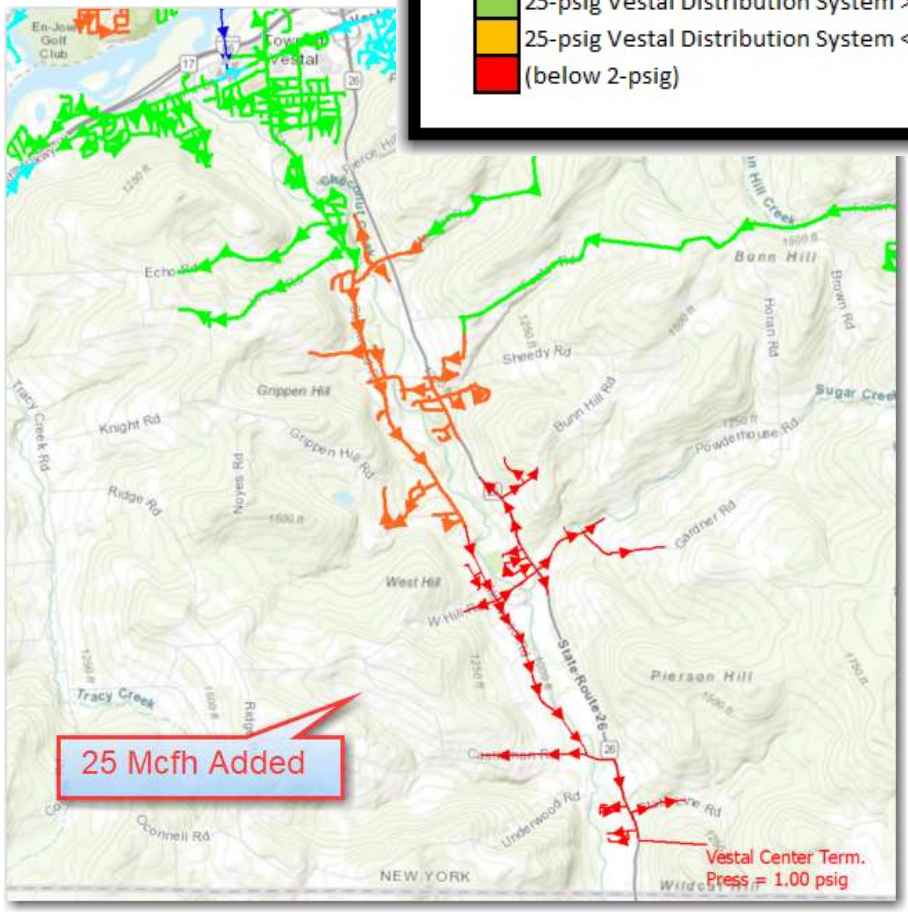
Snapshot of the Canandaigua Area (Geneva Division/Model)



Gas System Hydraulic Modeling & Network Analysis

Snapshot of the Vestal Area (Binghamton Division/Model)
(Ex. of an "monitored" Vulnerable Area)





Vulnerable Location Evaluation Criteria – Supply

Supply-Side Evaluation Criteria	
Reserve Margin	• <2% • Area may be experiencing growth • Limited or fully subscribed upstream pipeline capacity • Other, unique conditions
Maximum Daily Delivery Obligations (MDDOs)	• Contractual volumes per citygate • Max takes per gas day – measure of system flexibility • Pipelines can restrict hourly takes
Other	• Pipeline operations/conditions that limit flexibility • Area-specific challenges • Lack of liquid supply or alternatives to traditional supply solutions • Feasibility of alternative solutions

Supply-Side Vulnerable Locations

- **NYSEG Goshen**
  - Intermediary pipeline capacity
  - New/incremental customer load
  - Evaluating other options
- **NYSEG Carlisle, Canaan, and Richfield Springs Citygates**
  - System capacity and pipeline operational flexibility
  - New/incremental customer load
  - Monitoring
- **RG&E Avon Citygate**
  - Station/MDDO Capacity
  - New/incremental customer load
  - Monitoring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