ANALYSIS GROUP

Fuel and Energy Security Study Scope, Method, and Inputs

NYISO ICAPWG/MIWG/PRLWG

Paul Hibbard
Joe Cavicchi
Grace Howland

Analysis Group

April 21, 2023

Table of Contents

Context and Assignment

- Electricity market trends and more extreme weather conditions introduce potential reliability risks to the electric grid
  - For example, continued reliance on fossil fuels in the near-term, transmission, and increasing variable/weather-dependent generation

- In 2019, Analysis Group (AG) completed a winter fuel security study for NYISO, examining a 17-day cold period in winter 2023/2024

- This project revisits the potential reliability risks under severe winter conditions and system disruptions

- AG task: assess winter fuel/energy security for NYISO under various assumptions (and variations to assumptions) and scenarios; provide a report documenting the approach and findings

- Analytic framework
  - Extended period of cold weather in winter 2023/24 and two future winter periods
  - Examine weather data to identify winter conditions to model a severe extended duration cold weather event (including a cold snap) for winter 2023/2024 and the selected future periods
  - Scenario-based stacking order analysis based on forecasts of demand, supply and fuel availability
  - Identify circumstances under which resources may be insufficient to meet load plus reserves absent emergency actions, on statewide basis and/or within relevant load zones/regions
  - Evaluate fuel/energy adequacy under a wide range of future assumptions and potential electric and fuel (e.g., natural gas, and alternative fuel sources) system scenarios
 - Characterize probability of scenarios and outcomes relative to reliability criteria conditions

Table of Contents

1 Overview of Assignment

2 Modeling Structure and Inputs

3 Potential Model Scenarios

4 Next Steps

Model Overview

- Scenario-based model – stacking order analysis

  - Not a production cost or transmission security modeling exercise

- Forecast period: Winter 2023/2024, and 2 additional future winter periods

- Severe winter conditions: extended cold weather period based on historic weather/load data

  - Estimate hourly fuel (e.g., natural gas) and electric demand consistent with these conditions

- Modeling period: extended severe cold weather period plus embedded cold snap (not a full winter analysis)

  - Period and conditions based on analysis of historical weather data

- Resource starting assumptions consistent with the 2023 Load and Capacity Data report (commonly referred to as the "Gold Book") and the 2021-2040 System & Resource Outlook report ("2021-2040 Outlook"); little or no changes assumed to natural gas infrastructure

- Natural gas demand/supply and oil capability informs ordering of generating units under assumed load and resource conditions

  - Liquid fuel replenishment assumptions from historical experience and NYISO fuel survey data (i.e., data sourced from the NYISO's Generator Fuel and Emissions Reporting system)

  - Natural gas-fired power generation availability based on natural gas demand/supply analysis under these winter conditions

- Compare hourly generation to hourly load plus reserves over the full modeling period, including accounting for fuel draw down and replenishment

Model Setup Diagram: High Level
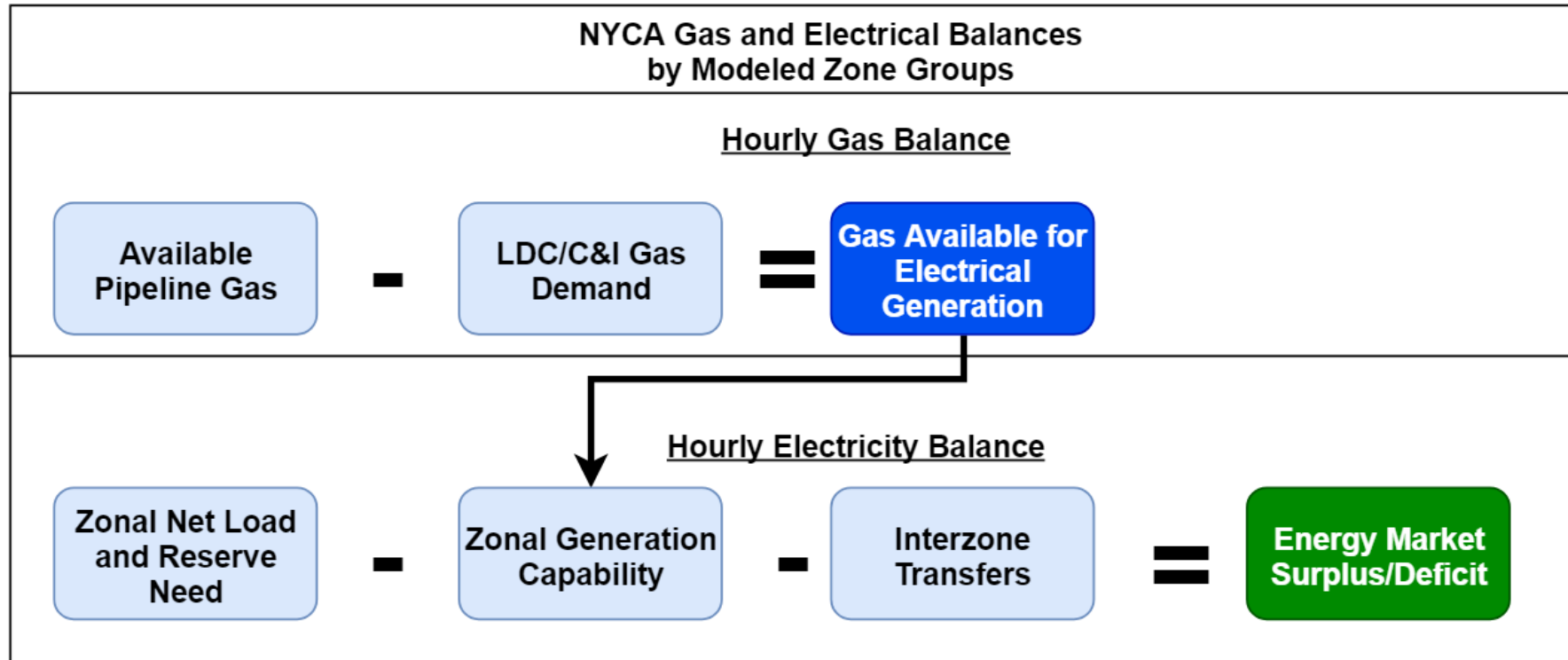
- Hourly balance of natural gas, to identify (hourly) *natural gas available for electric generation*

- With that (and information on fuel for/output from other generation sources) – conduct hourly evaluation of electric system balance

- Done over the defined/forecasted severe winter period

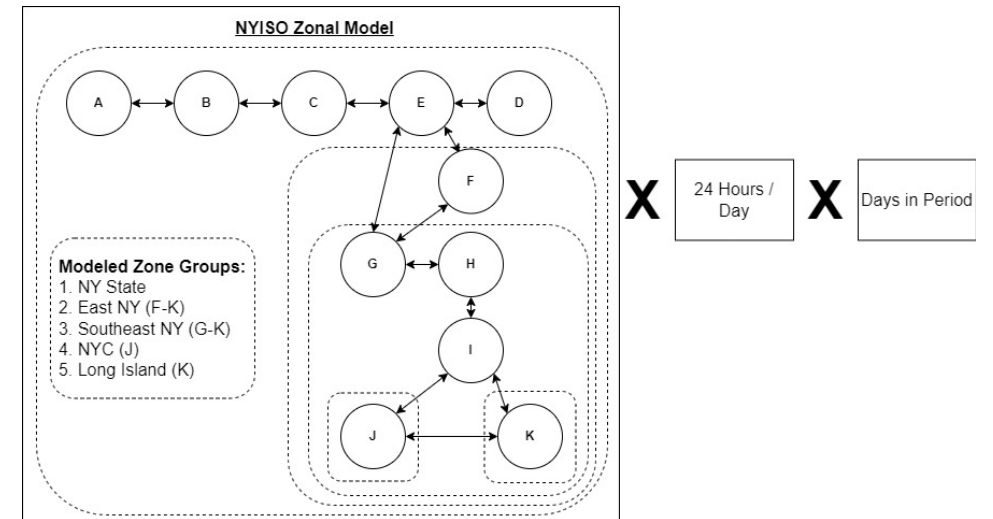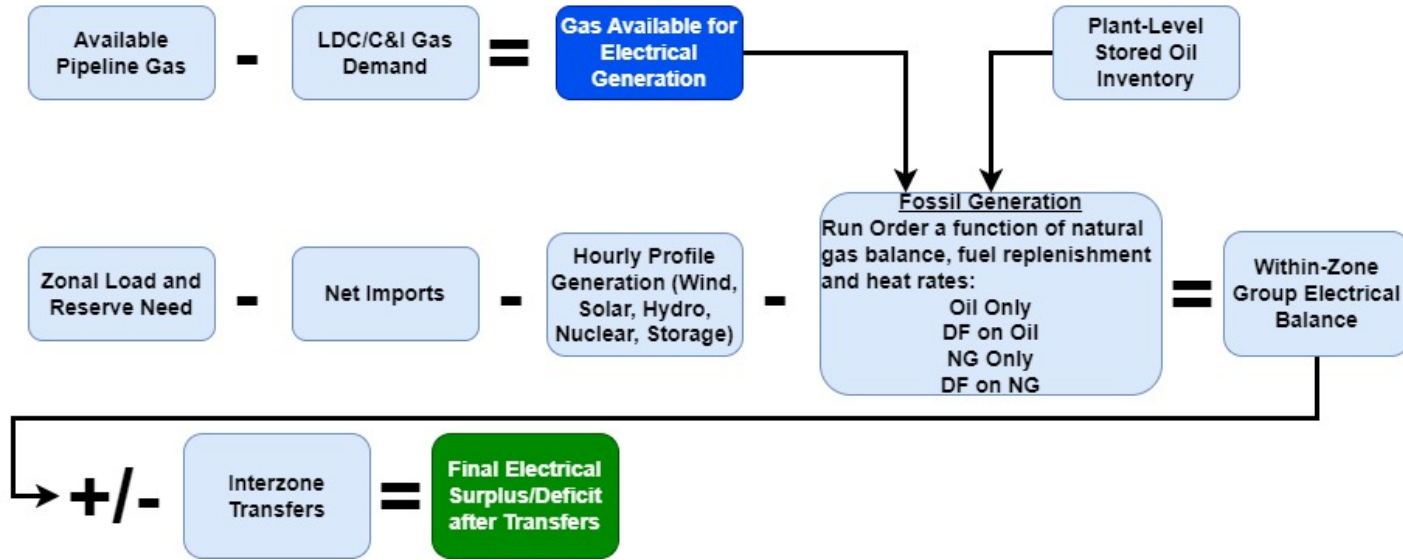- Years: Winter 2023/2024, and 2 additional future winter periods

Model Setup Diagram: Electric Balancing
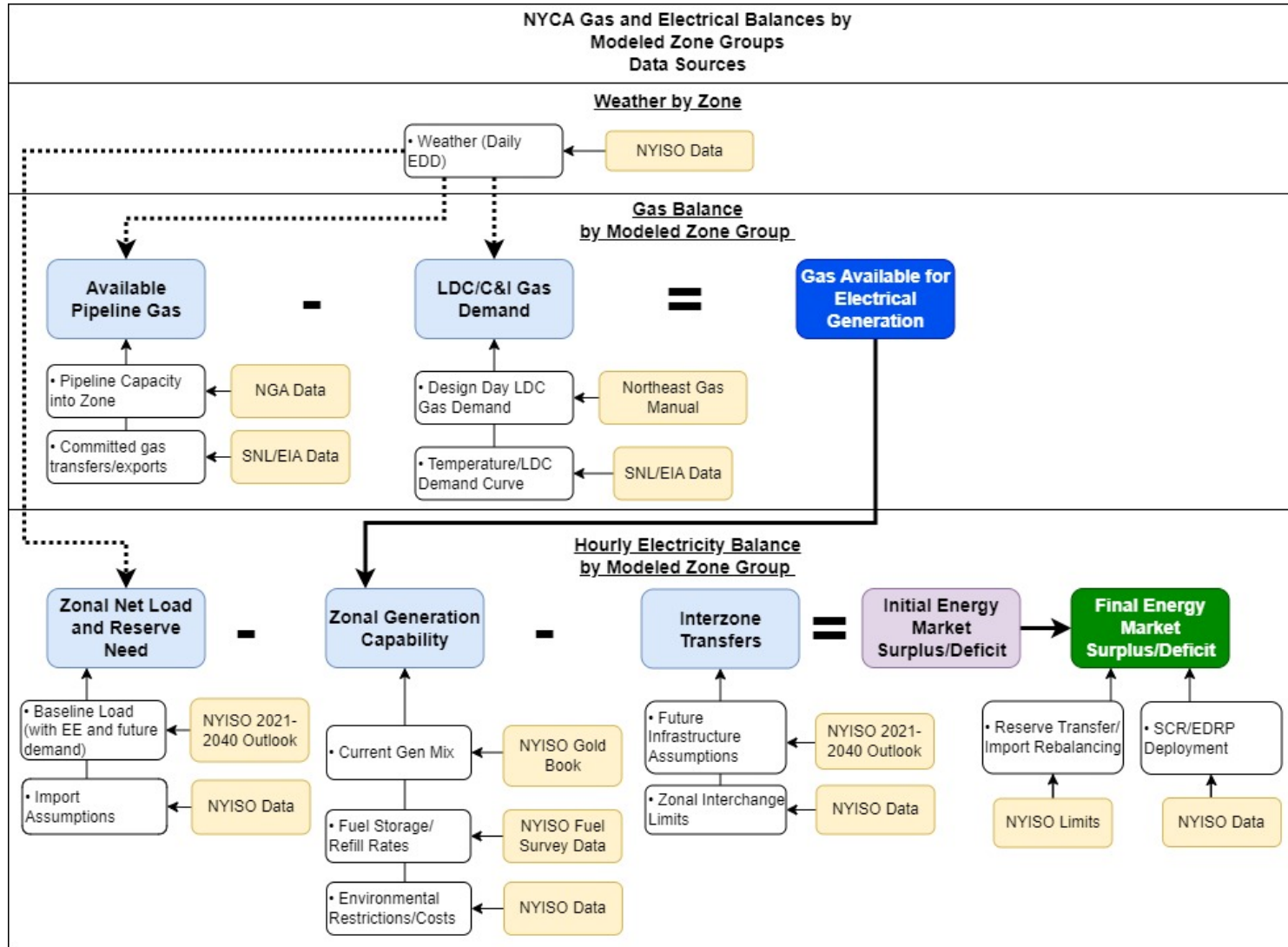
- AG will work with NYISO on data, and will use publicly-available data where available

- Load and resource assumptions previously vetted with stakeholders for prior studies (where possible)

- *Assumptions* – load, resource, and retail gas demand assumptions

- *Scenarios* – postulate natural gas and electric system failures to stress test the results

- Review assumptions and scenarios with stakeholders

Model Setup Diagram: Electric Order and Zones

Data

- The starting point will utilize data from the 2023 Gold Book and 2021-2040 Outlook, for developing the following study assumptions:
  - NYISO zonal load forecasts for 2023/2024, and 2 additional future winter periods
  - Accounting for applicable emissions restrictions
    - For example, the operational impact on "peakers" in accordance with the NYDEC's "peaker rule"
  - Integration of new renewables and energy efficiency to meet the Clean Energy Standard (CES) and Climate Leadership and Community Protection Act (CLCPA)
  - Transmission system upgrades anticipated to be placed in-service during forecast period
- The existing natural gas pipeline/storage network is assumed to stay the same throughout
- Forecasts of natural gas LDC demand based on LDC forecasts

Table of Contents

Assumptions and Scenarios

- Terminology
  - We use "assumptions" to indicate starting point assumptions with respect to demand, resources, and policies
  - We use "scenarios" to represent unexpected/additional losses of natural gas and/or power system infrastructure (pipelines, power plants, transmission facilities)
  - Assumptions and scenarios will be combined into a manageable number of "cases" (model runs) that span the range of potential futures, and stress test the system

- *Assumptions* - examples
  - Business as usual
  - Different quantities of renewable generating capacity and/or energy storage
  - Different quantities of unit retirements
  - Higher/lower than expected load growth
  - Higher than expected electrification of transportation and heating sectors

- *Scenarios* - examples
  - Loss of pipeline capacity (<u>e.g.</u>, pipeline and/or compressor station outages)
  - Loss of power plant capacity
  - Restrictions on oil replenishment
  - Interchange (imports/exports)

Table of Contents

Next Steps

- **Analysis Group/NYISO**
  - AG to complete model refresh and update
  - AG to work with NYISO and stakeholders to develop model data/assumptions, including scenario/system variations to be assessed
  - Run model cases, generate tabular/graphical results; review with NYISO and stakeholders
  - Draft report, final report
  - Periodic committee meetings to review analysis, results

- **Tentative Schedule**
  - Today: AG presentation of high-level overview of model structure and inputs
  - May 2023: AG presentation of study assumptions, data and scenarios
  - June/July 2023: AG presentation of fuel security analysis results/findings and initial recommendations
  - August/September 2023: AG presentation of final report

Contact

Paul Hibbard
Principal
617 425 8171
paul.hibbard@analysisgroup.com

Joe Cavicchi
Vice President
617 425 8233
joe.cavicchi@analysisgroup.com

Grace Howland
Associate
+44-203-480-7917
grace.howland@analysisgroup.com