Supply and Demand in an Uncertain Environment

U.S. and Canada Gas Market Overview
Based on the ICF GMM Reference Case
October 2008

Contact:
Kevin R. Petak
Vice President, Gas Market Modeling
ICF International
703-218-2753
kpetak@icfi.com

Disclaimer

This presentation presents the views of ICF International. The presentation includes forward-looking statements and projections. ICF has made every reasonable effort to ensure that the information and assumptions on which these statements and projections are based are current, reasonable, and complete. However, a variety of factors could cause actual market results to differ materially from the projections, anticipated results or other expectations expressed in this presentation.

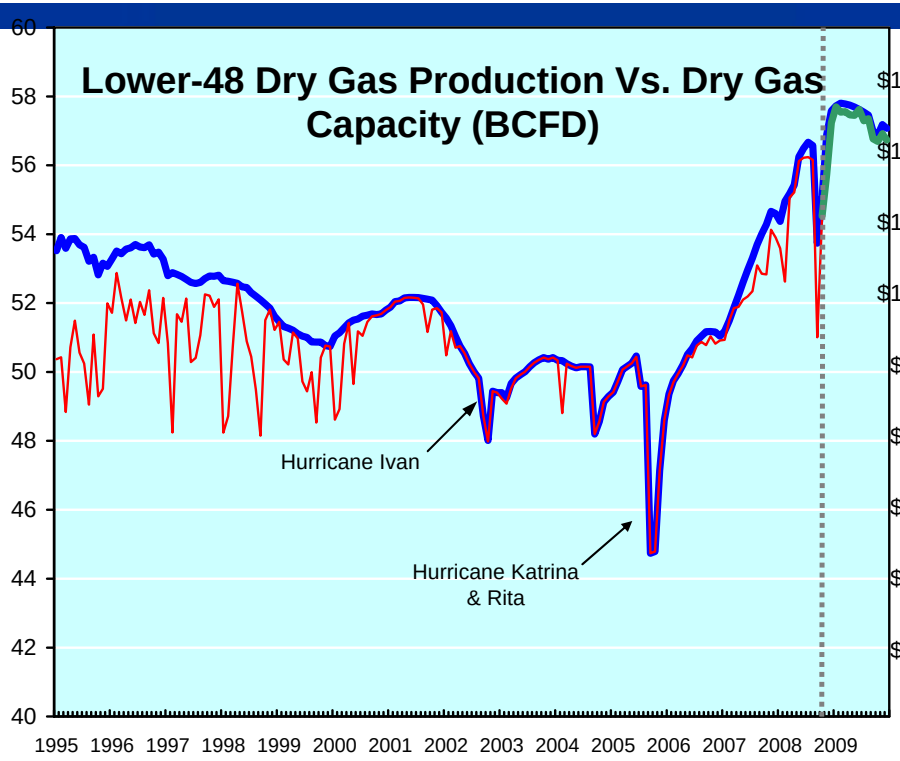
The information in this presentation is proprietary and confidential. It should not be distributed to third parties.

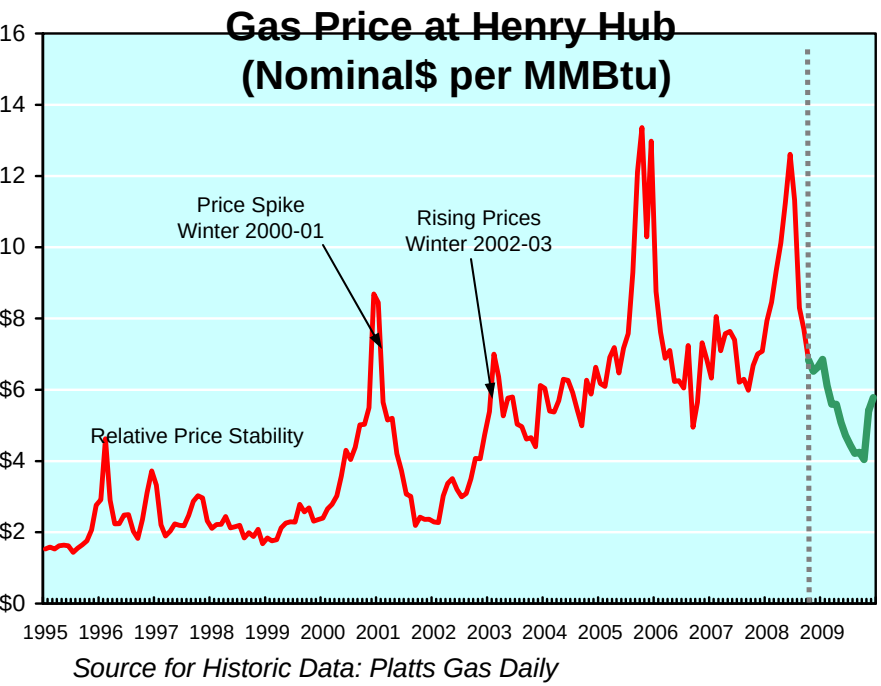
Contents

- Brief Review of Recent Market Conditions
- Have Recent Market Events Changed Our Views?
- Long-Term Outlook for U.S and Canada Gas Market
  - GDP and Oil Price Assumptions
  - Gas Demand
  - Gas Supply
  - Gas Price
  - Price Volatility
  - Key Findings

Note: Unless otherwise referenced, all conclusions and results are based on ICF's gas market fundamentals analysis.

The Natural Gas Balance

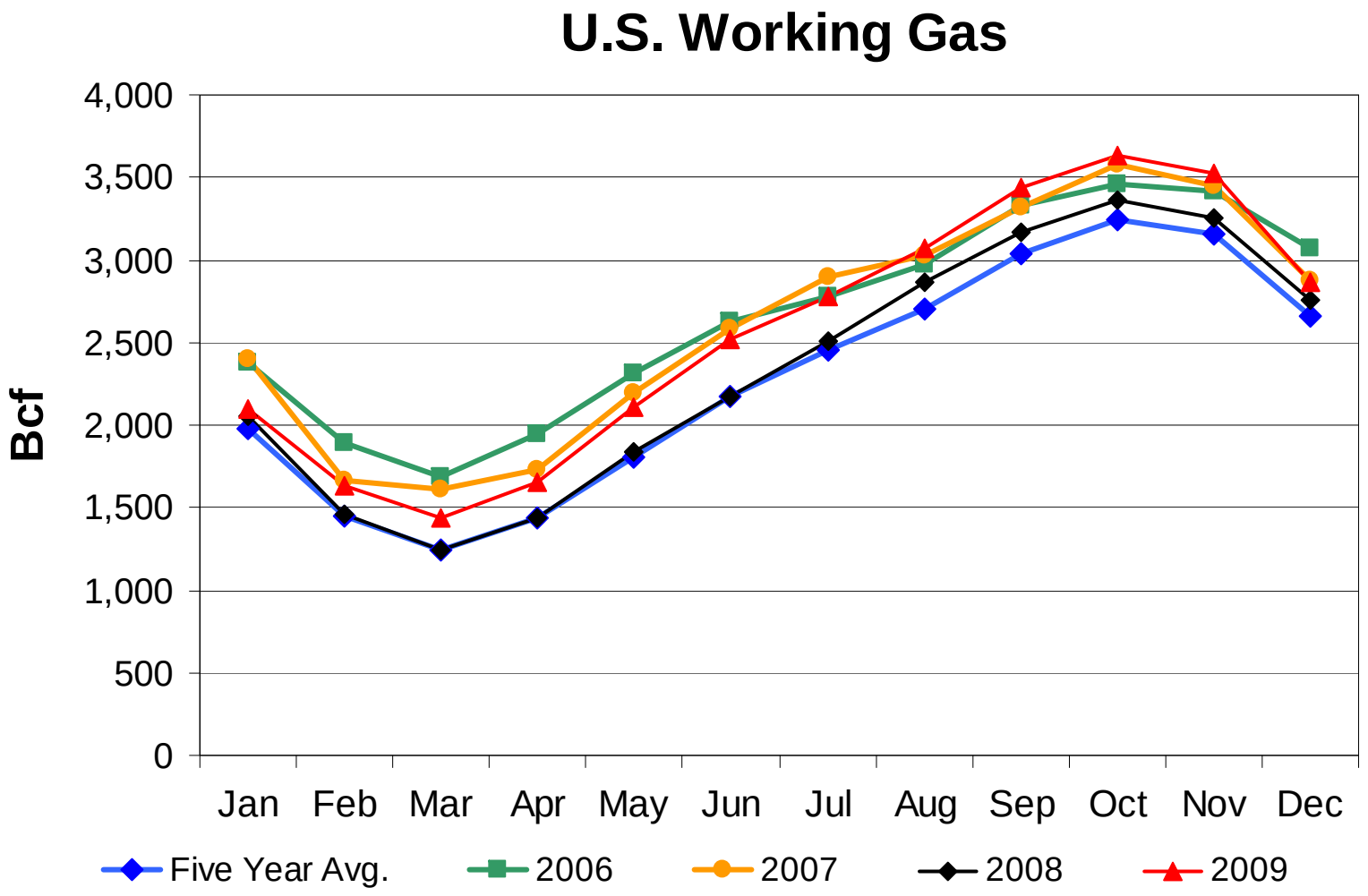




Source for Historic Data: Platts Gas Daily

The recent downturn in the economy will lead to a relatively looser balance between supply and demand over the next year.

Recent Gas Storage Trends



U.S. Gas Supply / Demand Balance

(Billion Cubic Feet per day)

	Injection Season 2007	Injection Season 2008 /1	Winter 2007-08	Winter 2008-09 /1
Gas Demand	63.3	63.7	78.0	77.8
R/C/I Gas Use	30.2	29.9	57.6	57.5
Power Gas Use	18.2	17.9	14.5	14.2
Other Gas Use	5.5	5.7	5.9	6.1
Net Injections	9.4	10.1	NA	NA
Gas Supply	63.9	64.6	78.9	78.5
US Production	53.8	56.4	55.3	58.6
Net Imports	10.1	8.2	8.0	6.9
Net Withdrawals	NA	NA	15.6	13.0
Balancing Item (S-D)	0.6	0.9	0.9	0.7

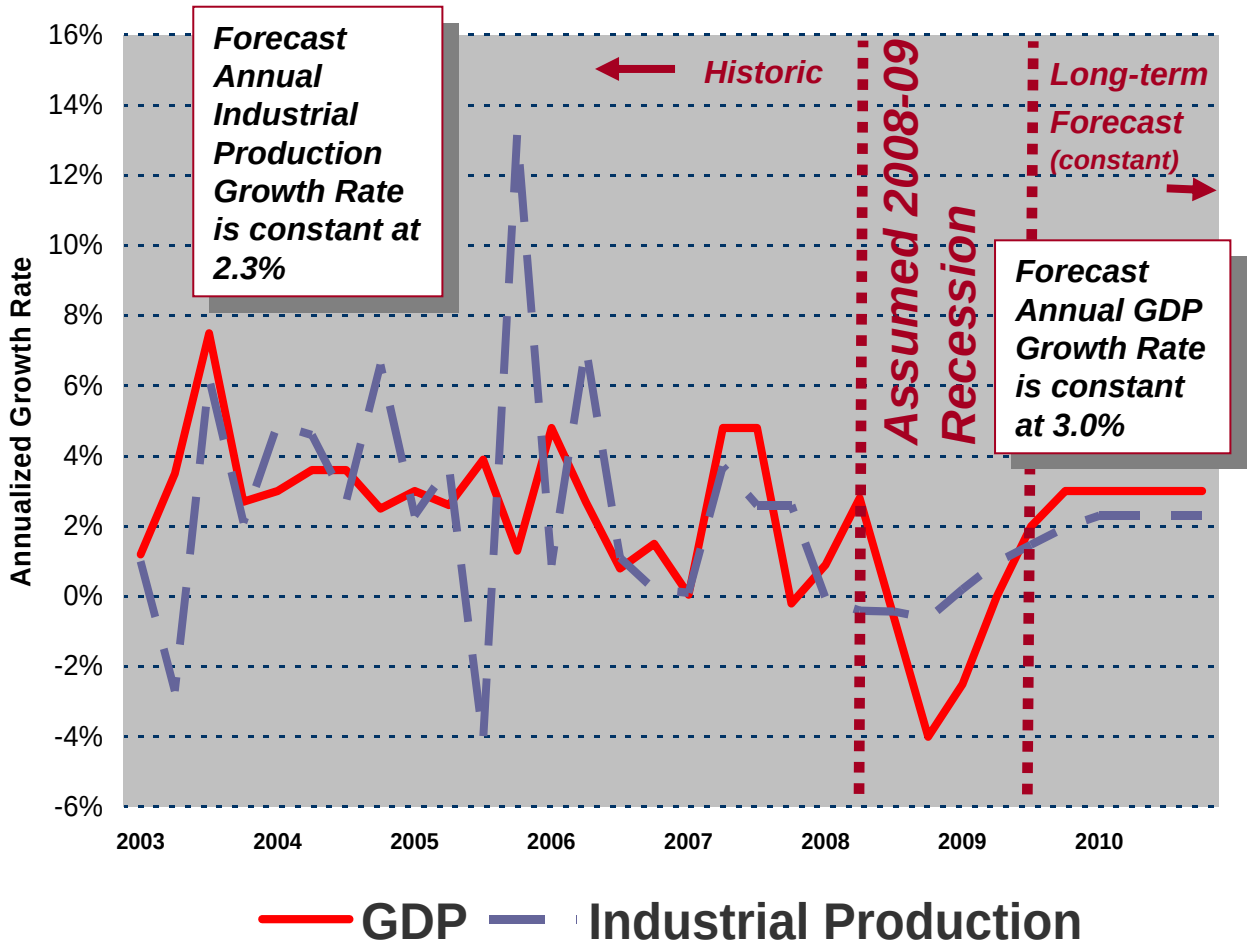
1. Projected results assume normal weather, and no significant hurricane disruptions of gas production.

Have Recent Market Events Changed Our Views?

- No, recent events have bolstered our views!
  - Recent price volatility demonstrates that a tight supply/demand balance has been in place.
  - While the economic downturn and new gas supplies such as shale gas will likely loosen the balance in the near-term, resumed demand growth, especially in the power sector, will lead to a tighter balance in the long-term.
- In the long run, new supplies will be needed to meet demand growth.

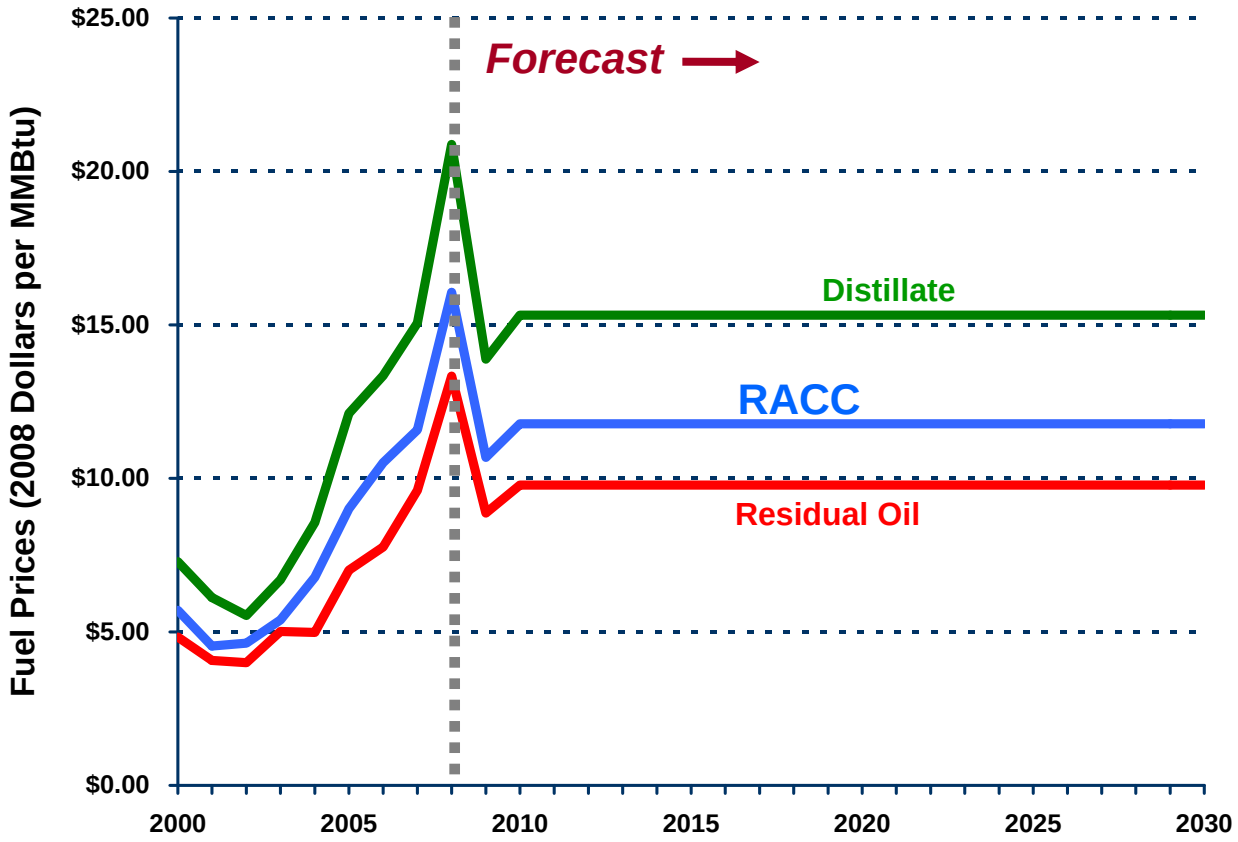
U.S. Gross Domestic Product (GDP) and U.S. Industrial Production

- U.S. GDP growth drives electricity demand growth and (to a lesser extent) residential and commercial gas demand growth.
- U.S. industrial production growth drives industrial gas demand growth.
- Actual GDP is applied through Q2 2008 and actual industrial production is applied through Q2 2008.
- From Q3 2008 through Q3 2009 a recession is assumed.
  - Average GDP growth for the period is -1.0%.
  - The recession bottoms out at -4.0% annualized GDP growth in Q4 2008.
- After Q3 2009, the GDP growth rate is held constant at 3.0%.
- Forecast industrial production growth rate is constant at 2.3% after 2009.



Oil Prices

- Oil prices affect gas-to-oil switching in the industrial and power generation sectors.
- Refiners' Acquisition Cost of Crude (RACC) equates to about 90% of the WTI price.
- Long-term residual and distillate fuel prices are based on recent historic relationships to the RACC price in $/MMBtu; 0.83 of RACC for residual oil, and 1.3 of RACC for distillate oil.



The oil price projection through September 2010 is consistent with October futures prices. After September 2010, we trend toward our long-run RACC price of $71/bbl ($11.78 per MMbtu).

ICF INTERNATIONAL

Important Demand Assumptions in Our Projection

- In the long-run, U.S. and Canada economic activity continues at levels consistent with levels observed during the past 20 years.
  - **A recession is assumed for 2008 and 2009.** We assume U.S. GDP growth averages -0.3% in 2008 and +0.6% in 2009, with proportional changes in U.S. industrial production and Canadian GDP.
  - The economy bounces back in Q4 2009 to 3.0% growth, which continues throughout the rest of the projection.
- Carbon policy is enacted.
  - Assumed policy is somewhat less stringent than the current version of Lieberman-Warner.
- Adoption of DSM programs and conservation and efficiency trends continue, consistent with recent history.
  - No assumed policies that create additional DSM, conservation, and efficiency beyond those currently in place.

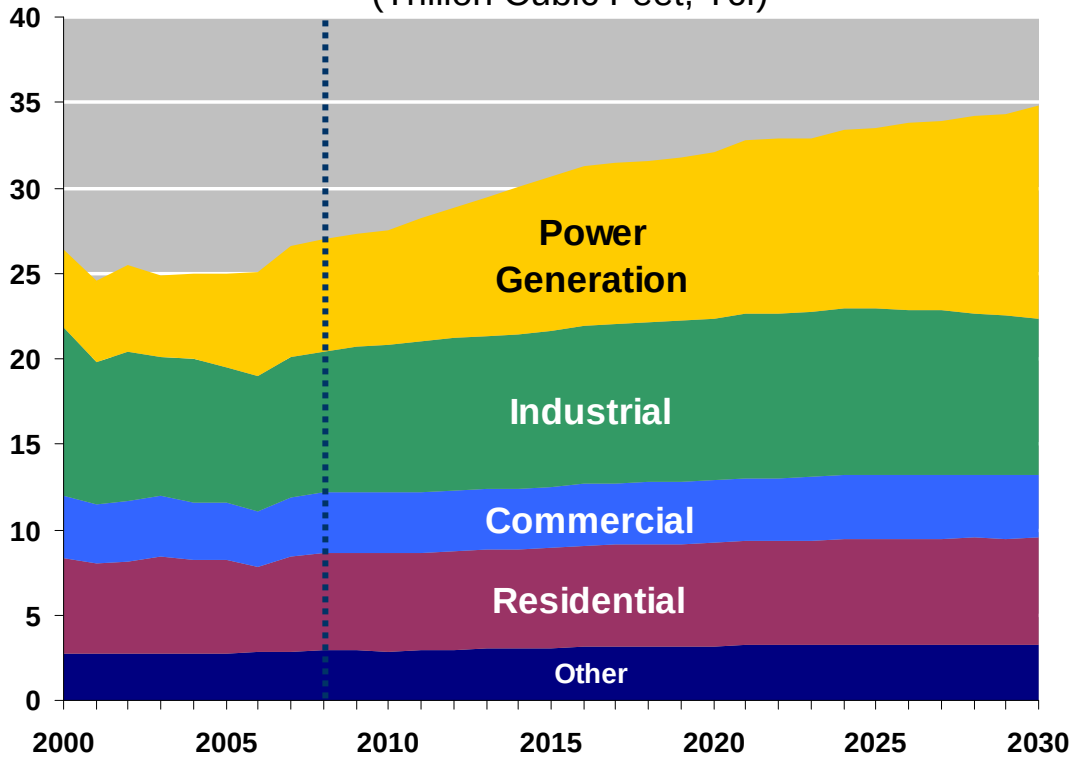
Gas Demand Outlook

The North American gas market may be best characterized as a "demand leads supply market" for the foreseeable future.

- The recent economic downturn will delay growth for a year or two.
- Gas consumption in the power sector will grow substantially.
  - Over 200 GW's of new gas-based generating capacity in the U.S. will be used to satisfy increasing electric load.
- Other sectors grow as a result of growth in input factors (i.e., GDP, disposable income, population, and industrial activity).
- When necessary, price-induced demand reductions will balance the market.

U.S. & Canada Gas Consumption

(Trillion Cubic Feet, Tcf)



	Delta 2007-2015	Delta 2007-2030
Power Generation	2.5	5.9
Industrial	0.9	1.0
Commercial	0.1	0.2
Residential	0.3	0.7
Other	0.2	0.4
Total	4.0 Tcf	8.2 Tcf

What Drives Growth in Gas-Fired Power Generation?

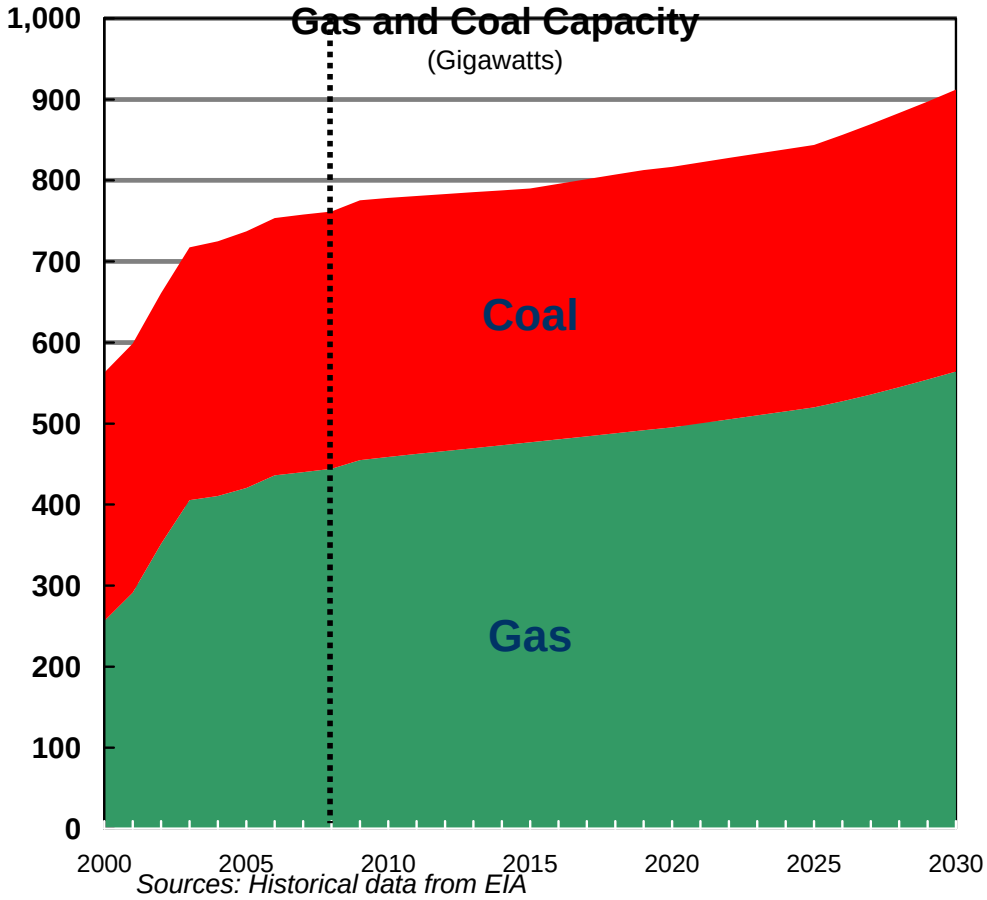
- Since 1997, over 200 Gigawatts of new gas-based capacity has been constructed.
  - Gas-fired plants have continued to be favored due to relatively low capital costs and pollutant emissions.
- Gas is an important bridge fuel for carbon policy.
  - Increased generation from existing coal plants is limited.
  - Carbon policy limits the growth in coal capacity during the next 10 years.
  - Coal with carbon sequestration is a viable option, but widespread commercial deployment is many years away.
- Generation from renewables grows at a rapid pace, but from a relatively small base.
  - This is mostly driven by state RPS specifications. The development is further enhanced by carbon policy.
- Significant growth in nuclear generation not expected until after 2020, and even uncertain then.
- No significant changes in hydroelectric capacity or generation.

The majority of the incremental growth in electricity demand during the next 15 years will likely be met by gas-fired generation.

Current Status of U.S. Carbon Policy

- The U.S. debate on regulation of greenhouse gases (GHGs) has changed from “if” or “when” to “how” and “how much”.
- States are implementing programs now.
- Federal legislation is not likely to pass until sometime in 2010, and the program details will continue to be hammered out.
  - The severity of the economic downturn will affect timing.
- GHG regulation will create direct compliance obligations and potentially large changes in power and gas markets.
- ICF’s expectation is that GHG regulation will increase gas demand, at least during the next 15 years.

U.S. Coal and Gas-Fired Capacity



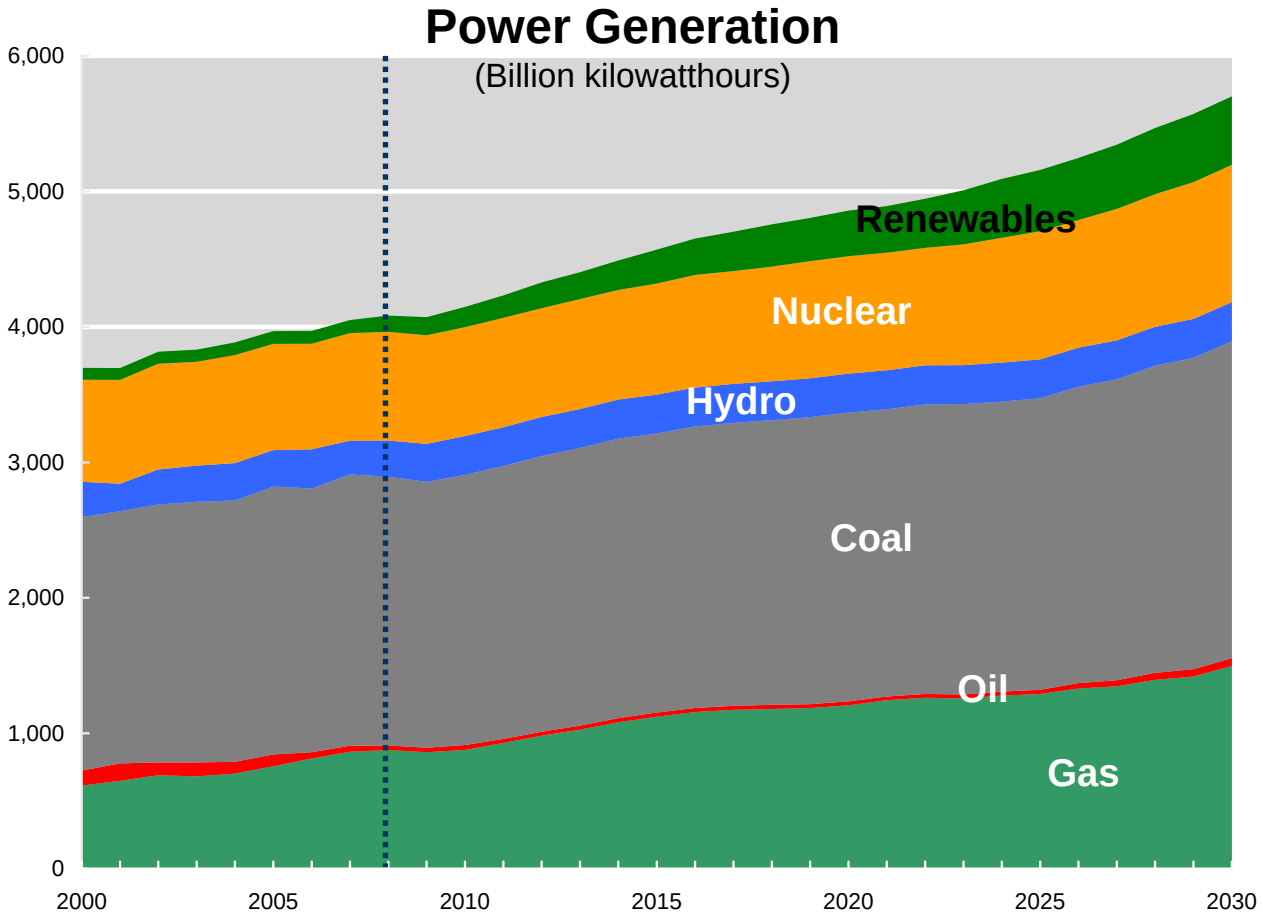
Sources: Historical data from EIA

- Over 200 GW of new gas-fired combined cycle and combustion turbine capacity has been added since 1997.
- The expansion pace has recently slowed and will level off, as existing capacity can meet most incremental electricity load growth during the next decade.

Gas-Based Generation

Powering The Future…

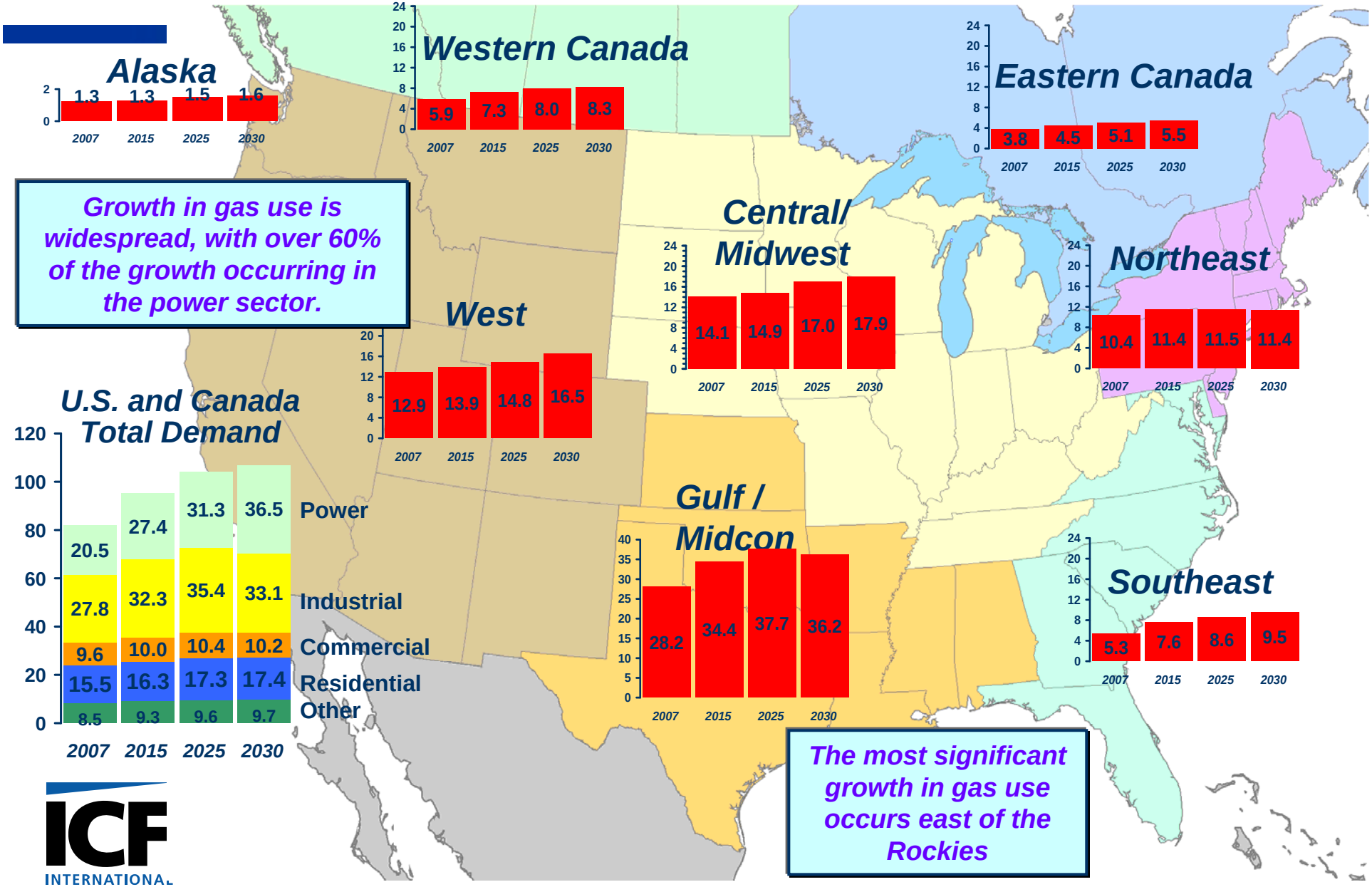
- In the next ten years, gas-based power generation will grow to around 25 percent of total generation.
- Penetration of gas-based generation will slow after 2020 as new clean coal units, renewable capacity, and some new nuclear units enter the market.



Gas Generation as Percent of U.S. Total Generation

2006: 20% 2017: 25% 2030: 26%

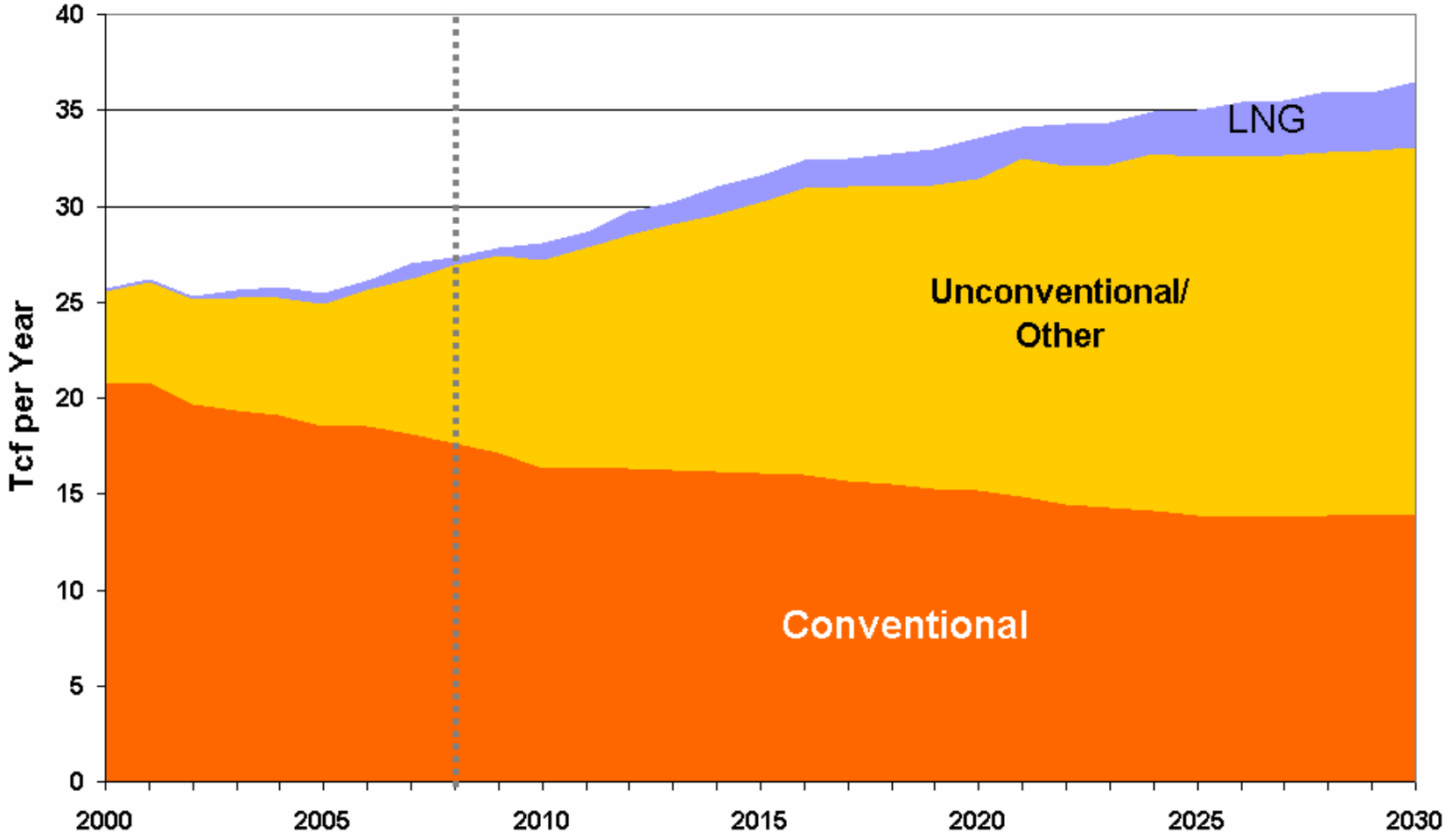
U.S. and Canada Regional Gas Demand (Bcf per day)



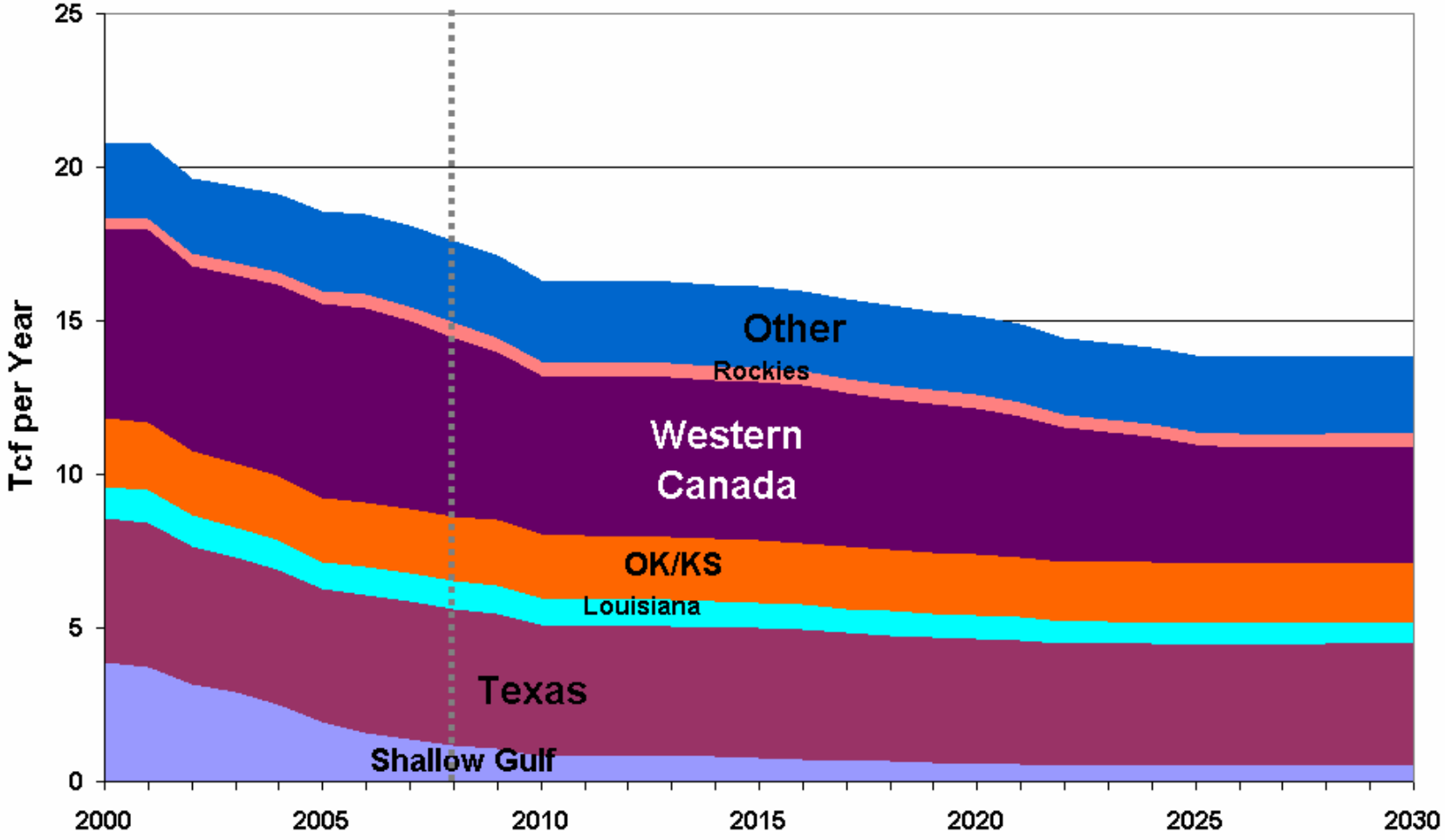
Summary of Gas Demand

- The recent economic downturn will delay growth in gas demand by one or two years.
- But, significant growth expected after the next two years, particularly in the power sector.
- Growth will occur with or without carbon policy, but greater growth is expected with carbon policy.
- Growth outside of power sector will be more modest. DSM, conservation, and efficiency will limit opportunities for growth.

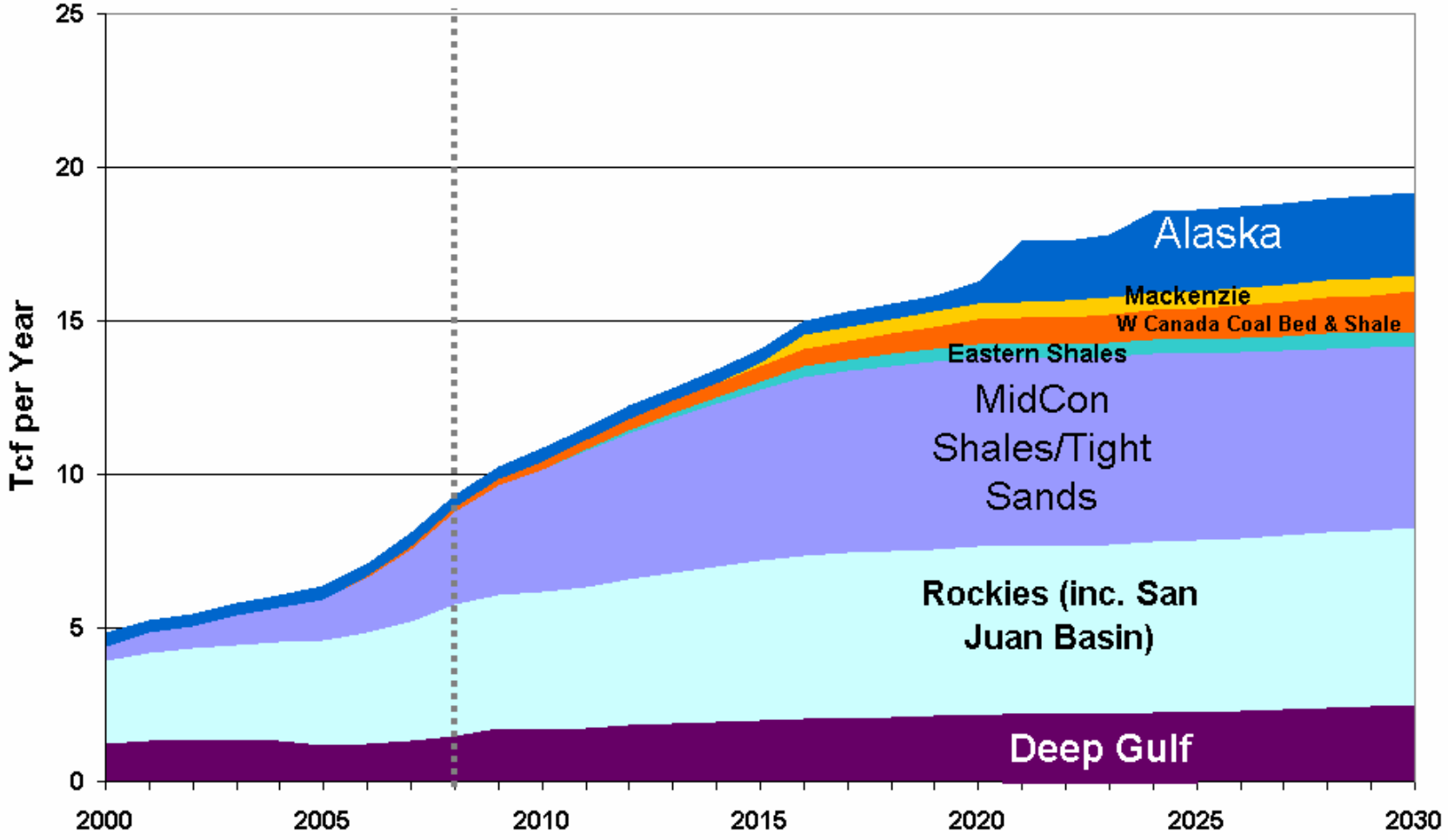
The Changing Supply Mix (Tcf per Year)



Conventional Production (Tcf per Year)

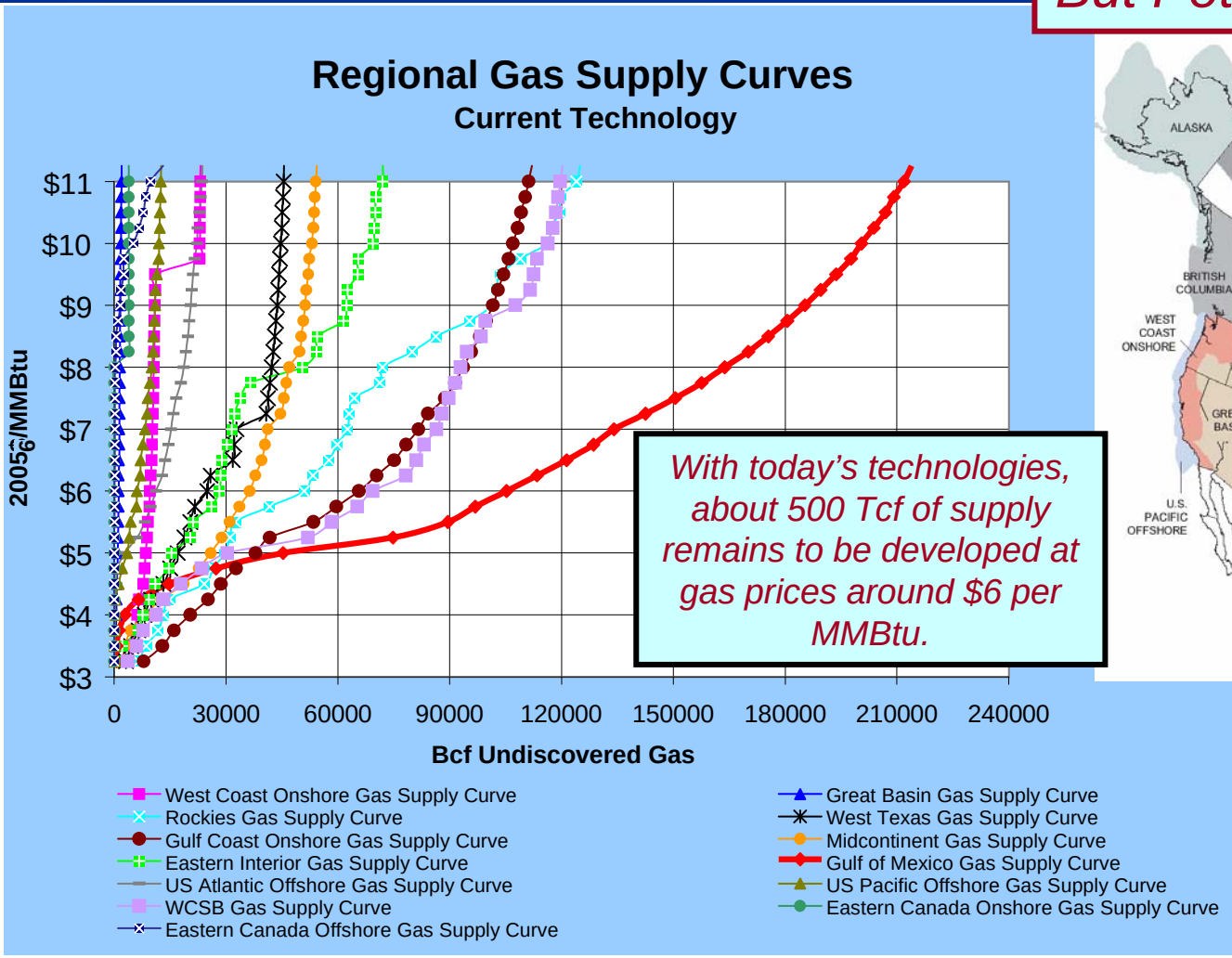


Unconventional and Frontier Supplies (Tcf per Year)

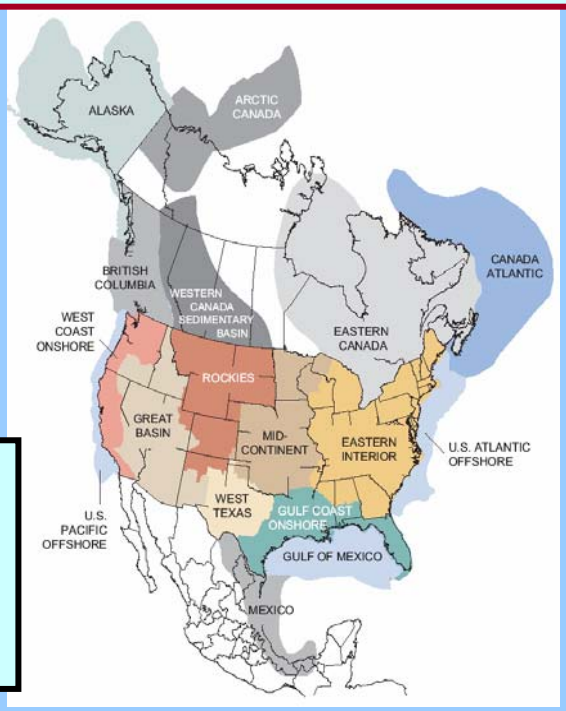


U.S. and Canada Gas Supply

*"Abundant…
But Potentially Costly"*



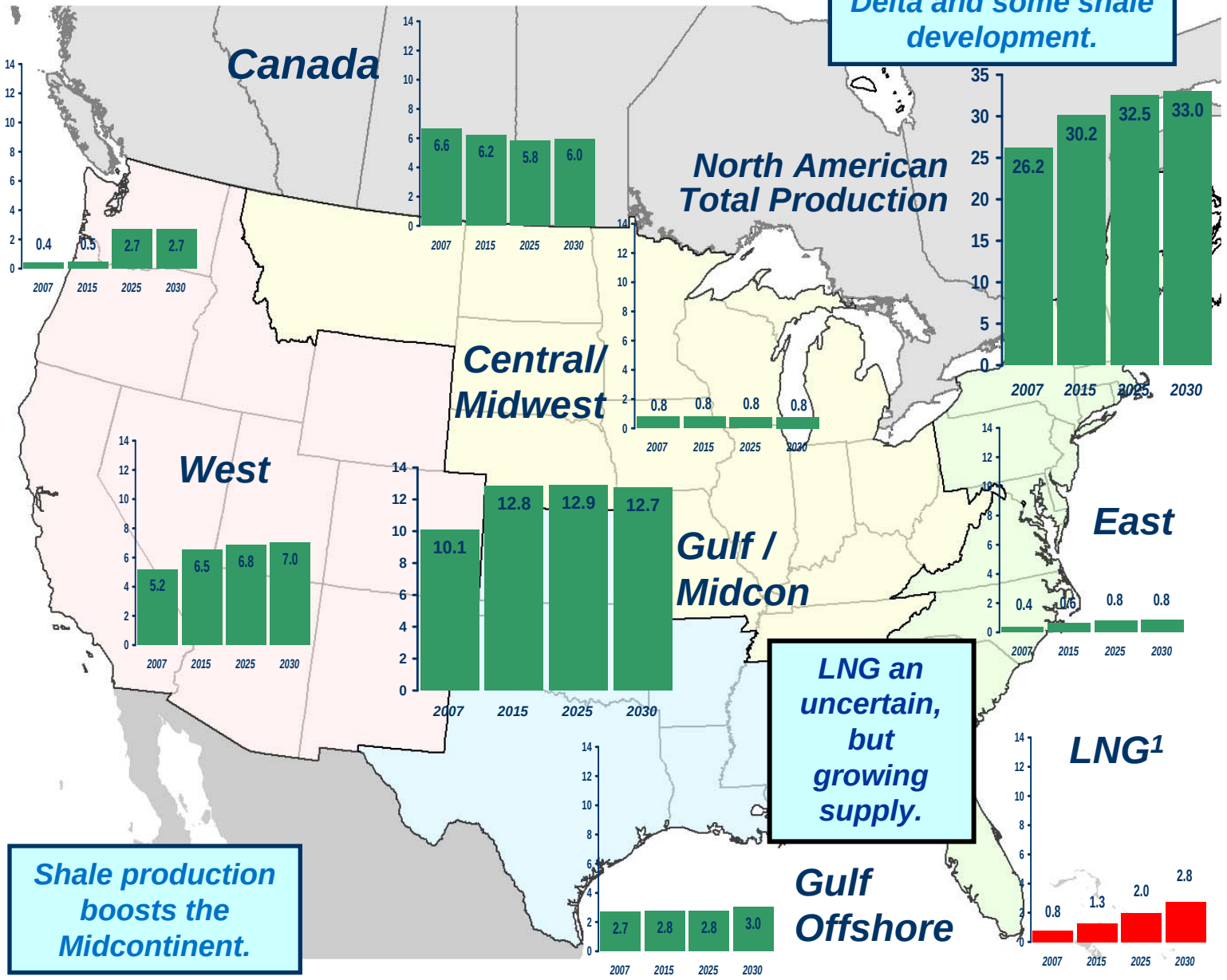
With today's technologies, about 500 Tcf of supply remains to be developed at gas prices around $6 per MMBtu.



Curves very elastic in the $5 to $6 range, yielding a "floor" on gas prices.

Regional Gas Supply

(TCF / year)



Canada declines even with MacKenzie Delta and some shale development.

Alaska always 10 years out - but needed.

The Rocky Mountain Basins continue to shine.

Gas Supply CAN support a growing market, but "new frontier" supplies and additional infrastructure are required.

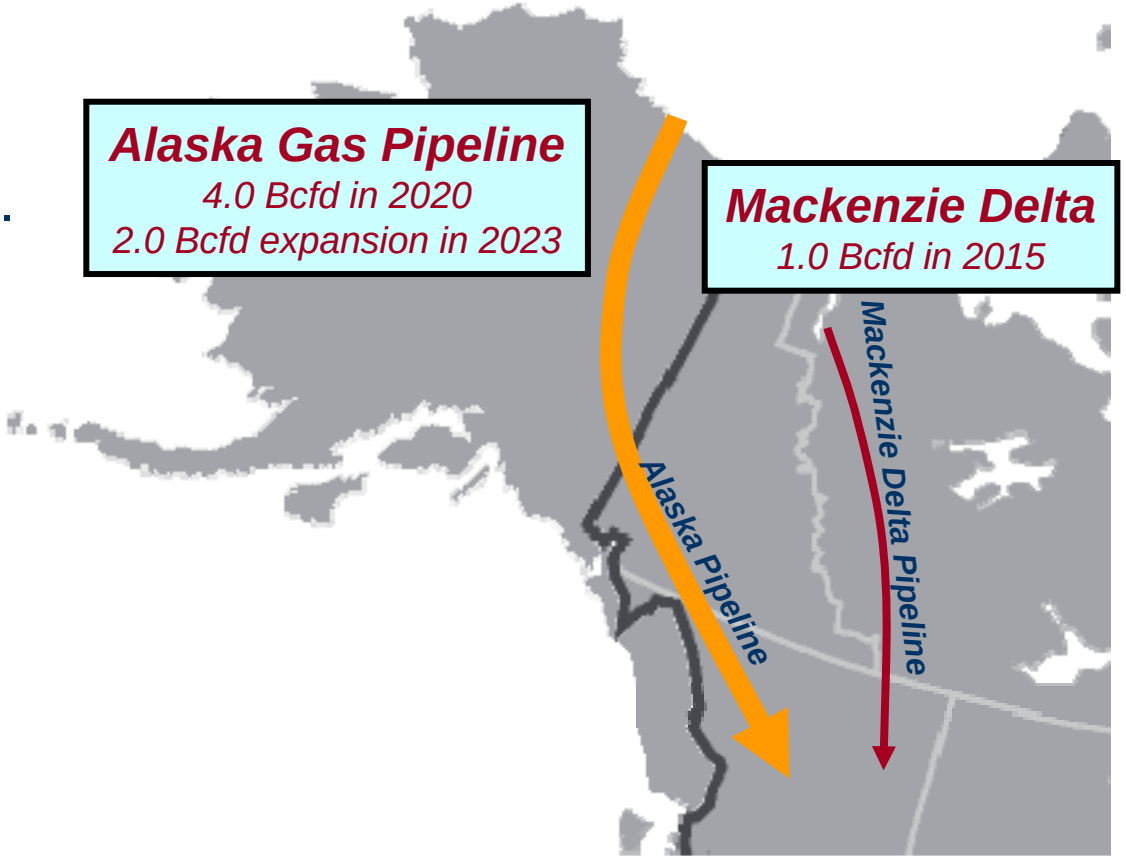
Shale production boosts the Midcontinent.

LNG an uncertain, but growing supply.

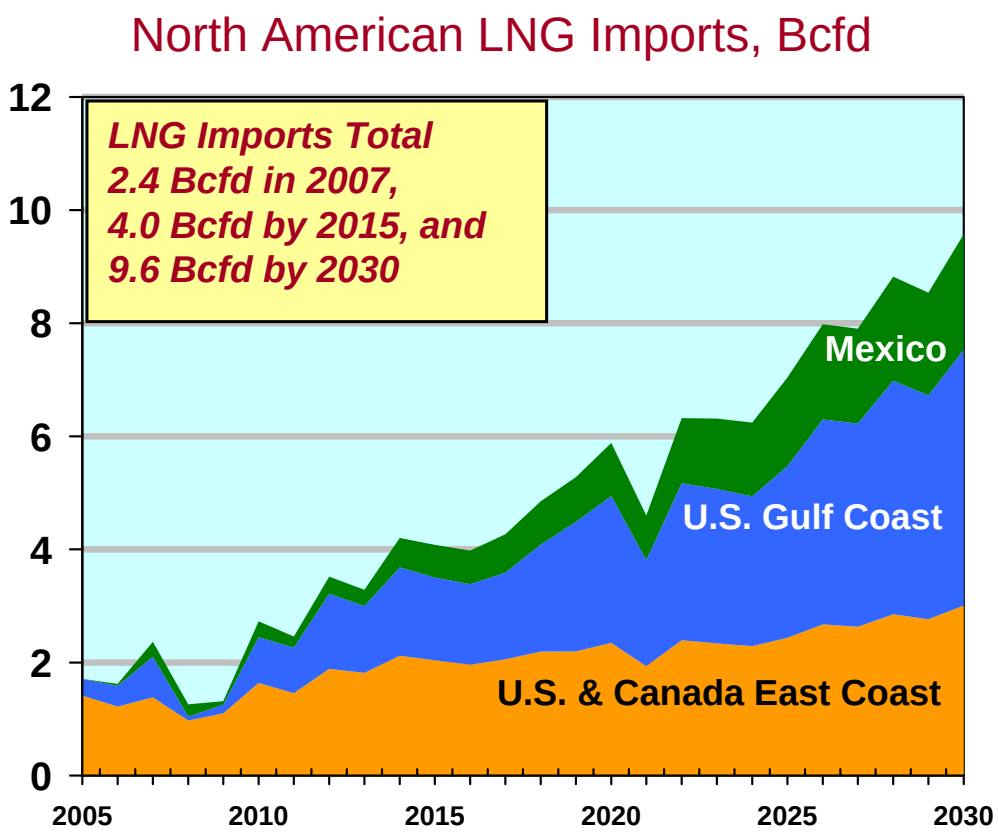
1) U.S. and Canadian LNG Imports Only (Mexican imports not included.)

Alaska and Mackenzie Delta Pipelines

- There are large proven reserves in both north Alaska and the Mackenzie Delta region.
  - Combined, these two areas could provide 7 Bcfd to the North American market.
- ***However, the prospects for both pipelines are risky, at best.***



North American LNG Imports



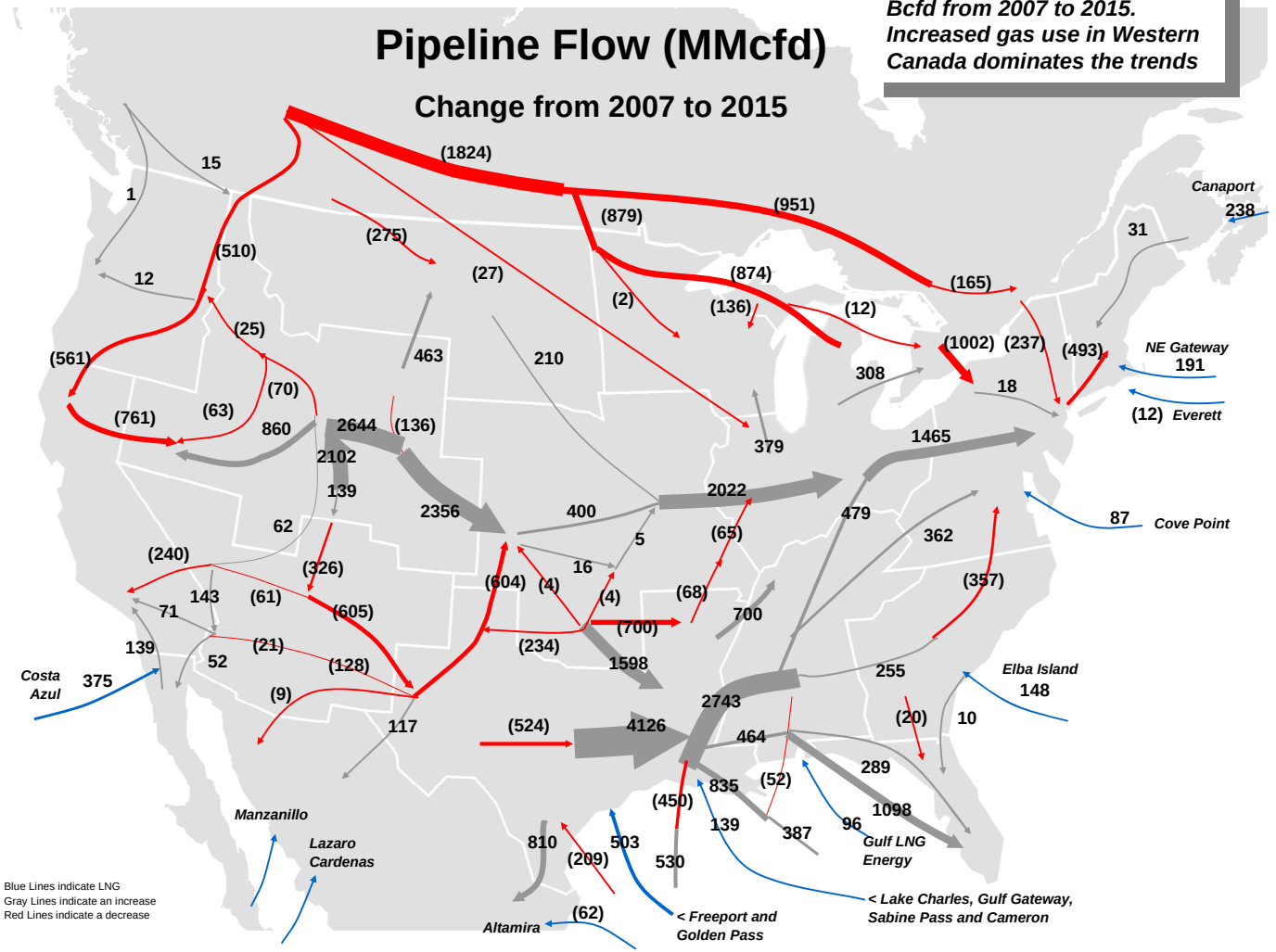
LNG Imports will provide about 8% of U.S. and Canadian gas supplies by 2030.

New Gas Supplies Affect Regional Flow Patterns

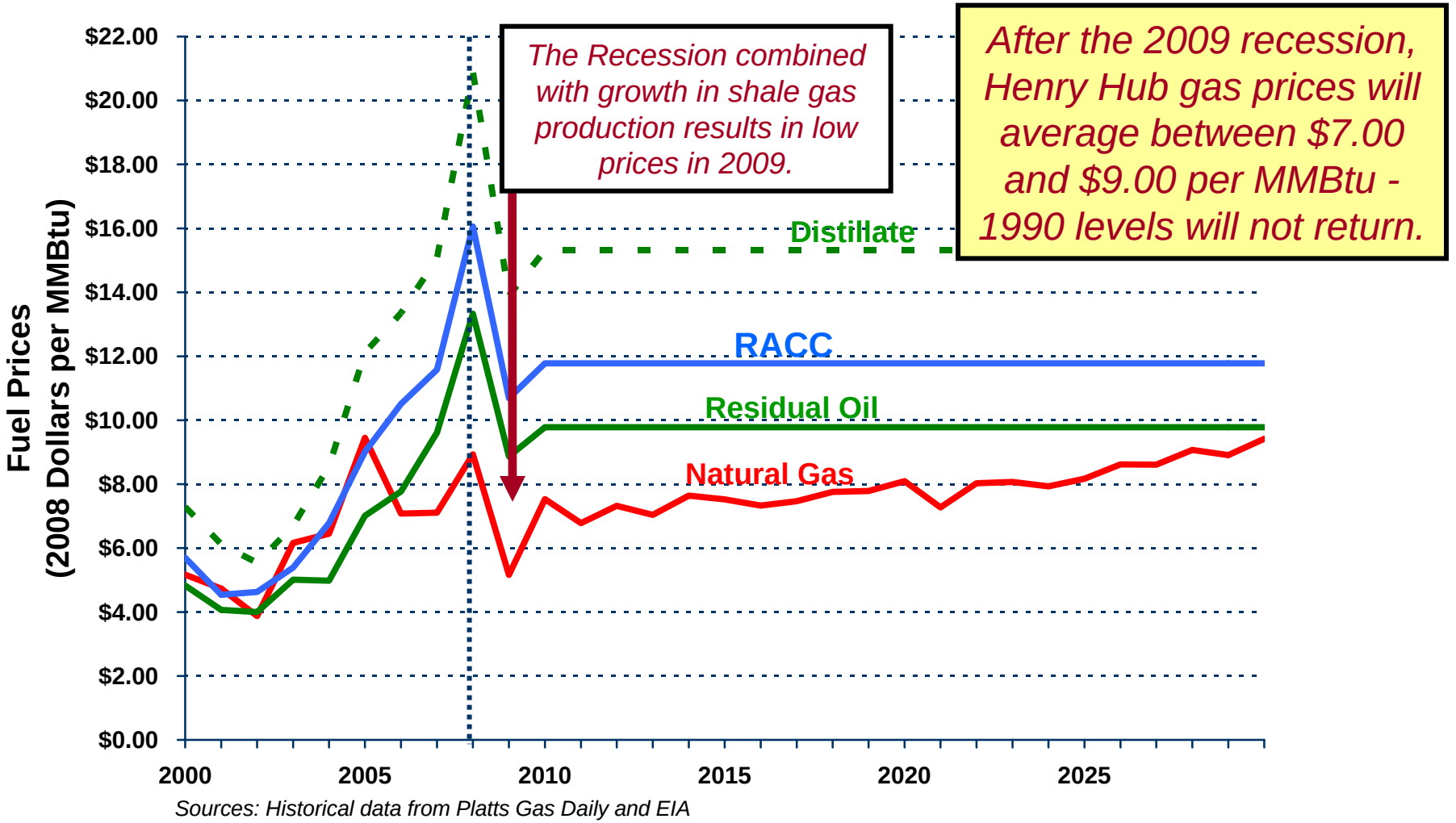
2007-2015

- Greatest increases in supply are from the Rockies and the Midcontinent shales.
- Exports from Western Canada down due to declining production and increased gas consumption in Western Canada.
- U.S and Canada LNG imports modestly increase to about 3.5 Bcfd by 2015.

Lower-48 Net imports from Canada down by about 3.2 Bcfd from 2007 to 2015. Increased gas use in Western Canada dominates the trends



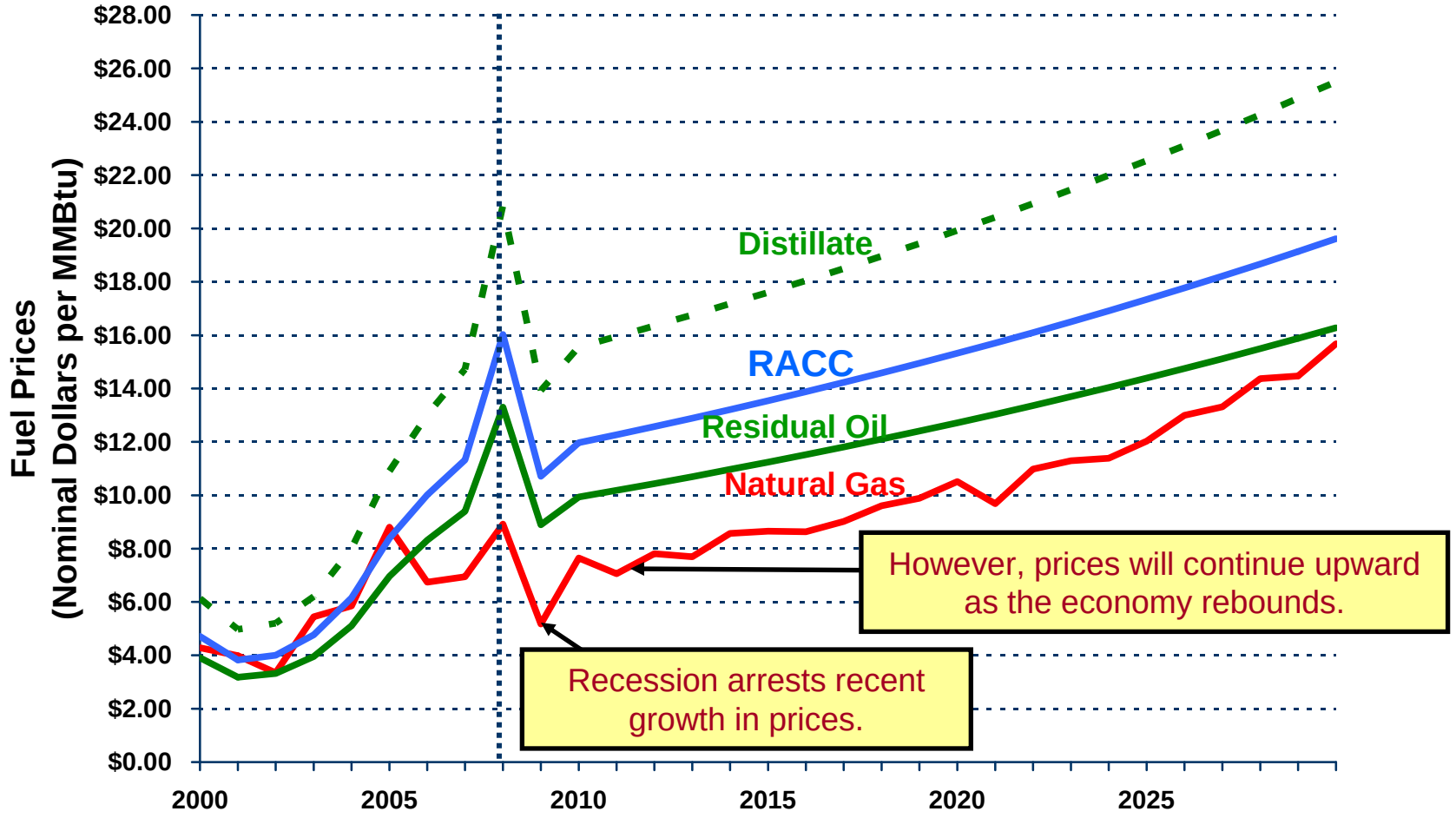
Projected Annual Average Henry Hub Gas Price (2008$/MMBtu)



Sources: Historical data from Platts Gas Daily and EIA

ICF INTERNATIONAL

Projected Annual Average Henry Hub Gas Price (Nominal$/MMBtu)



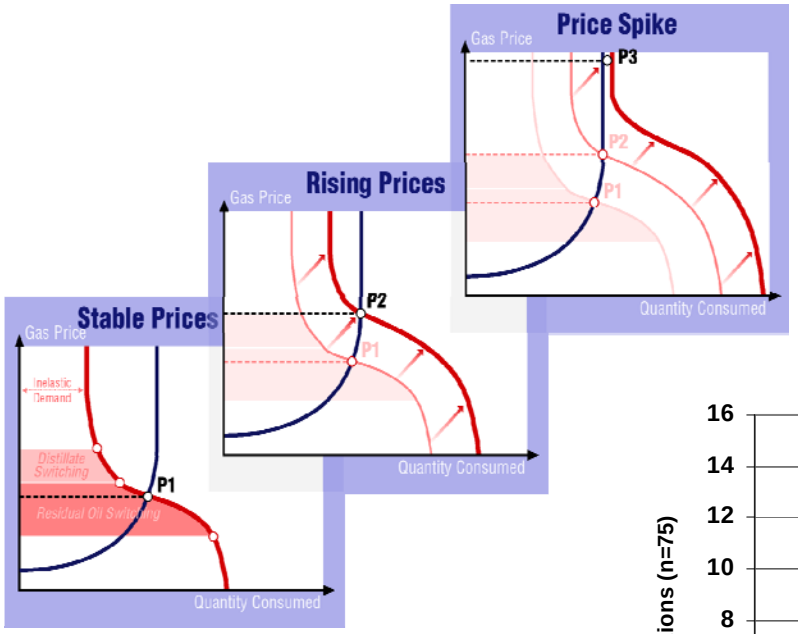
Sources: Historical data from Platts Gas Daily and EIA

ICF INTERNATIONAL

Projected Basis

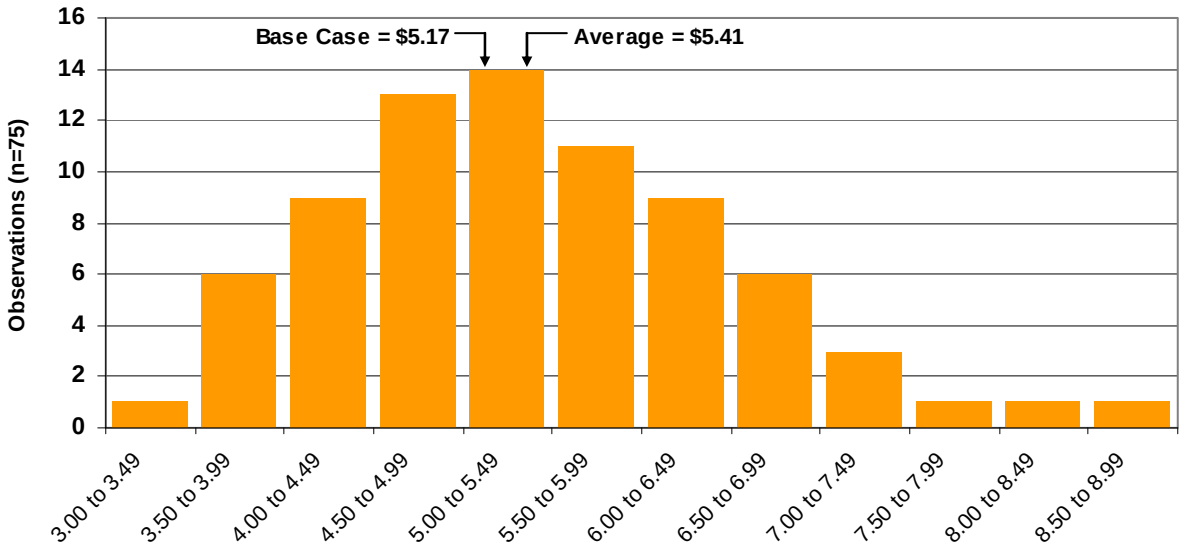
	Basis in 2008 $/MMBtu			*Basis in Nominal $/MMBtu*		
	2002 to 2006	2007 to 2015	2016 to 2030	2002 to 2006	2007 to 2015	2016 to 2030
Henry Hub to NYC	0.97	0.96	1.06	0.88	1.00	1.50
Henry Hub to Dominion North Point	0.84	0.53	0.53	0.76	0.56	0.74
Henry Hub to Dominion South Point	0.43	0.41	0.43	0.39	0.43	0.61
Henry Hub to Chicago	-0.10	0.10	-0.01	-0.09	0.11	-0.02
Henry Hub to Dawn	0.14	0.40	0.49	0.13	0.42	0.69
Henry Hub to South Florida	0.52	0.61	0.69	0.47	0.64	0.98
AECO to Chicago	0.97	0.52	0.74	0.88	0.54	1.05
Opal vs Henry Hub	1.34	1.56	0.86	1.22	1.58	1.23
Opal to Dominion North Point	2.18	2.09	1.39	1.98	2.13	1.97
Opal to Dominion South Point	1.77	1.97	1.29	1.61	2.01	1.84
Opal to Southern California	0.72	1.35	0.79	0.65	1.37	1.14
Southern California vs Henry Hub	0.62	0.21	0.07	0.57	0.21	0.10
Midcontintent vs Henry Hub	0.58	0.41	0.31	0.54	0.41	0.44
East Texas vs Henry Hub	0.29	0.15	0.11	0.27	0.15	0.16
San Juan Basin vs Henry Hub	1.19	0.63	0.45	1.08	0.64	0.63

Significant Price Volatility is Likely to Continue



Changes in weather shift daily demand, causing wide swings in gas prices.

Henry Hub Price Distribution
Average, Jan. 2009 – Dec. 2009
(Nominal $)



Significant price volatility creates uncertainties for planners.

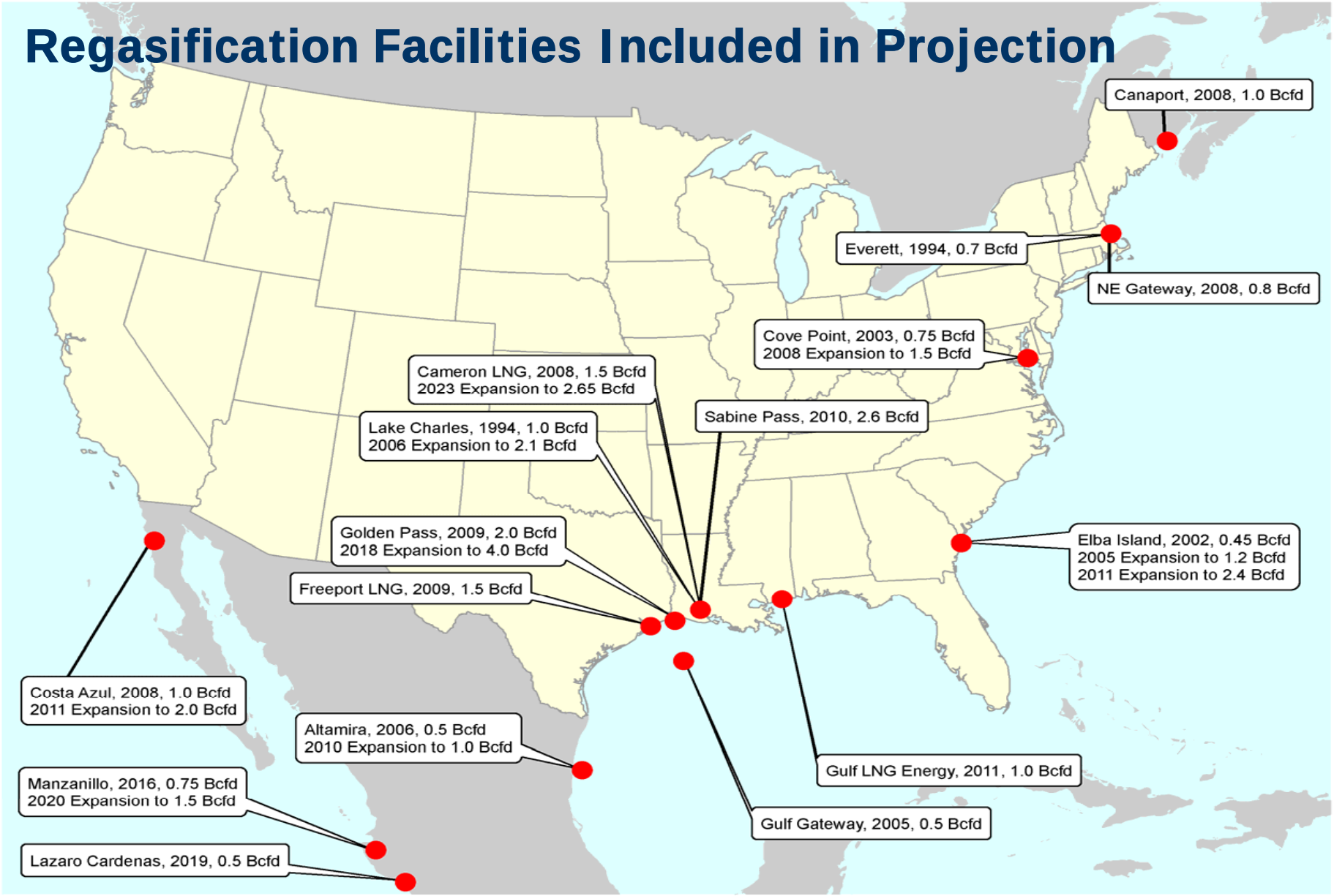
Key Findings

- Next year, gas prices will be lower due to the economic downturn.
- However, gas prices will rebound as the economy does.
- Gas consumption likely to grow, with significant growth in gas-based power generation.
- Shale gas development will be significant.
- Alaska gas and LNG imports will provide upwards of 13 percent of North America's total gas supply by 2030.
- Regasification capacity is not likely to constrain North American LNG imports – liquefaction capability will likely be the constraining factor.
- Henry Hub gas prices likely to average between $7.00 and $9.00 per MMBtu in real terms after next year.
- High levels of gas price volatility likely to continue.
  - Weather alone can significantly swing gas prices.

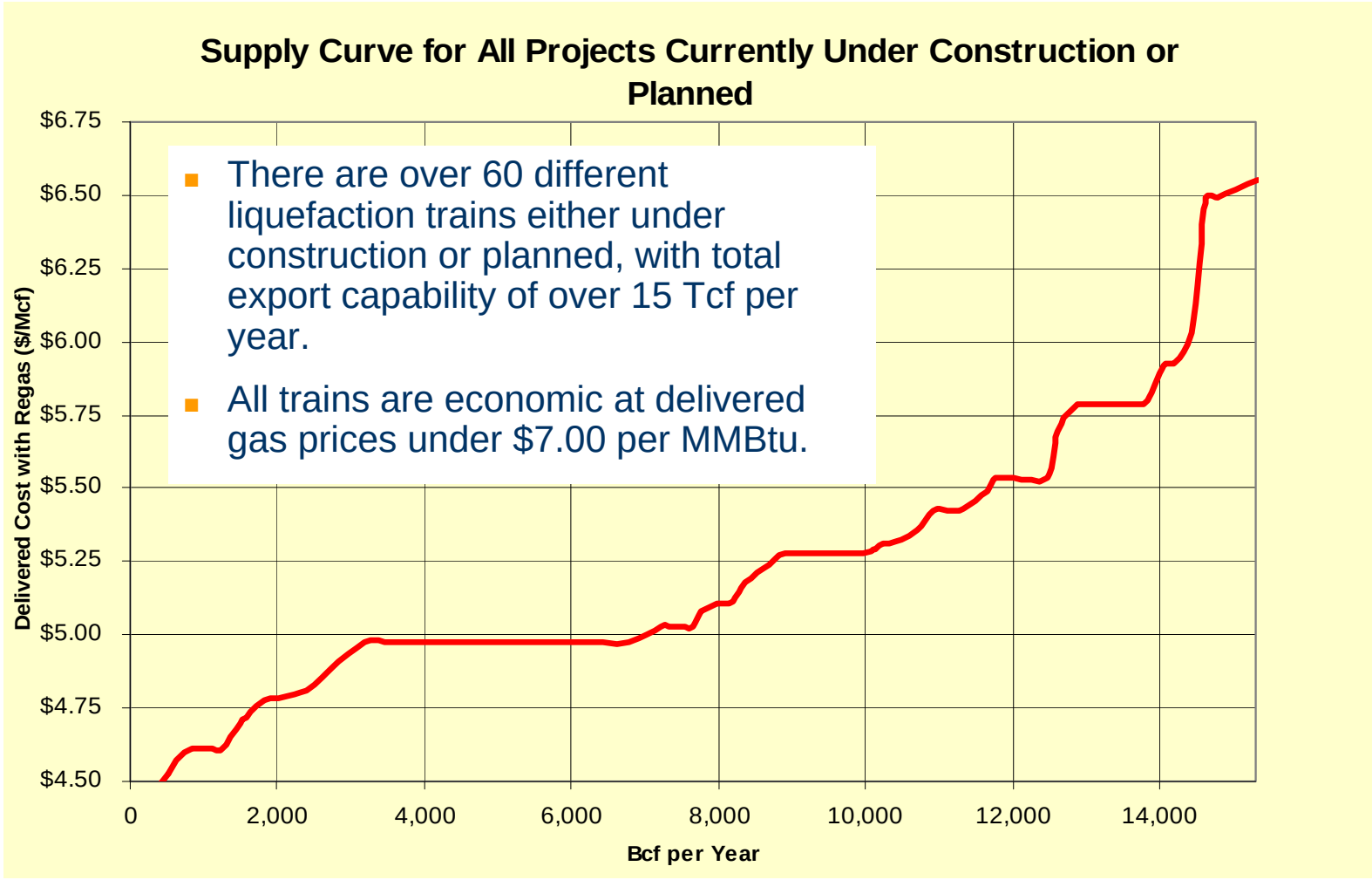
ICF INTERNATIONAL

Additional Slides

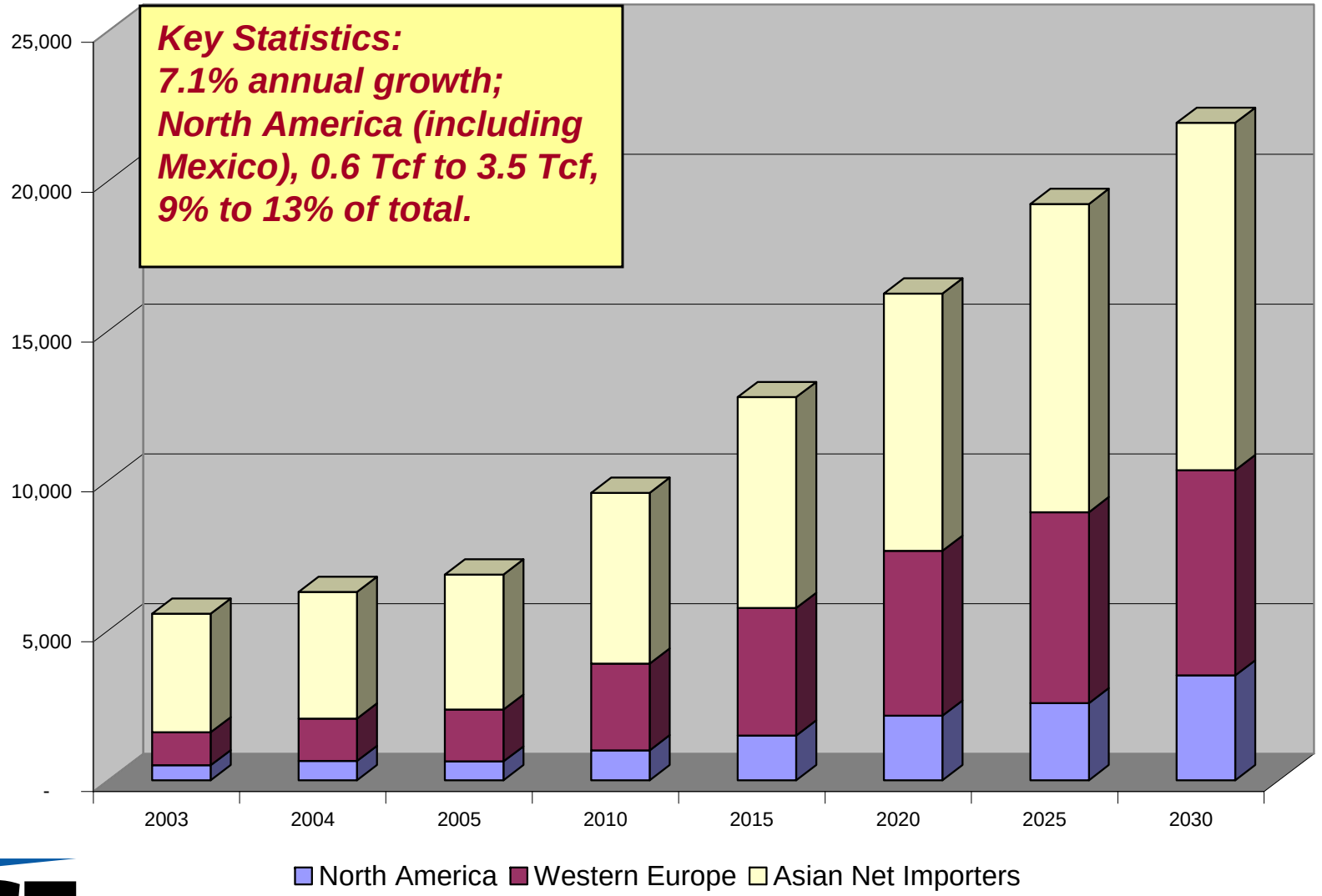
Regasification Facilities Included in Projection



LNG Supply Curve

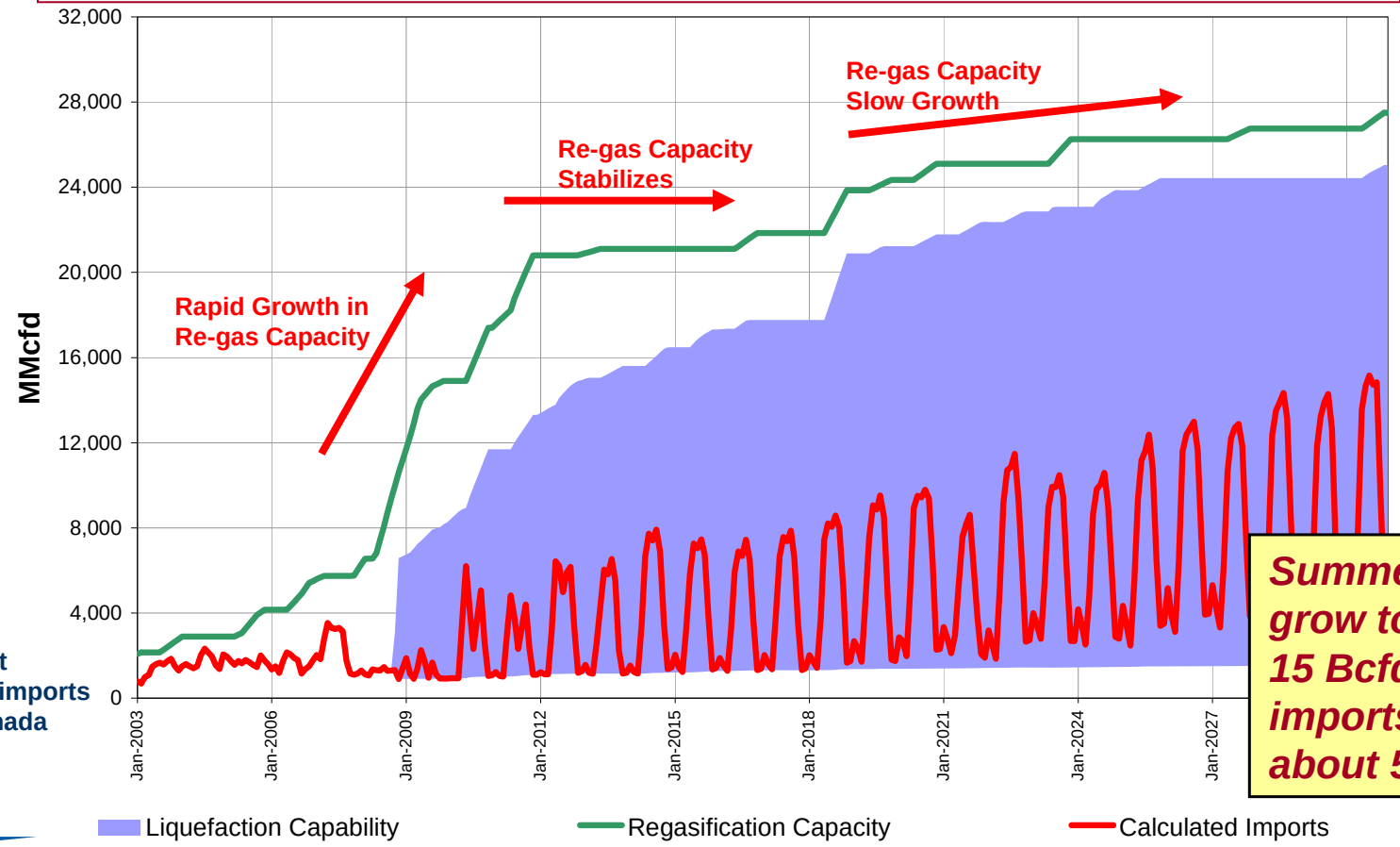


Projected Global LNG Imports, Bcf per year



North American Regasification Capacity Versus Liquefaction Capability

Regasification capacity is not the constraint on North American deliveries – liquefaction capability is!



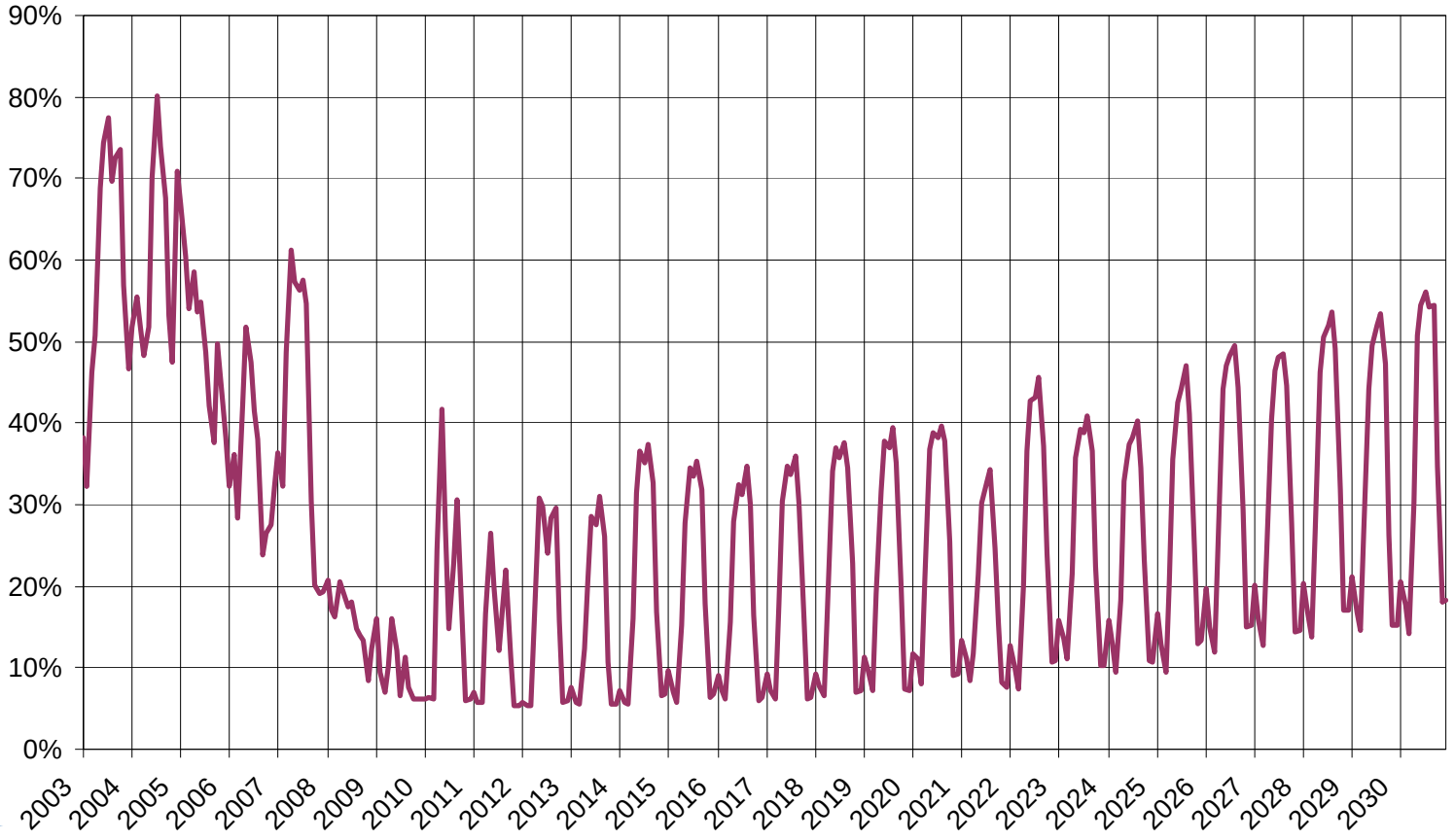
Note: Chart represents imports to U.S., Canada and Mexico

Summer imports grow to near 15 Bcfd. Winter imports grow to about 5 Bcfd.

ICF INTERNATIONAL

Utilization of Regasification Capacity

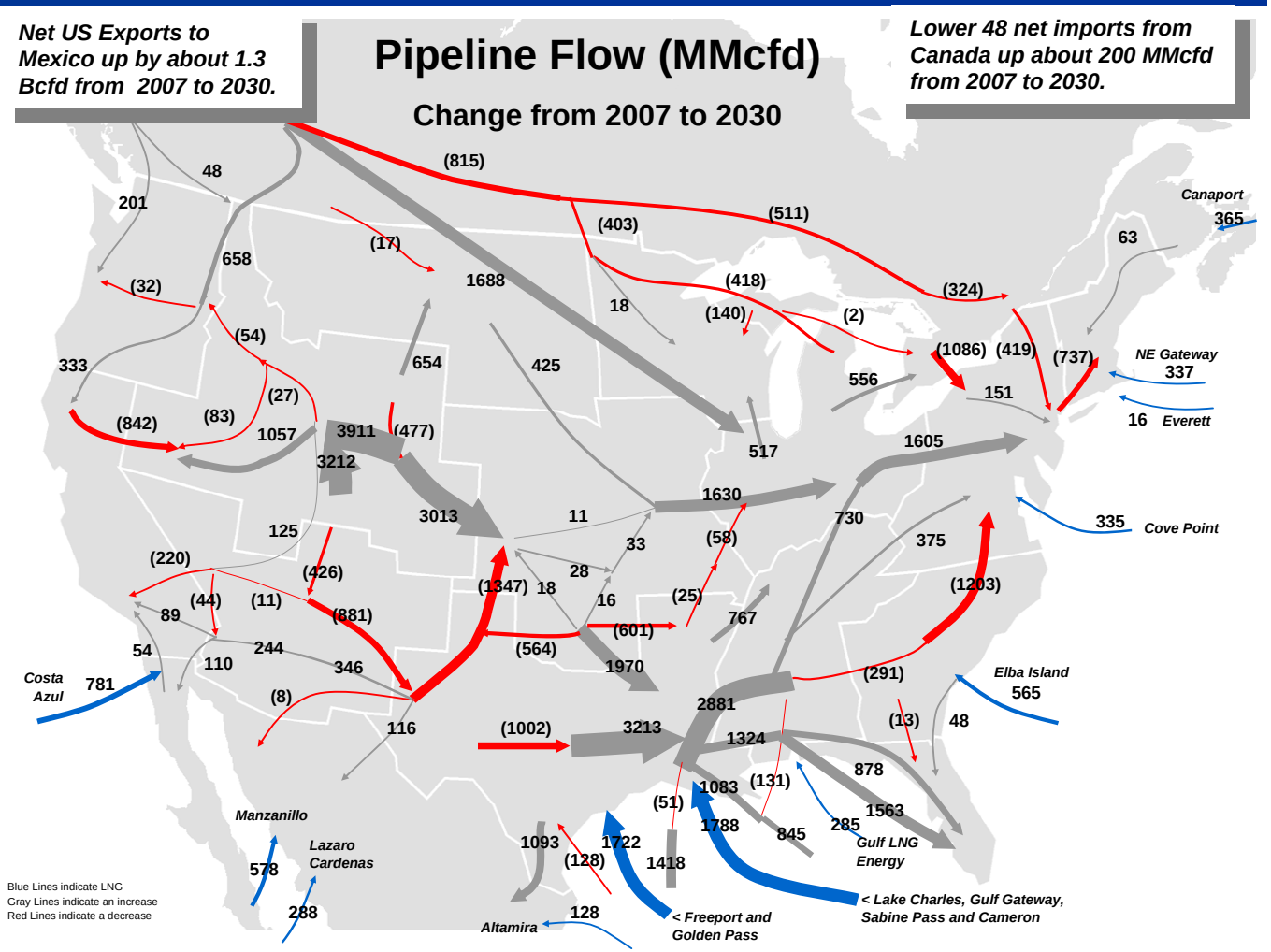
Utilization of all North American regasification facilities averages under 40 percent throughout the projection.



New Gas Supplies Affect Regional Flow Patterns

2007-2030

- Greatest increases in supply are from the Rockies and the Midcontinent shales.
- Net exports from Western Canada are up about 1.8 Bcfd, spurred by 7 Bcfd of Alaskan and Canadian Arctic gas development.
- U.S and Canada LNG imports increase to around to 7.5 Bcfd by 2030.



Supply and Demand in an Uncertain Environment

U.S. and Canada Gas Market Overview
Based on the ICF GMM Reference Case
October 2008

Contact:
Kevin R. Petak
Vice President, Gas Market Modeling
ICF International
703-218-2753
kpetak@icfi.com