

North American Market Gas-Trade (NAMGas) Model: **Updated Common Cases**

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Work Continuing with Cases

- February 19th IEPR Workshop
 - NAMGas Model Leon Brathwaite
 - Iterative Modeling Process Ivin Rhyne
 - Stakeholders' comments and suggestions

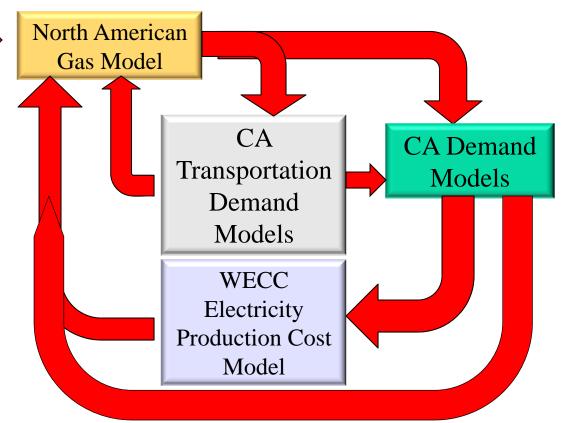


Work Continuing with Cases (cont.)

Rice University
Production
Costs

Updated
Economic/
Demographic
Assumptions

Iterative Modeling Process



Reference Case: Changes Made from February 19th Assumptions

- Coal Fired Generation Retirement:
 - 30 GW starting in 2014 => 61 GW starting in 2014
 - The Brattle Group October, 2012
- Renewable Portfolio Standard:
 - California meets RPS on time, 5 year delay for other states =>
 California and rest of WECC states meet RPS on time, 5 year delay elsewhere
- Updated Infrastructure Capacity Addition to Export Natural Gas to Mexico
- Added Structure to Improve Performance of the LNG Sector
 - Conversion from WGTM to NAMGas

High Price/Low Demand Case: Changes Made from February 19th Assumptions

- Cost Environment:
 - P50 Line => P10 Line
- Updated Infrastructure Capacity Addition to Export Natural Gas to Mexico
- Added Structure to Improve Performance of the LNG Sector
 - Conversion from WGTM to NAMGas

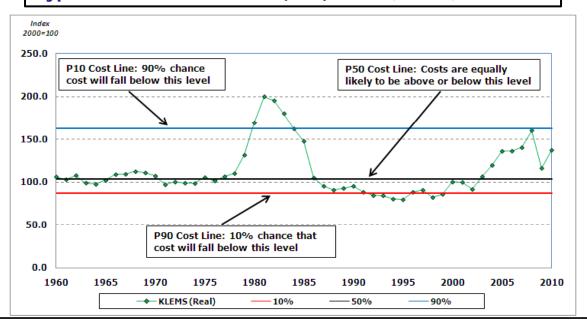


Low Price/High Demand Case: Changes Made from February 19th Assumptions

- Cost Environment:
 - P50 Line => P90 Line
- Coal Fired Generation Retirement:
 - 1 GW starting in 2014 => 31 GW starting in 2014
 - The Brattle Group October, 2012
- Updated Infrastructure Capacity Addition to Export Natural Gas to Mexico
- Added Structure to Improve Performance of the LNG Sector
 - Conversion from WGTM to NAMGas

North American Market Gas Trade Model: Developing a Cost Environment

Typical Cost Environment (P50): 1975, 1986, and 2003



- Staff must simulate the cost environment for analysis:
 - Graph shows indexed cost between 1960 and 2010
 - High cost environment ~ 1979 1984
 - Low cost environment ~ 1992 2000.

Sources: Baker Institute.



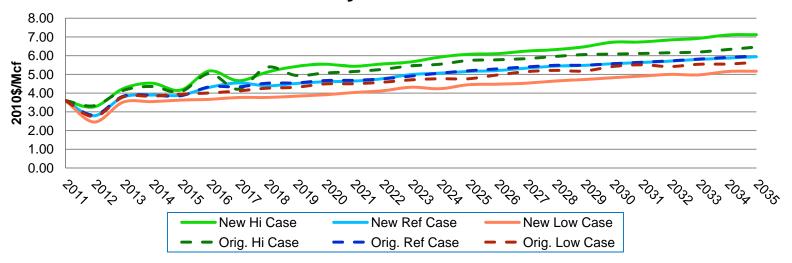
Common Cases: Supply Balance

Performance of Cases: Lower 48



Common Cases: Price Performance of Cases (Henry Hub)

Henry Hub Prices

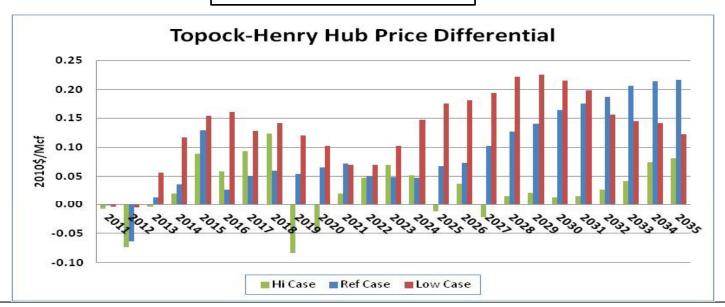


- In general, prices behave as expected:
 - High Price case produced highest prices
 - Low price case produced lowest prices
- Adjusted cases have created a larger "zone of uncertainty"



National Cases: Price Performance of Cases (Differentials)

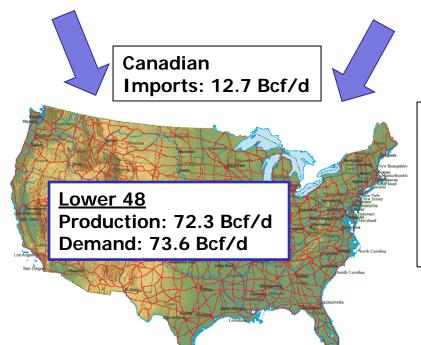
Topock - Henry Hub



- In general, differentials turn positive after 2013:
 - Resource abundance more evident in the eastern US
 - Access to shale and 'tight' gas resources is re-ordering the supply portfolio, impacting eastern prices more than western.



Common Scenarios Cases: Supply Portfolio of Reference Case (2025)



- Two main demands: End-use and Exports
- Demand satisfied by:
 - Canadian Imports
 - L48 Production
 - LNG Imports



Exports: 8.4 Bcf/d



LNG Imports: 0.21 Bcf/d

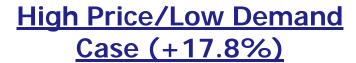


Common Scenarios: Reconfiguration of Supply Portfolio (2025)



Canadian

Imports: 12.4 Bcf/d



- Two main demands: End-use (-9.1%) and Exports (+66.7%)
- Demand satisfied by:
 - Canadian Imports (-2.4%)
 - L48 Production (- 1.2%)
 - -LNG Imports (+204.0%)
- Competing sources of natural gas reconfiguring the supply portfolio



Production: 71.3 Bcf/d

Demand: 70.0 Bcf/d

Exports: 11.1 Bcf/d



LNG Imports: 0.64 Bcf/d



Common Cases: Reconfiguration of Supply Portfolio (2025)



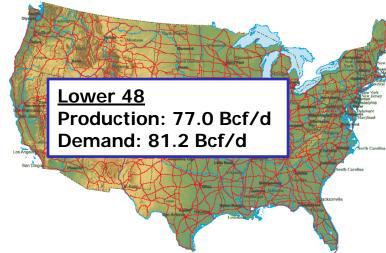
Canadian

Imports: 13.0 Bcf/d

Low Price/High Demand
Case (-13.8%)



- Demand satisfied by:
 - Canadian Imports (+2.4%)
 - -L48 Production (+6.5%)
 - LNG Imports (-57.1%)
- Competing sources of natural gas reconfiguring the supply portfolio



Exports: 5.5 Bcf/d



LNG Imports: 0.09 Bcf/d

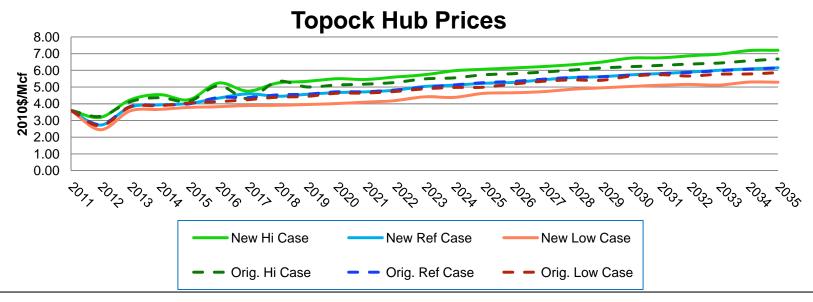


Common Cases: Supply Balance

Performance of Cases: California



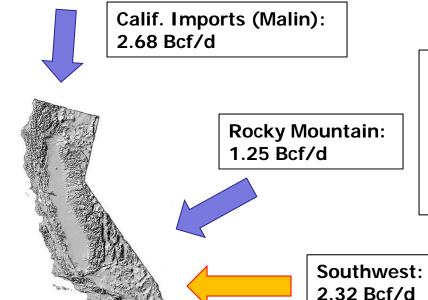
Common Cases: Price Performance of Cases (Topock Hub)



- In general, prices behave as expected:
 - High Price case produced highest prices
 - Low price case produced lowest prices
- The adjusted cases creates a larger "zone of uncertainty" for California.



Common Cases: California Supply Portfolio (2025)



Reference Case

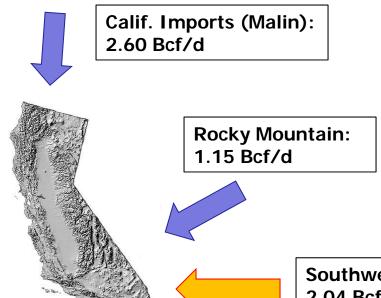
- California Demand: End-use
- Demand satisfied by:
 - Imports (Malin)
 - Rocky Mountain Supplies
 - Southwest Supplies
 - Local Production

California

Production: 0.20 Bcf/d Demand: 6.38 Bcf/d



Common Cases: California Supply Portfolio (2025)



High Price/Low Demand Case (+16.1%)

- California Demand: End-use (-7.8%)
- Demand satisfied by:
 - Imports (Malin) (-2.98%)
 - Rocky Mountain Supplies (-8.0%)
 - Southwest Supplies (-12.1%)
 - Local Production (-20.0%)
- Competing sources of natural gas reconfiguring the supply portfolio

Southwest: 2.04 Bcf/d

California

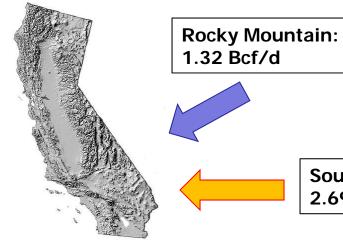
Production: 0.16 Bcf/d Demand: 5.83 Bcf/d



Common Cases: California Supply Portfolio (2025)



Calif. Imports (Malin): 2.78 Bcf/d



Low Price/High Demand Case (-11.5%)

- California Demand: End-use (+9.8%)
- Demand satisfied by:
 - Imports (Malin) (+3.7%)
 - Rocky Mountain Supplies (+5.6%)
 - Southwest Supplies (+15.9%)
 - -Local Production (+45.0%)
- Competing sources of natural gas reconfiguring the supply portfolio

Southwest: 2.69 Bcf/d

California

Production: 0.29 Bcf/d Demand: 6.94 Bcf/d



Summary:

- Work Ongoing with Cases
- Modeling Iterative Process still ongoing
- More Stakeholders suggestions and comments possible
- Larger Zone of Uncertainty