

## Navigating a fractured future Insights into the future of the North American natural gas market

A report by the Deloitte Center for Energy Solutions  
and Deloitte MarketPoint LLC



# Dynamic North American gas market

Just in the past several years:

- Prices rose to unprecedented levels in 2005-8 and then retreated to prior levels.
- Shale gas production grew from an insignificant percentage in 2005 to about 20% in 2010 of the total U.S. domestic supply.
- Global recession depressed global gas demand.
- U.S. LNG terminals, built in anticipation of large import volumes, are largely idle and many are now considering conversion to export LNG.
- Environmental concerns are shifting balance towards gas-fired generation.

# ***Overview of Navigating a fractured future: Insights into the future of the North American natural gas market***

- Purpose is to analyze alternative assumptions and their potential implications on the North American natural gas market.
- Key questions include:
  - How long will United States natural gas prices stay low, and will they achieve parity to other global markets?
  - Will U.S. shale gas production continue its rapid growth and eventually overtake conventional production?
  - Will low natural gas prices stimulate significant additional demand in the U.S. for power generation and for other sectors of the economy?
  - How might changes in shale gas costs impact U.S. production and prices?
  - How might the anticipated increase in global LNG supply affect the U.S.?
  - Will the U.S. ever import large volumes of LNG and, if so, how much of the existing regasification capacity will be utilized?
  - Alternatively, will the U.S. become a long-term exporter of LNG?
  - How will the announced nuclear shutdowns in Japan, Germany, and other countries affect worldwide gas demand, and what are the implications for the U.S.?

# Scenarios described in the natural gas paper

1. Reference
2. Grand Slam for Gas
3. Lower Shale Costs

<sup>1</sup> Please note that where the results of analysis are discussed in this presentation, the results are based on the application of specific economic logic and assumptions. These results are not intended to be predictions of events or future outcomes and have been provided solely for informational purposes.



# Key North American gas market findings<sup>1</sup>

1. Shale gas becomes the dominant U.S. supply source
2. Gas demand for power generation grows sharply (much higher than EIA's forecast)
3. U.S. natural gas prices rebound (counter to what some forecast)
4. Basis relationships are dramatically altered
5. Cost of U.S. shale gas production is key
  - Imported LNG is a marginal supply into the U.S.

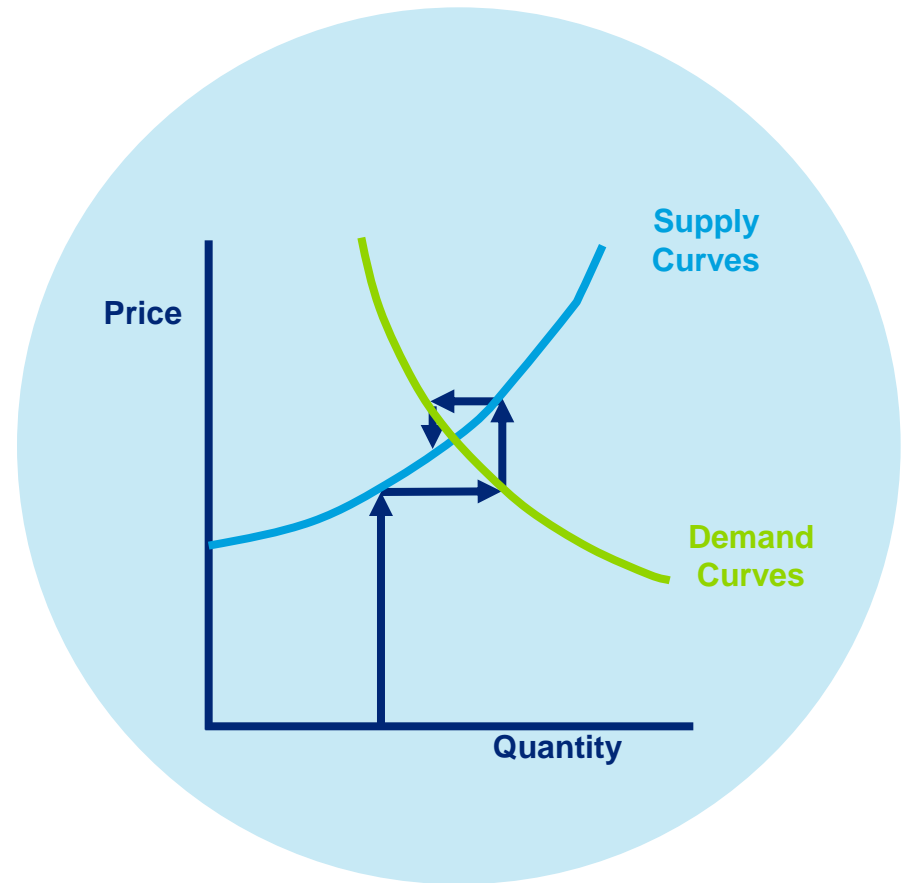
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# Key global gas market findings

1. World LNG supply continues rapid growth
2. European and Asian gas prices soften relative to U.S. prices, and oil indexation of gas contracts faces increased pressure

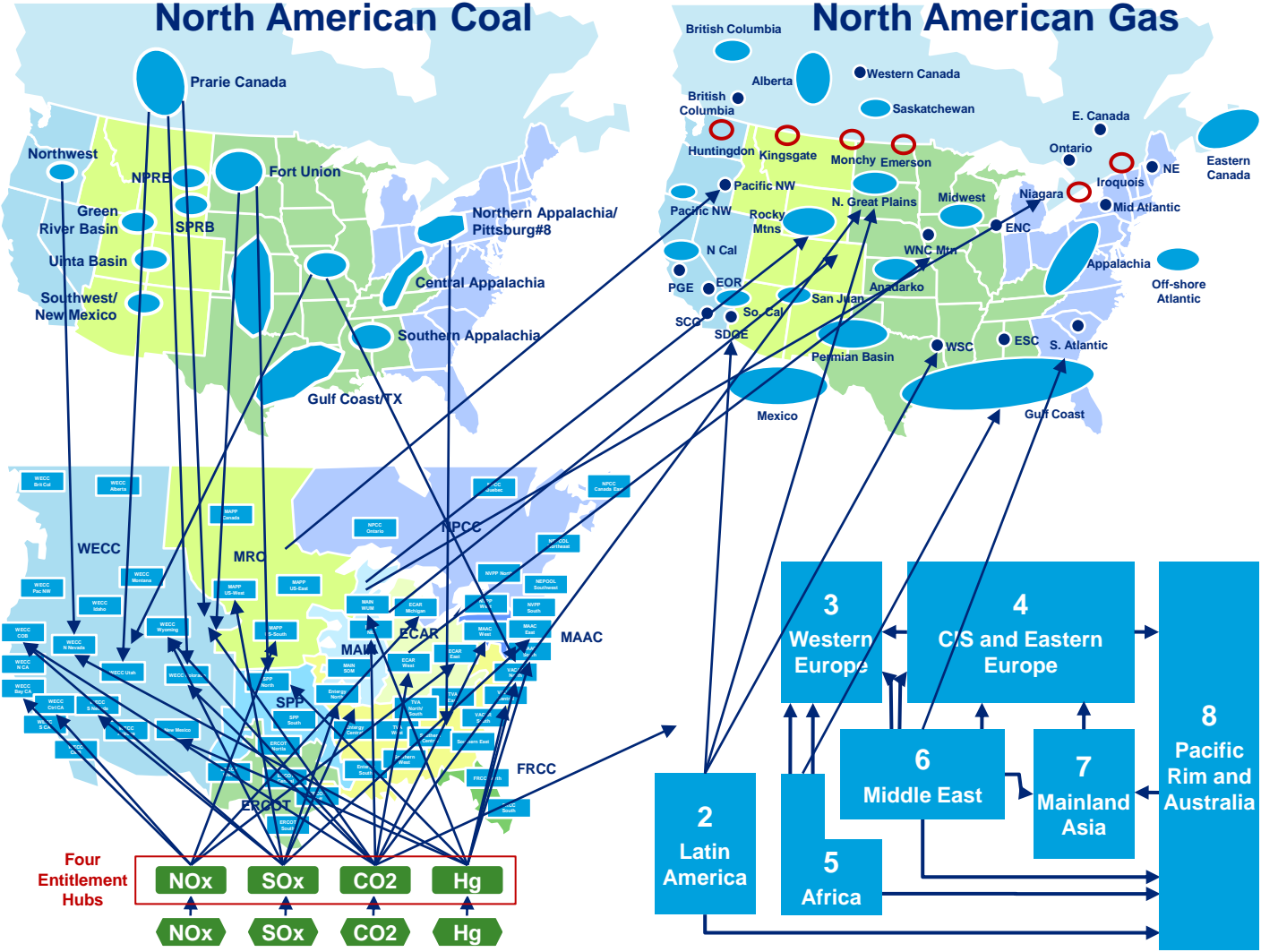
# Deloitte MarketPoint's fundamental market models

- Models use an iterative algorithm to simultaneously solve for market clearing prices and quantities for each region and time point in the model.
- Each market agent seeks to maximize its own value, just like in the real market
  - This is easy for a single market, single point in time, but very difficult for multiple markets that are geographically and temporally interconnected.
- This solution has been developed over past 30 years and has successfully been used by leading U.S. and international energy companies.





# Integrated models for power, world gas, coal and emissions



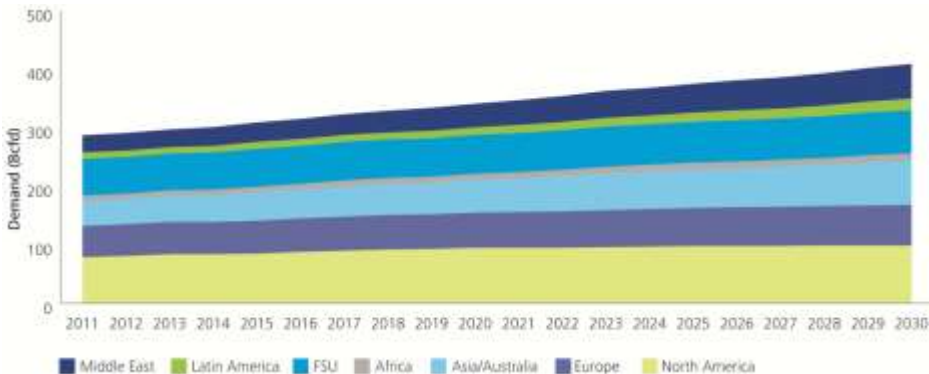
North American Electricity & Emissions

World Gas Model

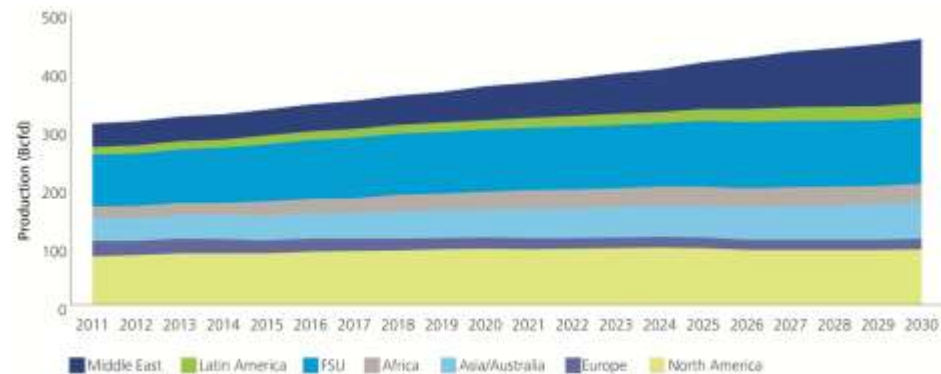
# Global supply and demand balance

- Projected world demand for gas grows at 1.9% per annum through 2030, with Asia and Middle East showing the highest growth rates.
- Global gas production is led by the Middle East, which is projected to triple in volume, and Australia, which will have a surge in LNG exports, over next two decades.

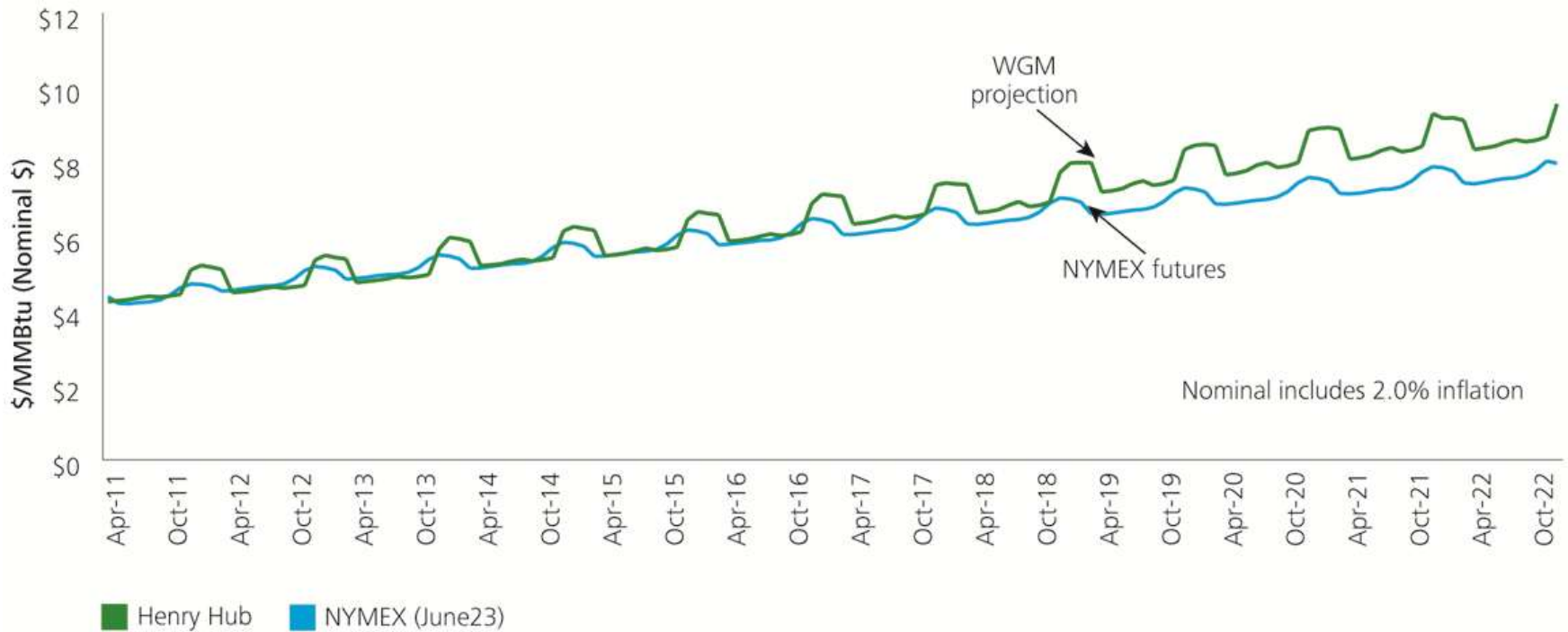
## Global gas demand



## Global gas production



# Our projection shows more rapid firming of prices than does Nymex futures prices

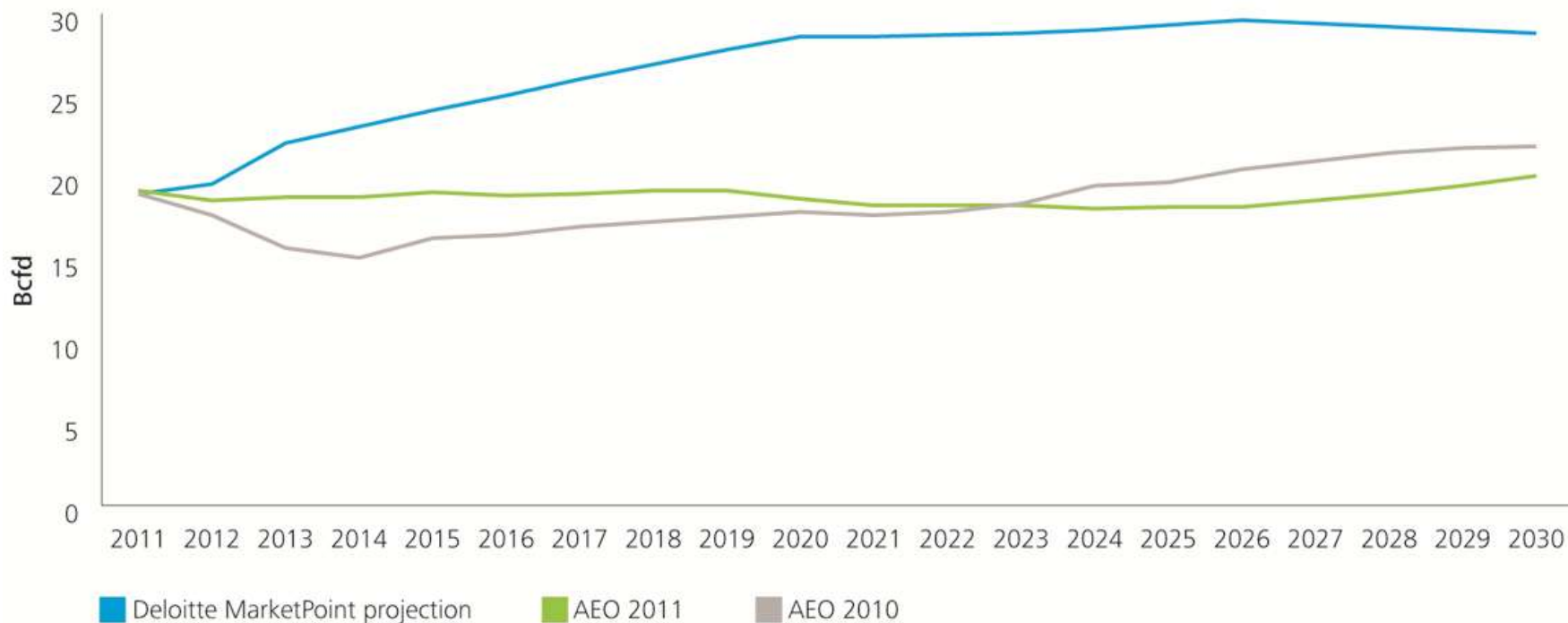


# Henry Hub price projection under the reference and alternative scenarios

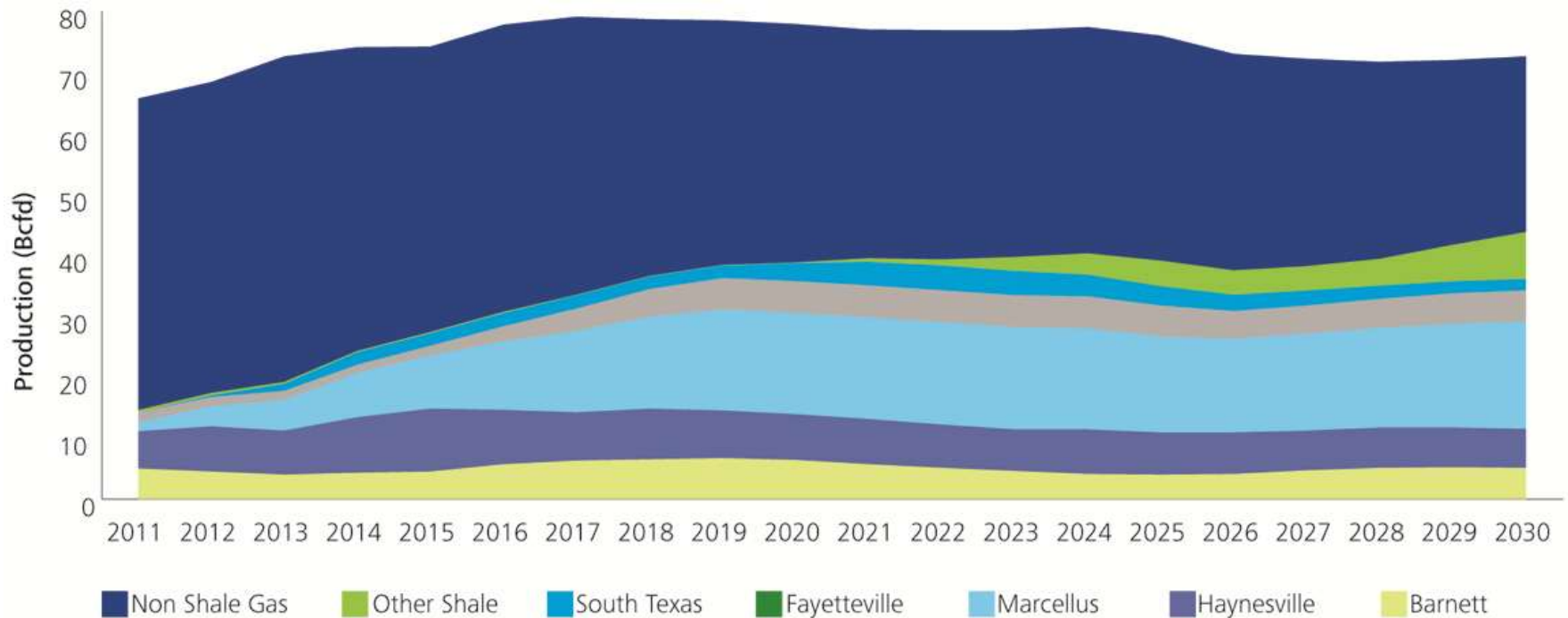


Source: Historical data from EIA; projections DMP's World Gas Model

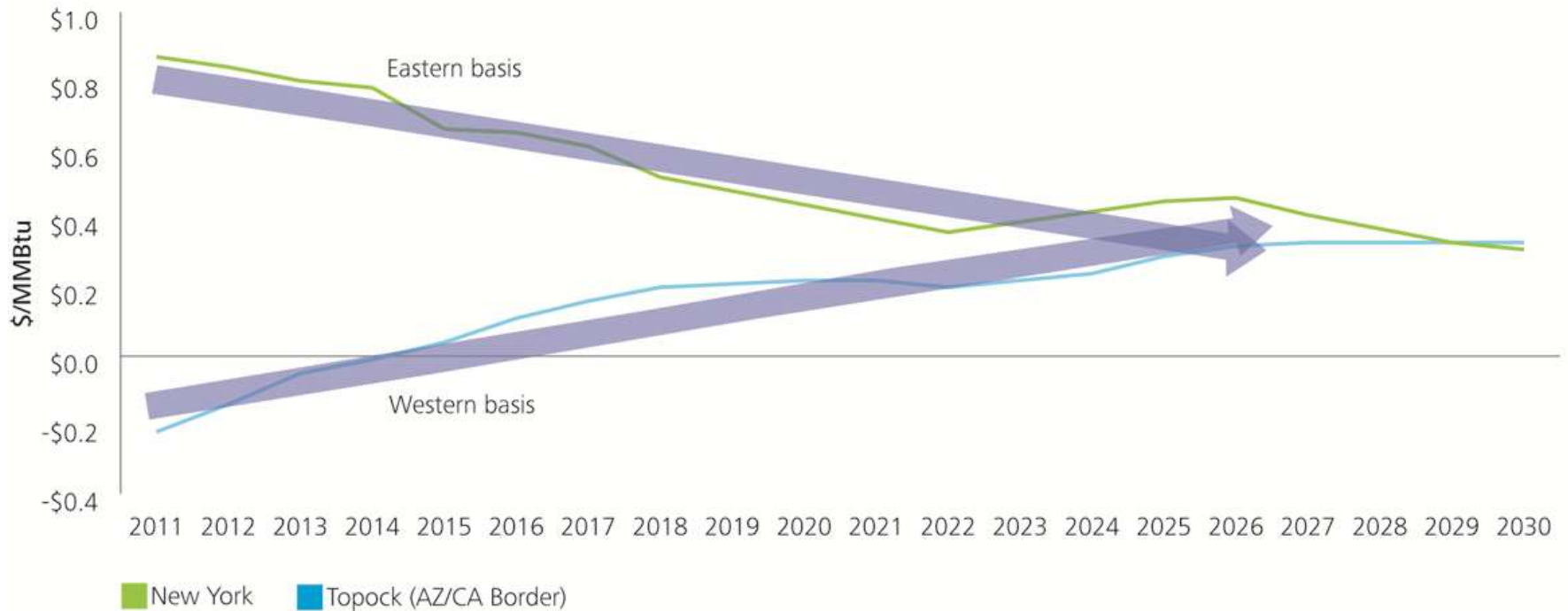
# We project rapidly increasing U.S. gas demand for power generation later this decade, in sharp contrast to EIA's Annual Energy Outlook projections.



# Shale gas production is projected to continue its rapid growth until it becomes the dominant domestic source

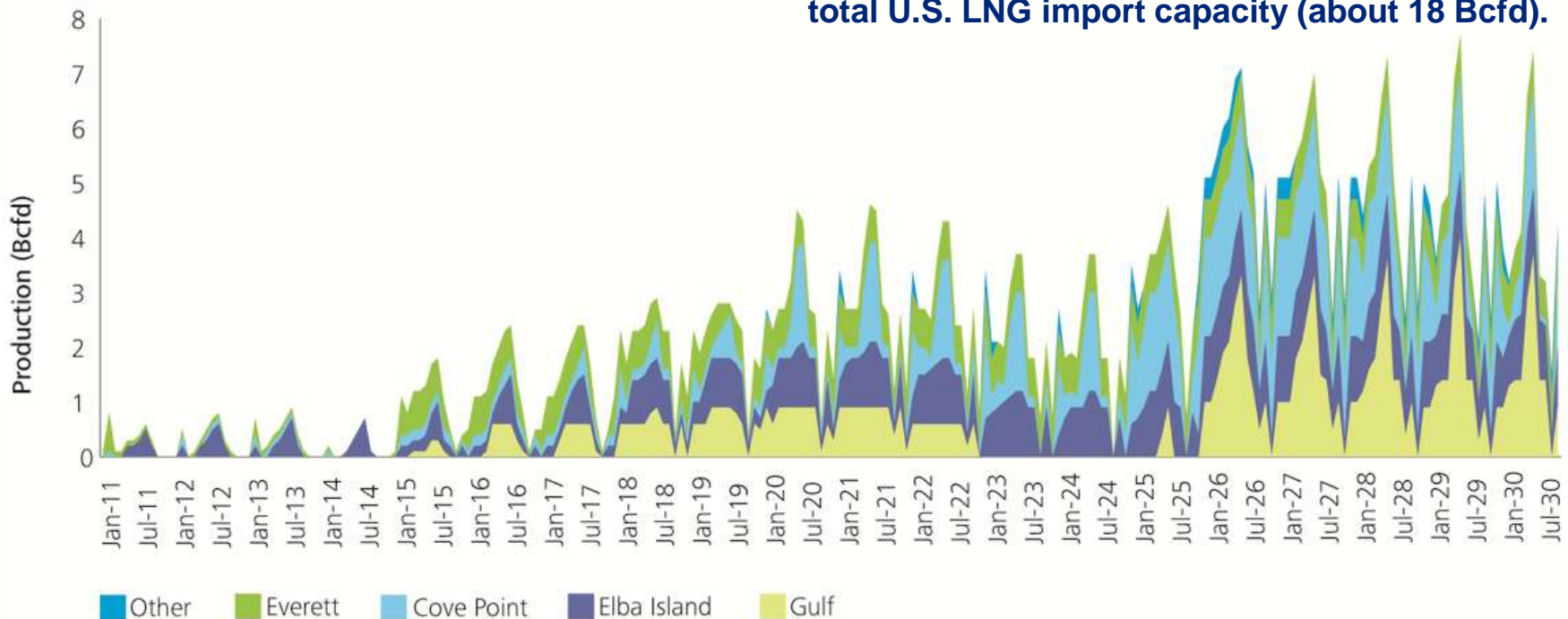


# Basis relationships are projected to be significantly altered by shifting sources of production



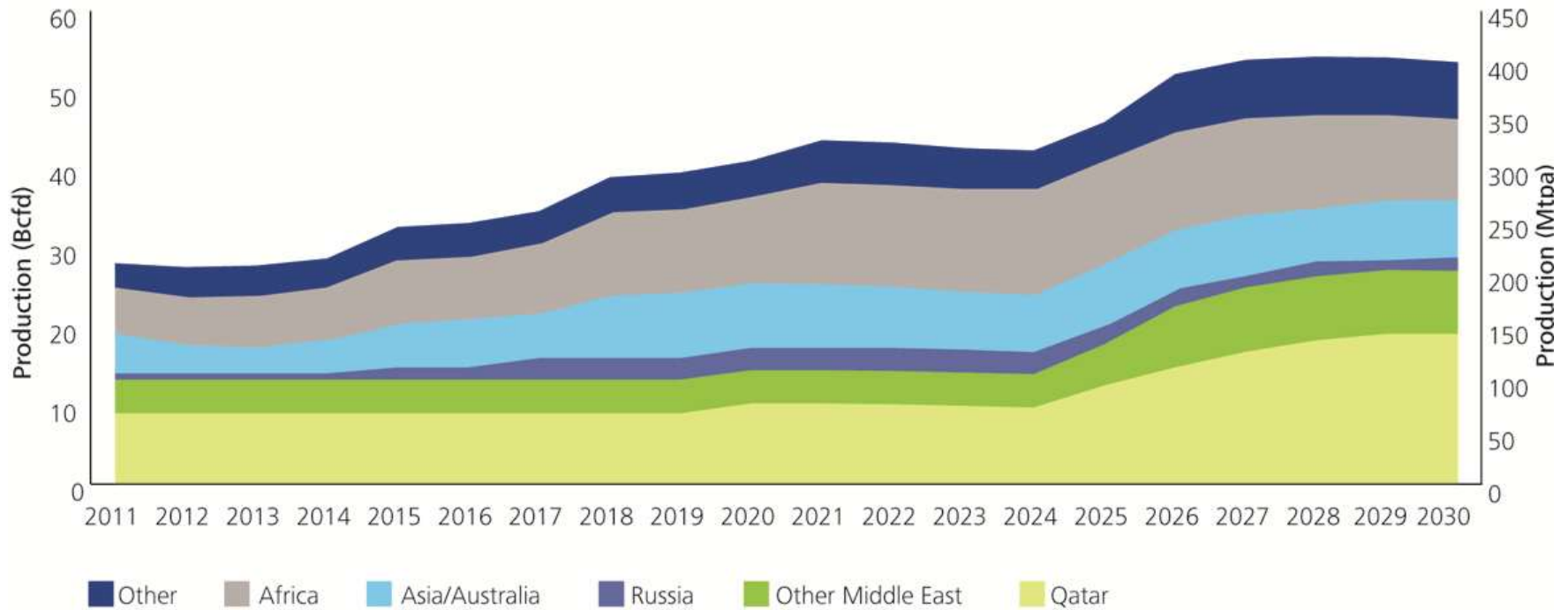
# U.S. LNG imports are projected to remain bleak for another decade before eventually rebounding.

Even in the long-term, LNG Import volumes are likely to be seasonal and remain well below total U.S. LNG import capacity (about 18 Bcfd).





# Global LNG supplies are projected to continue to grow as suppliers seek to monetize their assets



# Closing comments

- Convergence of natural gas, electricity, coal, and emissions requires an integrated approach to capture the market dynamics.
- Gas demand for power generation is projected to show significant increases this decade as gas becomes the fuel of choice.
- Shale gas is plentiful but likely to require higher than current Nymex futures prices to sustain the required level of production to meet expected demand.
- Increased shale gas production is projected to transform basis relationships.
- Large volume of domestic supplies could shield the U.S. from price impacts of demand changes.



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