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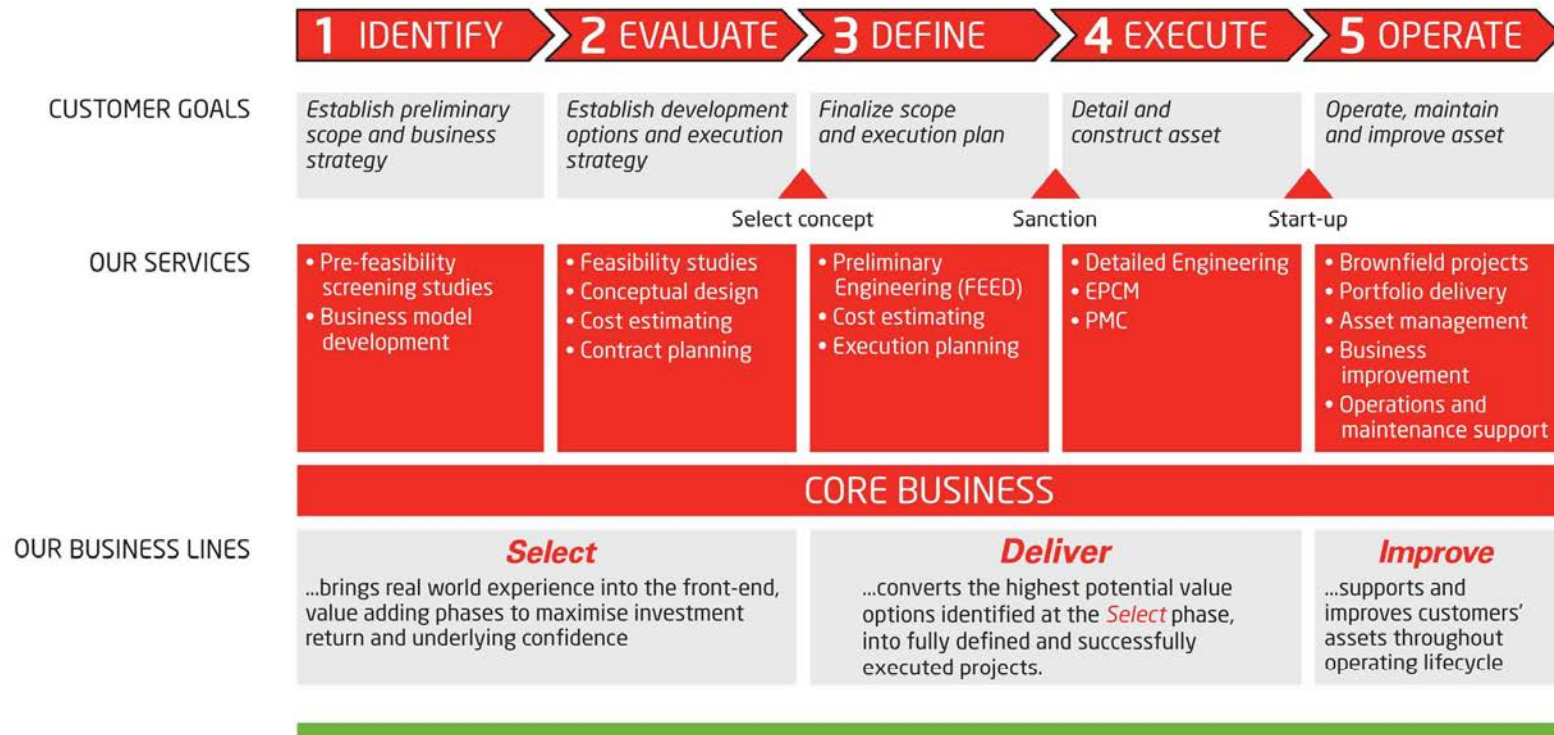
# The Impact of New Natural Gas on Energy & Environmental Decision Making CIBO Annual Meeting

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October 2013



# Project Delivery Diagram



Delivering profitable sustainability **EcoNomics**<sup>™</sup>

...profitably embeds environmental, social, and financial sustainability into project delivery across the asset lifecycle





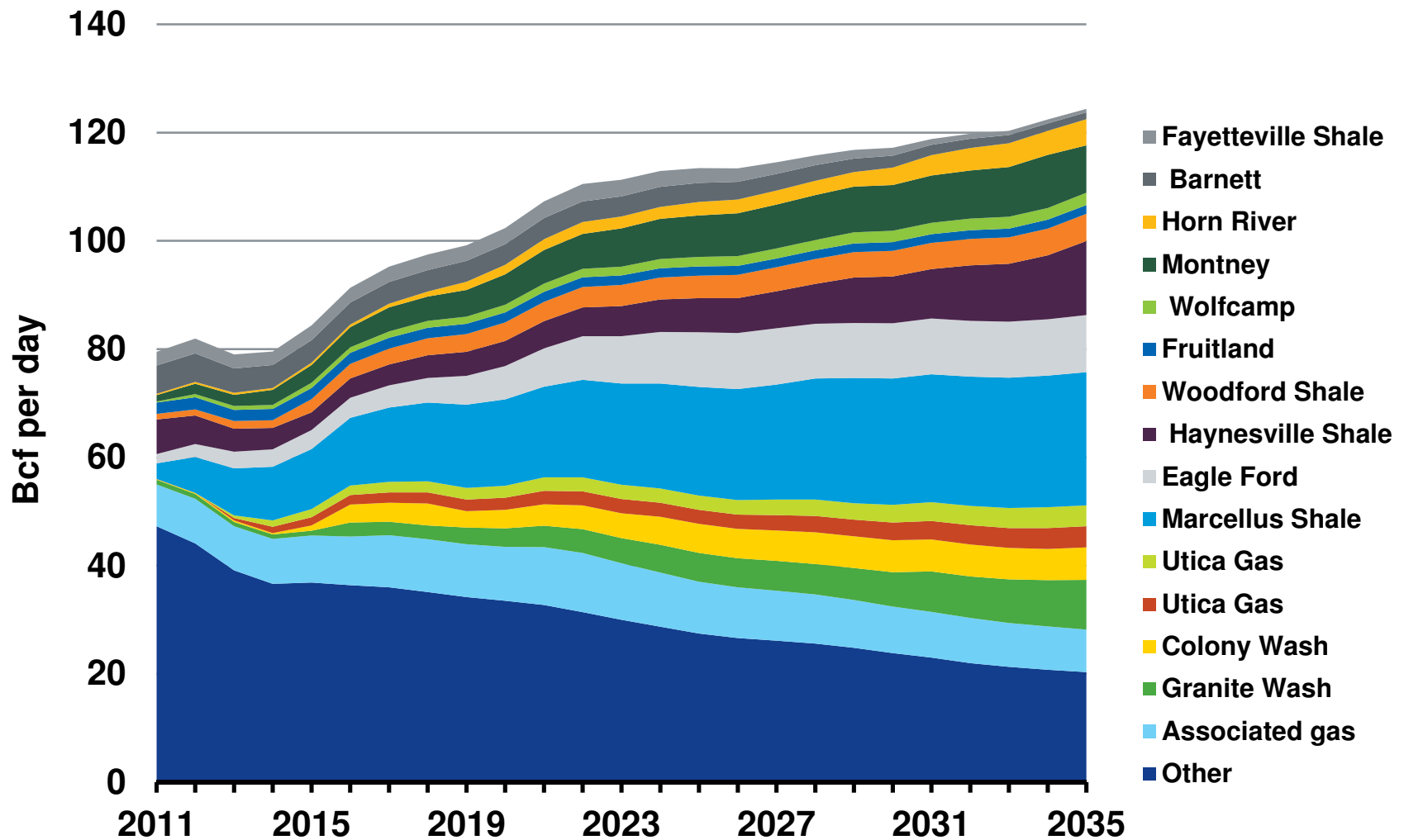
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What to do?  
Natural Gas CHP?  
“To burn or not to burn”

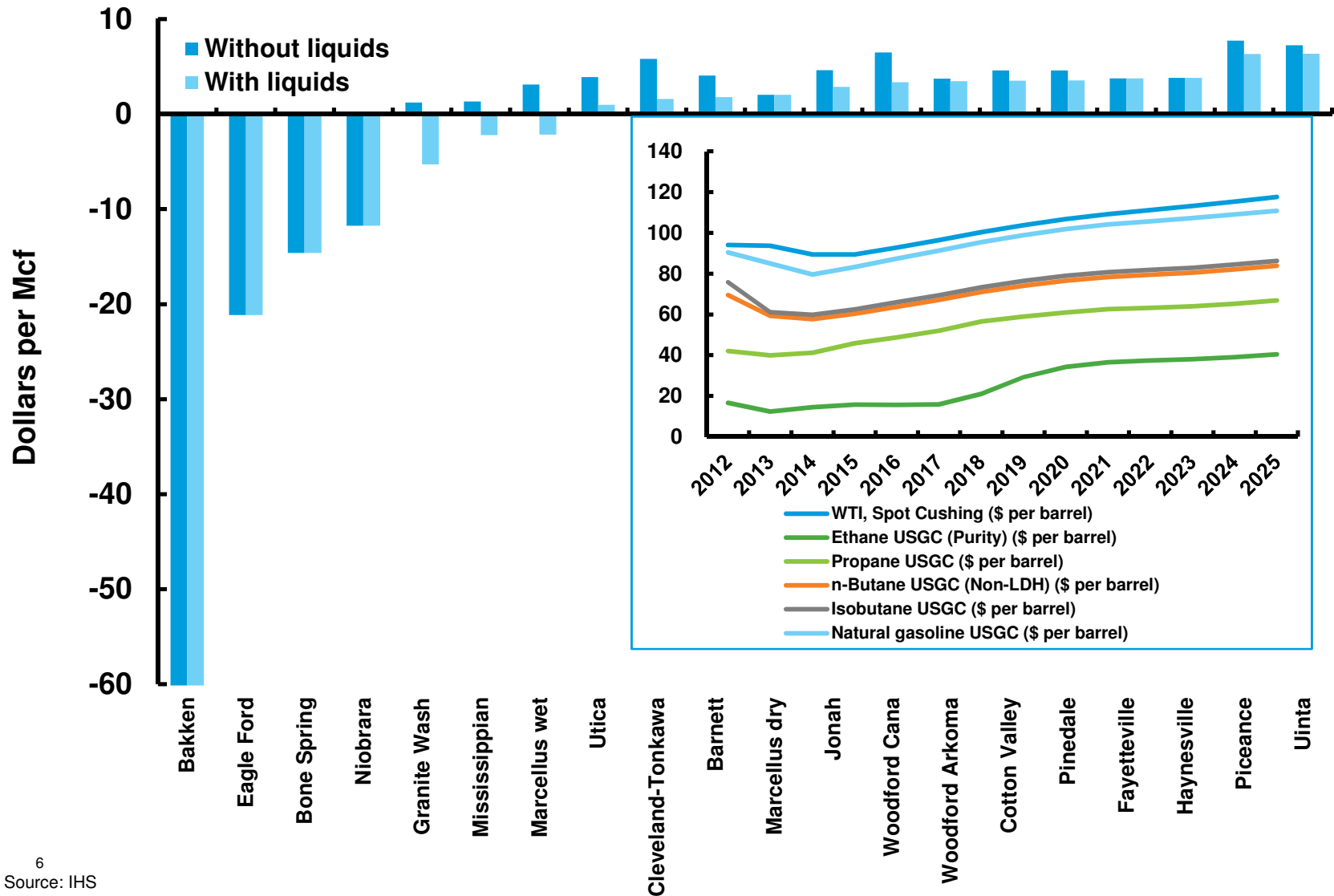


# Natural Gas Story - Supply

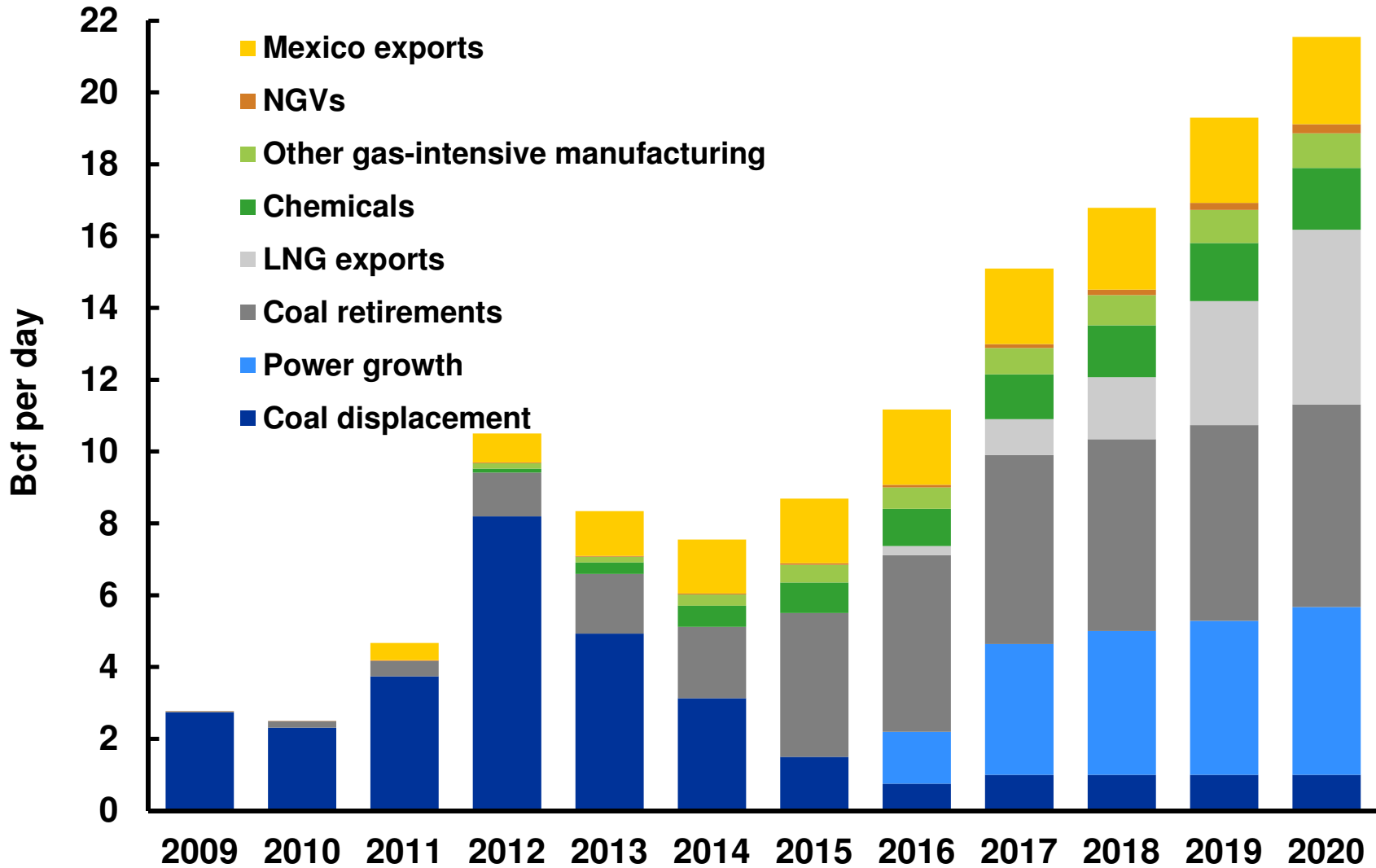


Source: IHS CERA

# Natural Gas Story - Breakeven

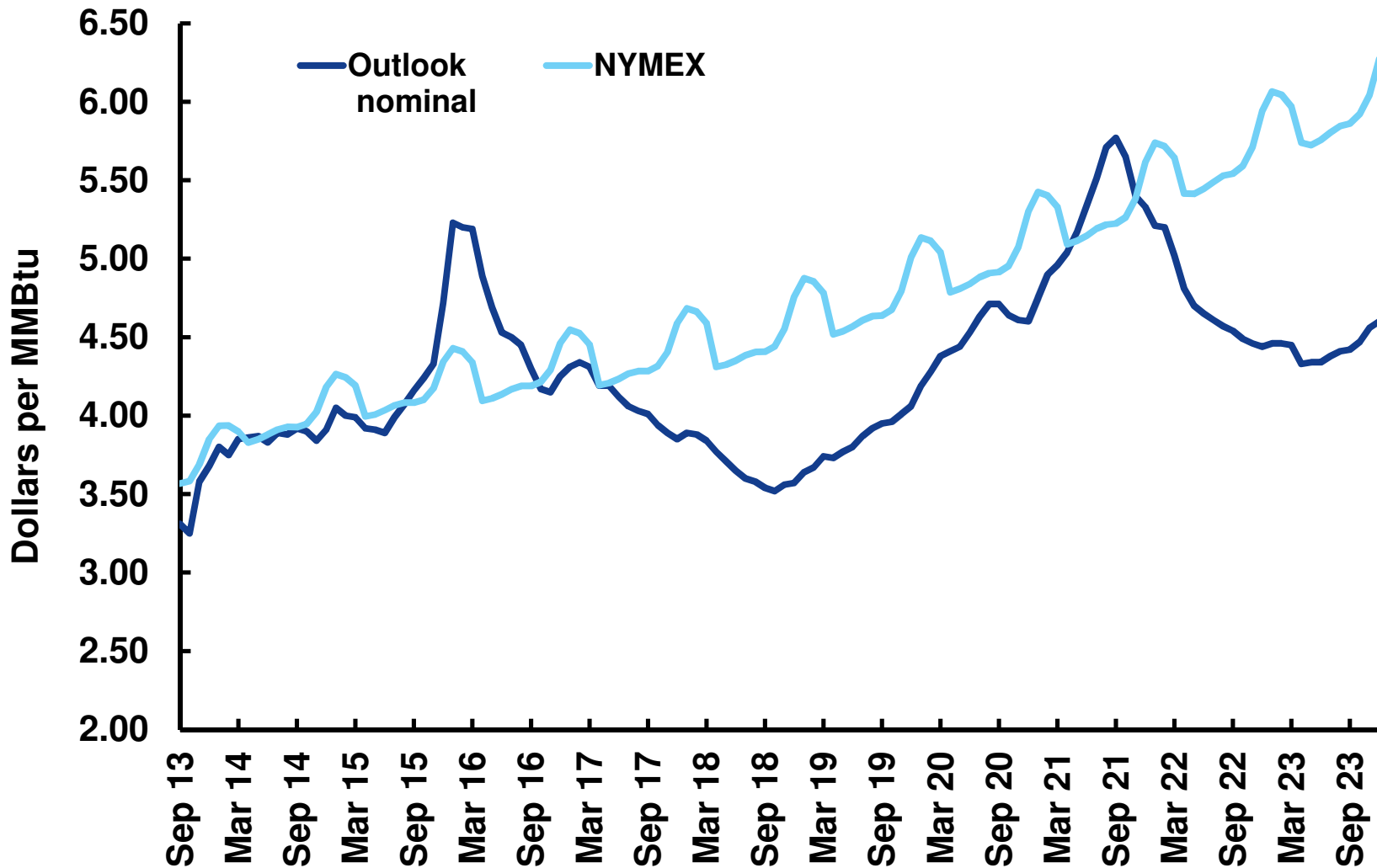


# Natural Gas Story - Demand



Source: IHS CERA

# Natural Gas Story - Pricing





# Balancing Multiple Objectives

- Minimize site total energy costs while meeting operational flexibility
  - Fuel supply
  - Power needs in electricity
  - Thermal needs
- Invest in continued coal fired plant with Air Quality Control System
  - Higher O&M costs over existing ops
  - Increased maintenance cost for existing equipment
  - Risk of escalating coal costs
  - Risks of future exposure to new regulations
- Invest in gas fired CHP Option
  - Lower O&M
  - Leverage CHP for producing electricity to supplement plant load or sell excess
  - Natural gas price risk exposure
  - Lower O&M costs through external electricity sales and improved plant profitability

# Developing Market – Additional Value

- Considerations with Existing Operations
  - Corporate sustainability compliance implementation plans alignment
  - Site expansion and increasing steam/electric demands
- Economic and Operational Benefits
  - Enabling System Resiliency in Energy Infrastructure
  - CHP during grid outages – “Island Mode”
    - Continued operations
    - Avoided shutdown costs
  - Hedge against rising electricity costs
  - Avoided costs of new regulations (coal, oil fired boilers)
- Environmental Benefits
  - Reduced GHGs emissions and other criteria air pollutants, hazardous air toxics, solid waste (coal, oil fired boilers), wastewater
  - Increased energy output per unit of fuel consumption with significantly improved energy conversion efficiency



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A photograph of an industrial plant, likely a power station, at sunset. The sky is a mix of orange and blue. Several tall smokestacks are visible, with some emitting white smoke. The plant's complex structure of pipes, walkways, and scaffolding is illuminated by warm lights. A large, semi-transparent blue rectangular box with a fine grid pattern is overlaid on the left side of the image, containing the text 'Sample Results' and 'CHP'.

# Sample Results

## CHP



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# Screening Analysis Results

## Total Project Costs (\$1,000)

\$42,210



ERROR: ioerror  
OFFENDING COMMAND: image  
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