



# Future Natural Gas Supplies, Demand and Pricing for the United States, Mexico, and Canada

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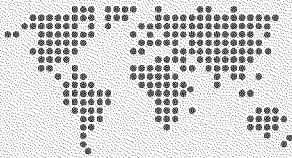
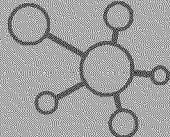
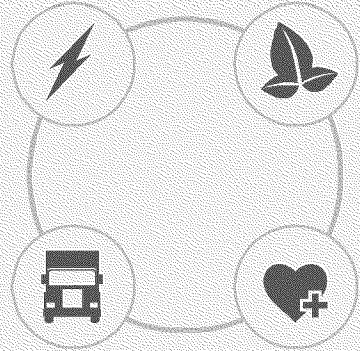


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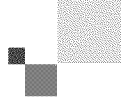
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 <p>GLOBAL PRESENCE 70+ offices</p>	 <p>diverse client base</p>	<p>energy environment</p> 	 <p>Best Global Environmental Consultancy in 5 of 6 categories. — Environmental Finance Magazine</p>
<p>Headquartered in the Washington, DC area</p>	 <p>"One of America's Best Small Companies." — Forbes 2005-2011</p>	<p>transportation health care</p> <p><b>World-class expertise</b></p>	





# Outlook for North American Markets

- **Market Overview, Highlighting Key Factors Driving Natural Gas Supply, Demand, and Pricing**
- **Uncertainties for Market Development**
- **Implications and Conclusions**

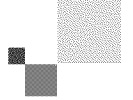




## Setting the Stage with Key Observations about Recent Market Trends

- North American natural gas has generally been in a “supply push” and not a “demand pull” environment during the past five years.
- Gas supply has been growing robustly as productivity continues to rise, despite lower drilling levels over the past 24 months.
- Warmer-than normal winters have also influenced (reduced) gas prices.
- Drivers are in place to shift the gas market into a “demand pull” environment. Future gas prices will be determined by the “tug of war” between demand growth and technology evolution for gas supply.

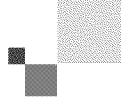




## Key Trends Projected in ICF's Base Case

- Natural gas prices will be modestly higher during the next decade, approaching \$4 per MMBtu at Henry Hub by 2025.
- But, gas price increases will be limited by relatively high price elasticity of U.S. supplies – Marcellus/Utica, Haynesville, and West Texas supplies are abundant.
- Even though prices will be up, gas will remain attractively priced for many consumers.
- LNG and Mexico exports are likely to rise significantly – LNG exports approach 10 Bcfd and Mexico exports rise to 6 Billion cubic feet per day (Bcfd) by 2025.
- U.S. and Canada's gas use for power is also up significantly; +9 Bcfd (35%) by 2025.
- Significant upside for gas exports if gas-fired power generation doesn't grow by as much as projected.



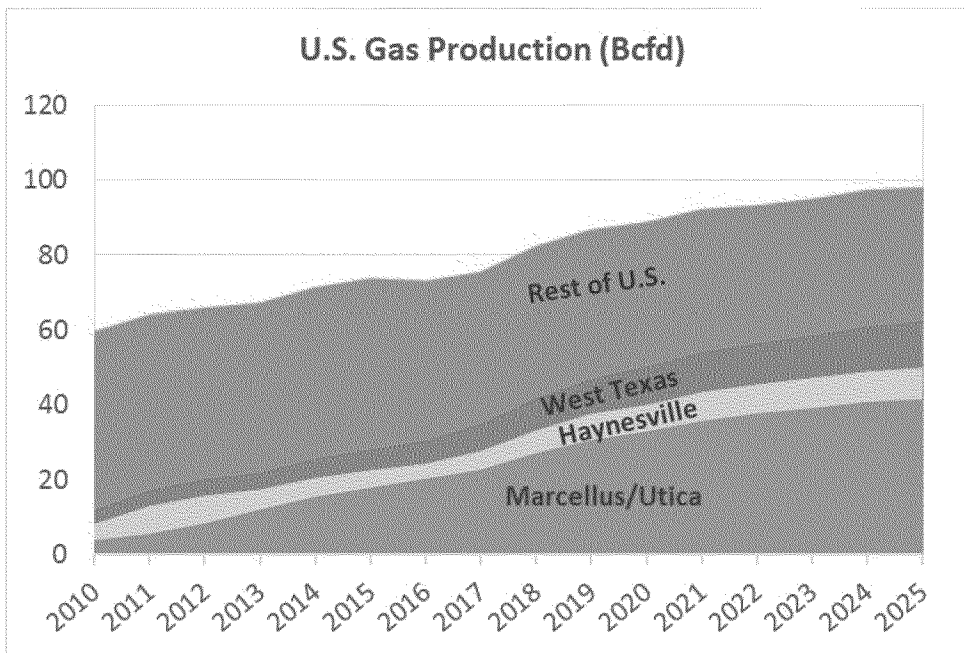


## Important Assumptions in ICF's Base Case

- Economic activity remains strong with 2.1 % growth in GDP annually.
- Oil prices rise, reaching \$75 per barrel by 2025.
- Global gas trade rebounds with healthy economic activity.
- Mexico's gas use rises as older oil-fired power plants are replaced by newer gas units.
- Technological improvements continue for gas supply development, increasing recovery factors.
- Electric load growth averages roughly 0.7% per year across the U.S. and Canada, consistent with recent ISO projections.
- National carbon reduction programs are implemented, with some states adopting more aggressive measures.
- Renewables growth occurs, meeting state standards.

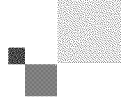


# ICF's Projection for U.S. Gas Supply – Robust Growth Likely to Continue but Concentrated in a Few Areas

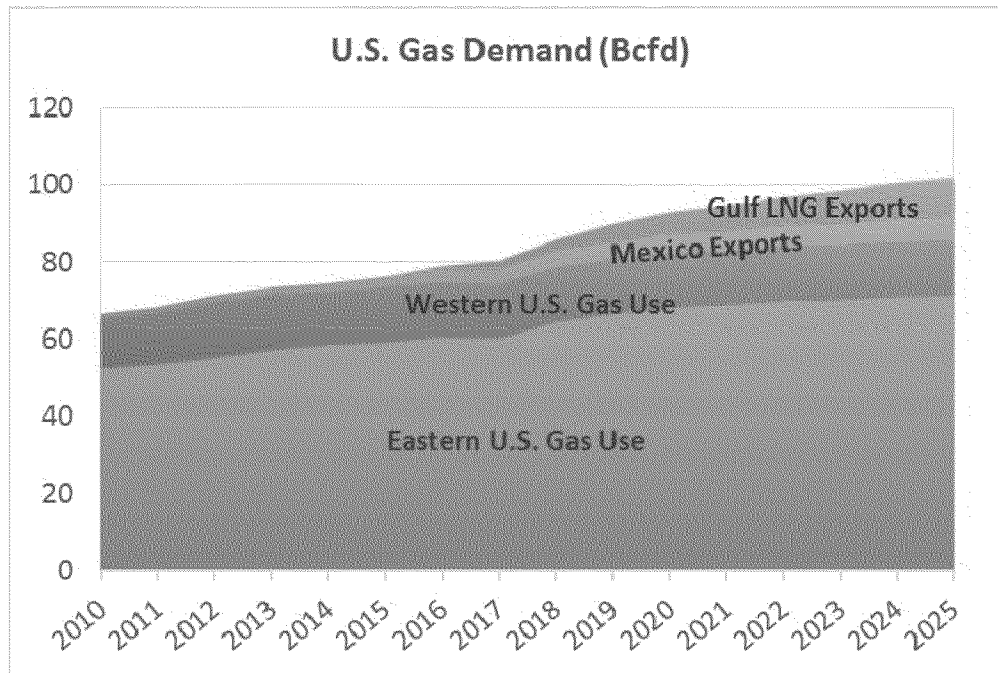


- Total gas production approaches 98 Bcfd by 2025.
- Marcellus/Utica's production up to 42 Bcfd – continuing to be the largest gas play in North America.
- West Texas approaches 13 Bcfd – diverse production area with upside potential.
- A resurging Haynesville rises to over 8 Bcfd.
- Rest of U.S. down by 3 Bcfd.





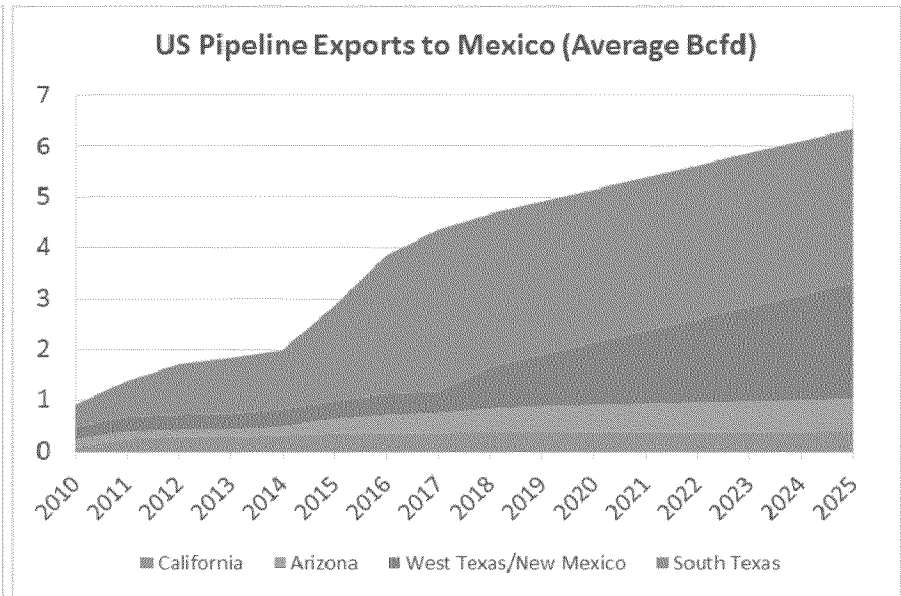
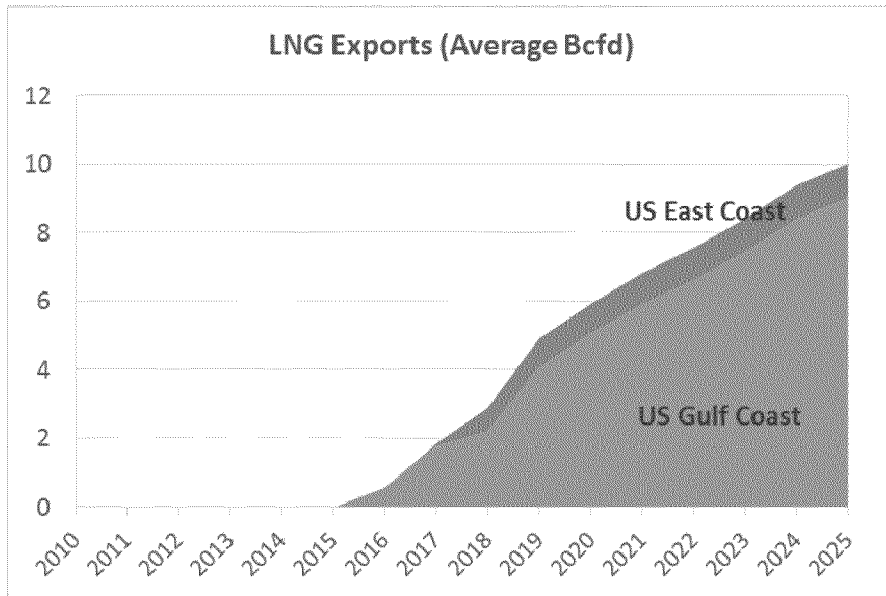
# ICF's Projection for U.S. Gas Use – Growth Will Come from “New Markets”



- Gas use rises for LNG exports, exports to Mexico, and power generation.
- Growth will be concentrated in the Eastern U.S., particularly along the Gulf Coast.
- LNG Exports off of the Gulf Coast lead the way – up to over 9 Bcfd by 2025.
  - “Second Wave” of LNG expansions possible around 2025.
- Mexico exports have significant upside, mostly from West Texas.
- Gas-fired power generation is a significant driver of Eastern U.S. growth.



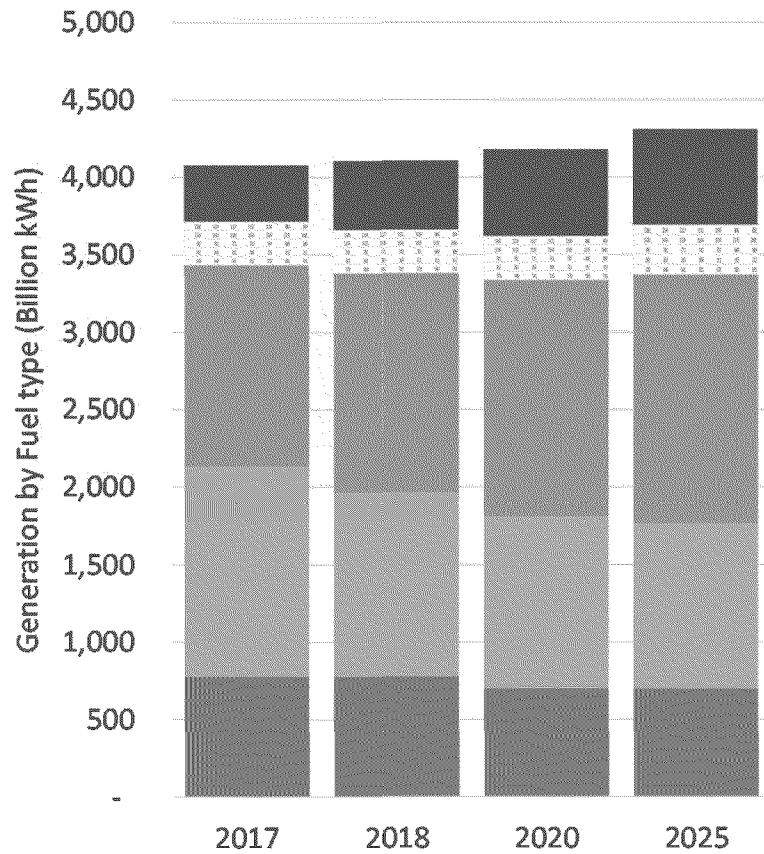
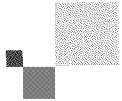
# LNG and Mexico Exports are a Big Portion of the “New Market” Growth



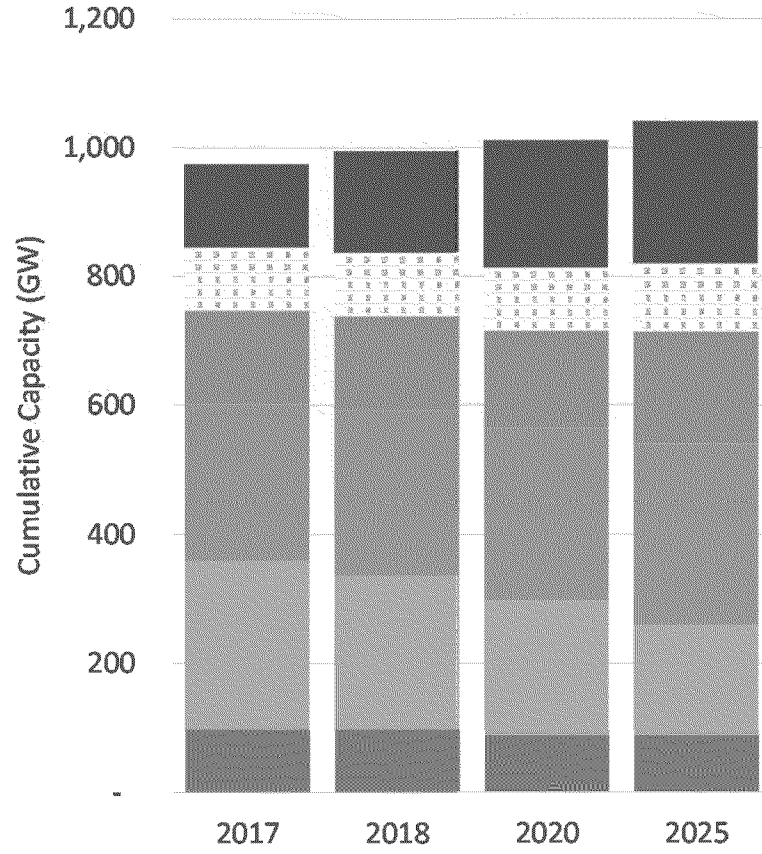
Significant UPSIDE for LNG and Mexico Exports



# US Generation and Capacity Mix – Coal and Nuclear Down; Gas and Renewables Up

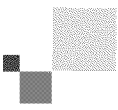


- Nuclear
- Natural Gas
- Non-Hydro Renewables
- Coal
- Hydro

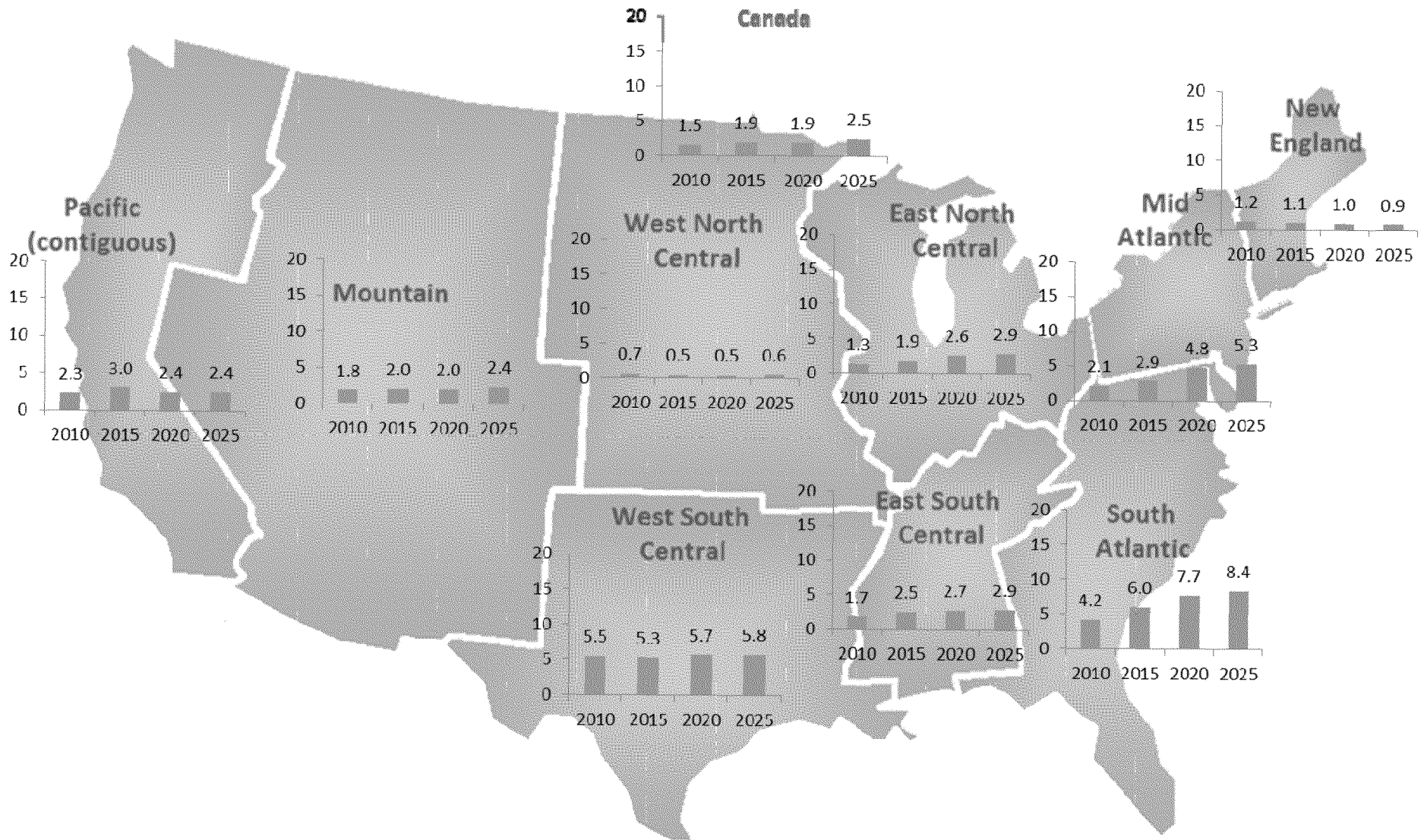


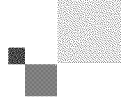
- Nuclear
- Coal
- Combined Cycle
- Hydro
- Combustion Turbine
- Non-Hydro Renewables





# Regional Gas Use for Power Generation (Bcfd)



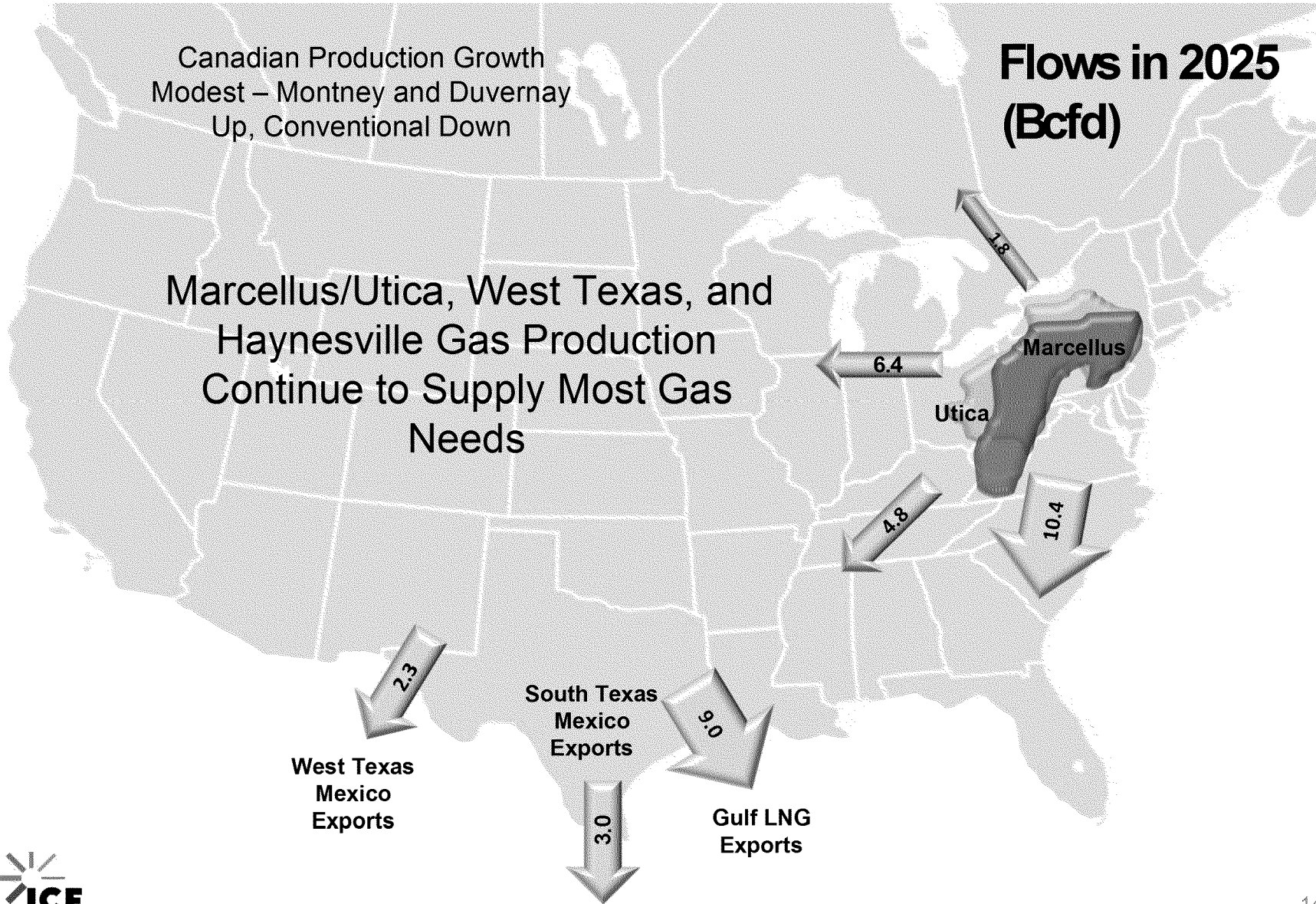
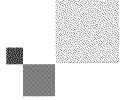


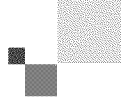
# Overview of Gas Infrastructure (Pipeline) Development

- For API's study entitled *U.S. Oil and Gas Infrastructure Investment through 2035: An Engine for Economic Growth*, ICF projected that almost 50 Bcfd of new gas pipeline capacity would be added from 2017 through 2025, at a cost ranging from \$100 to \$150 billion.
- Pipeline development will be widespread to facilitate transport of gas from areas where supply is growing to budding markets.
- Hot spots for new capacity include:
  - Marcellus/Utica
  - West Texas
  - Haynesville
- Continued buildout of pipelines out of the Marcellus/Utica is very important because it limits gas price increases across the continent.



# Pipeline Transport Shifting Significantly, with Northeast to Southwest Trend



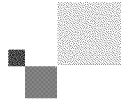


# Pipeline Development Projected to be Robust During the Next Few Years

Area	Total Capacity (Bcfd)	Some Major Projects
Northeast U.S	10.7	Leach Xpress, Rover Pipeline Phase 1, PenneastPipeline, Atlantic Sunrise, Dominion Supplu Header, Atlantic Bridge, Rover
Canada	2.8	Dawn to Parkway 2017-Bright Compression, TCPL Vaughan PipelineLoop, Towerbirch Expansion Spruce Ridge Project
Gulf Coast	1.8	Impulsora Crossing, Nueces-Brownsville, Gulf Connector, Stratton Ridge, Lone Star, Hillabee Pipeline
West Texas	5.8	Gulf Coast Express, Pecos Trail Pipeline, Permian to Katy Pipeline
To Mexico	3.7	Impulsora Crossing Project, Nueces-Brownsville
Rockies West	0.0	N/A

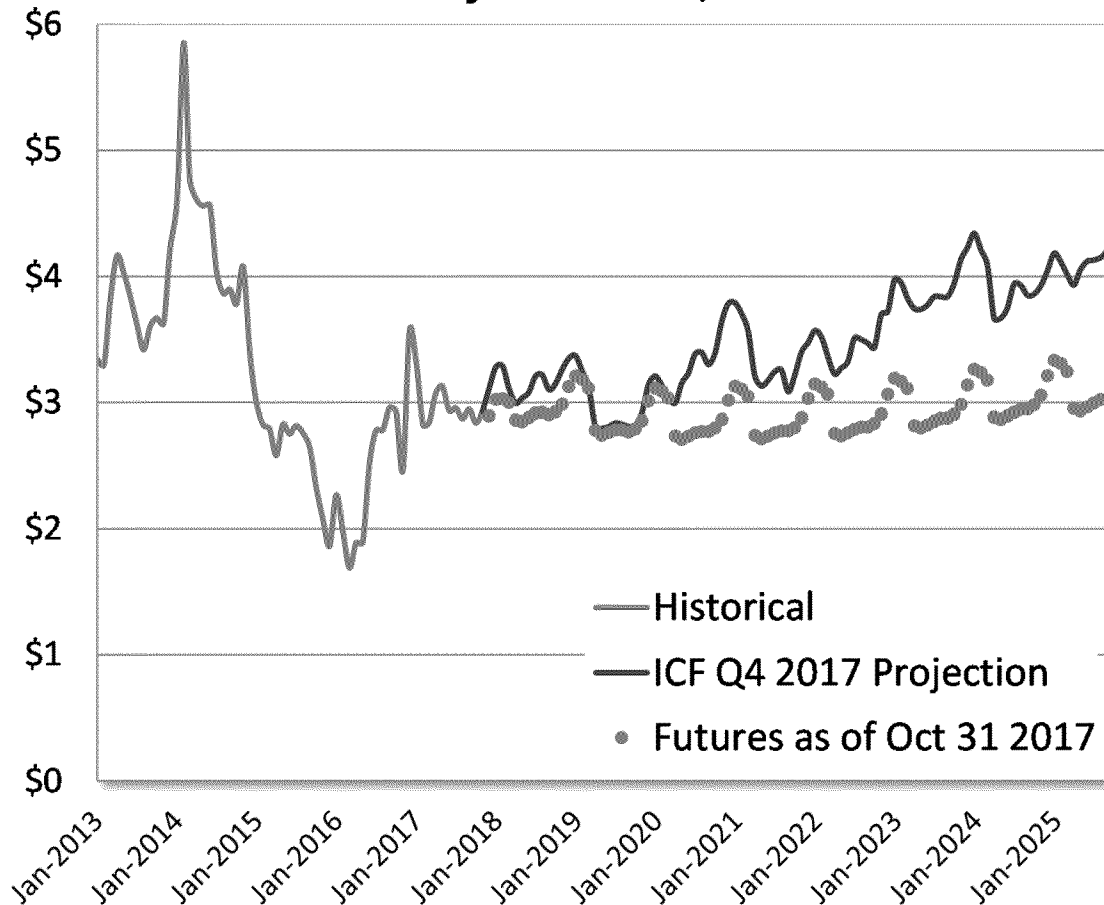
- Roughly 25 Bcfd of new pipeline capacity will be placed into service with the completion of major projects during the next few years.
  - This tally does not include smaller localized projects.
- New capacity is needed to facilitate market growth.





# Gas Prices Projected to Trade Between \$3 and \$4 at Henry Hub

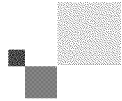
Near-term Henry Hub Price, Nominal \$/MMBtu



Source for Historical and Futures Prices: ABB, Ventyx

- Difference between the futures strip and ICF's fundamentals view is likely due to level of market growth.
- Nevertheless, gas will continue to be priced attractively for most consumers.

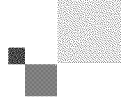




## Many Supply Areas Will Trade Below Henry Hub – Few Markets Trade Higher

Average Price Difference (i.e., Basis) Versus Henry Hub (Nominal \$/MMBtu)	Past 24 Months	Next 12 Months	Following 48 Months
Marcellus and Utica (Dominion South Point)	(\$0.88)	(\$0.86)	(\$0.98)
Algonquin Citygates (New England)	\$0.49	\$0.87	\$1.07
Haynesville Supply (Carthage Hub)	(\$0.08)	(\$0.06)	(\$0.06)
Chicago Citygates	(\$0.03)	(\$0.03)	(\$0.01)
MidContinent Supply (OK)	(\$0.27)	(\$0.34)	(\$0.19)
Houston Ship Channel	(\$0.01)	(\$0.04)	(\$0.03)
Opal	(\$0.20)	(\$0.33)	(\$0.22)
AECO	(\$0.92)	(\$0.65)	(\$0.54)
SoCal	\$0.13	(\$0.11)	(\$0.00)
West Texas	(\$0.20)	(\$0.33)	(\$0.21)
South Texas	\$0.00	(\$0.08)	(\$0.08)

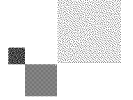




## Summarizing Gas Prices

- Projected prices are likely to rise above levels observed during the past few years due to robust market growth.
- However, relatively high price elasticity for gas supply will limit price increases.
  - Continued improvement of well productivity is an important factor to watch.
- Henry Hub will trade at a premium, and gas prices at many other locations will be much lower.
  - Henry Hub can no longer be thought of as “the representative price for North American natural gas”.





# Major Uncertainties for Market Development and Gas Prices

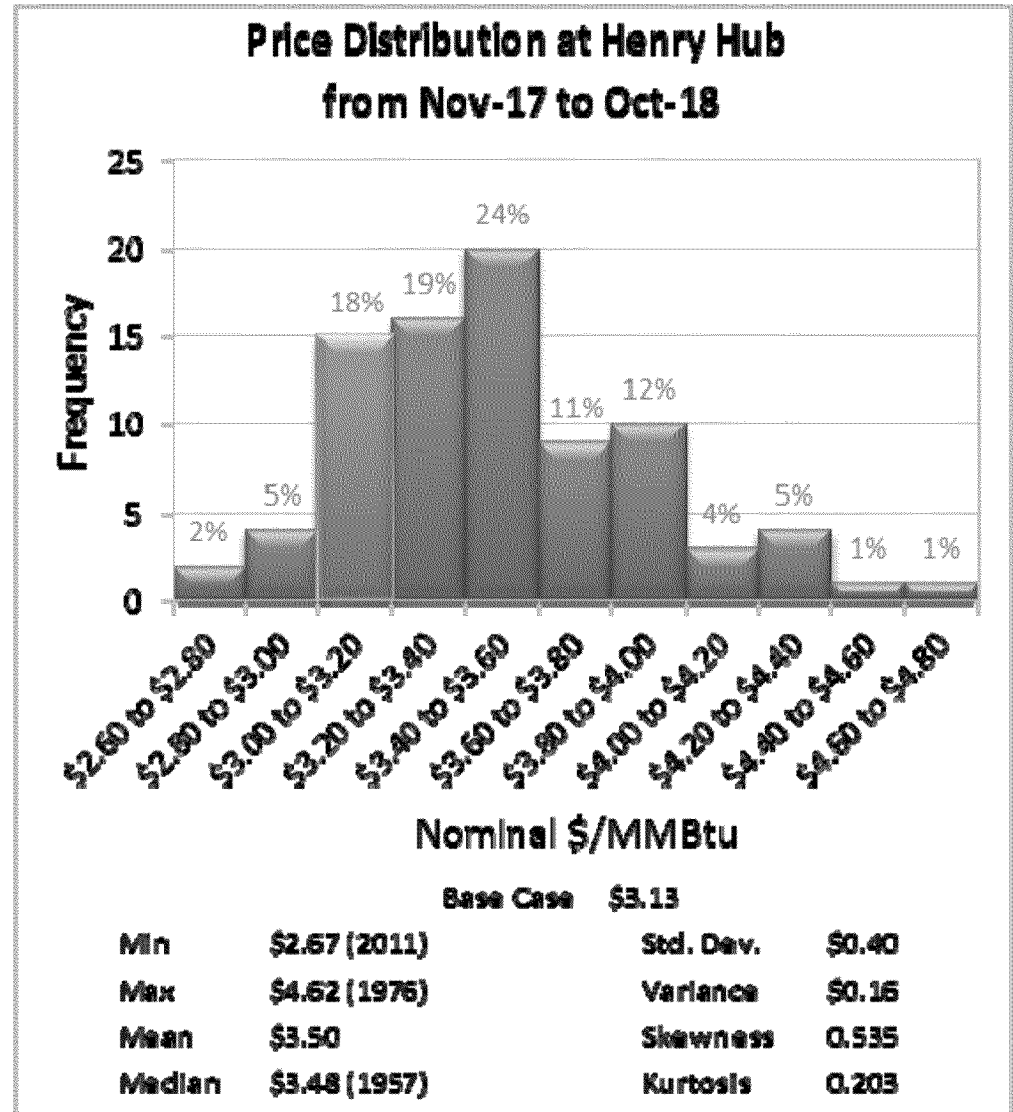
- Amount and Timing of Supply Development
- Pipeline Infrastructure Development
- Global Market Conditions – LNG Overhang and Oil Prices
- Regulatory Changes and Policies (e.g., resiliency NOPR)
- Weather

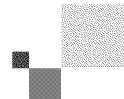


# Example Sensitivity Analysis

## (Potential Impact of Weather on Next Year's Gas Prices)

- Gas prices can range from \$2.60 to \$4.80 over the next year, solely due to weather.



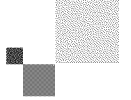


## Implications and Conclusions

- Market growth likely to be significant. Market transitioning from “supply push” to “demand pull” environment.
- Gas prices up gradually during the next decade – after all, gas is a commodity and “price cycling” is typical.
- Price increases limited by relatively high price elasticity for gas supply, with productivity increases affecting price levels.
- Continued development of pipeline infrastructure is imperative for supply development and market growth.
- Still much uncertainty for gas markets, with regulatory changes difficult to predict.



# Questions & Contact Information



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