

Why Natural Gas Market Fundamentals Support Long Term Investments in Technology Development
Why Natural Gas Market Fundamentals Support Long Term Investments in Technology Development
Why Natural Gas Market Fundamentals Support Long Term Investments in Technology Development

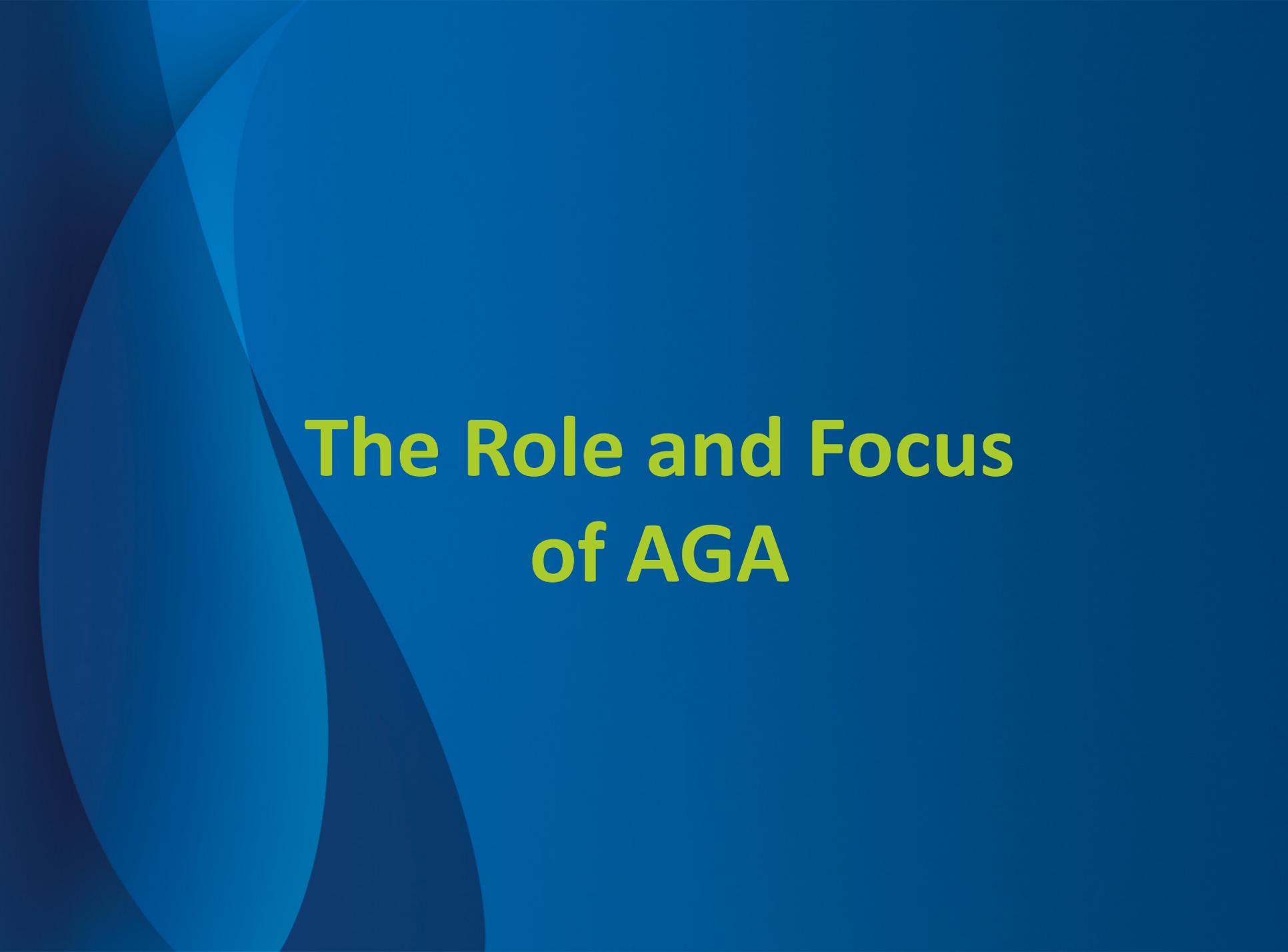
October 21, 2015

Why Natural Gas Market Fundamentals Support Long Term Investments in Technology Development

ARPA-E GENSETS PROGRAM KICKOFF MEETING

Rick Murphy
Managing Director – Sustainable Growth


AGA
American Gas
Association

The background is a solid dark blue color. On the left side, there are several overlapping, semi-transparent circles in various shades of blue, creating a layered, abstract effect. The text is centered in the middle of the slide.

The Role and Focus of AGA

OUR ROLE IN POLICY

Delivering on America's National Priorities

National energy policies should help:

- ✓ Improve Energy Efficiency
- ✓ Ensure Energy Affordability
- ✓ Reduce Consumer Costs
- ✓ Reduce Greenhouse Gas Emissions
- ✓ Increase America's Energy Security and Support American Jobs
- ✓ Create a Level Playing Field



INDUSTRY ISSUES

Top 5 Advocacy Priorities

1. Pipeline Safety
2. Methane Emissions
3. Natural Gas Supply
4. Efficient Natural Gas Solutions
5. Infrastructure: Cybersecurity

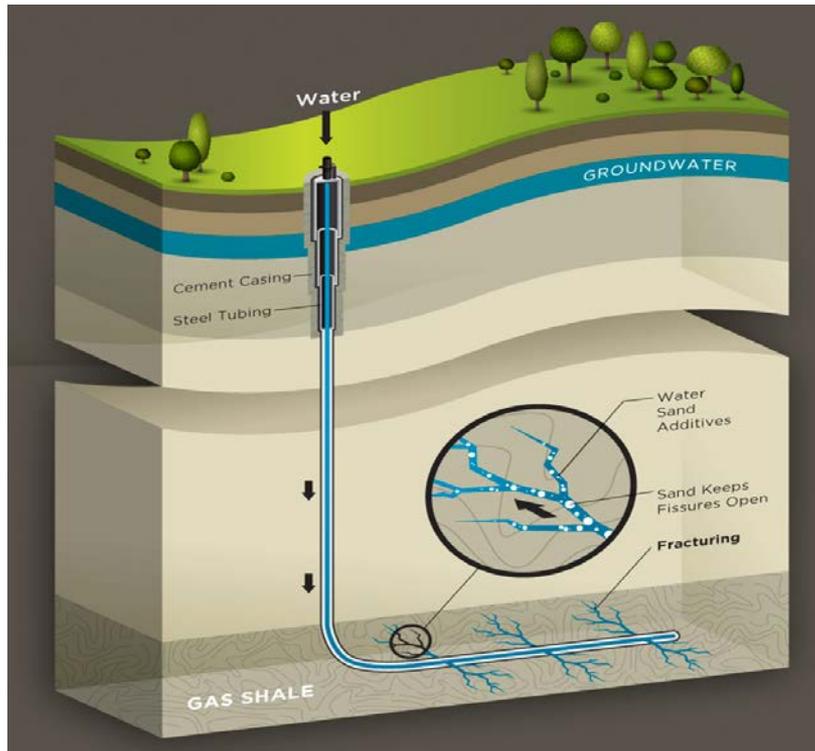


The background is a solid dark blue color. On the left side, there are several overlapping, semi-transparent circles in various shades of blue, creating a layered, organic effect. The text is positioned in the center-right area of the slide.

Abundant Resource Base

What a Difference *Shale* Makes

- Advances in technology has dramatically changed the natural gas resource base in the United States
- This energy endowment can be developed in a ***responsible and sustainable*** manner.



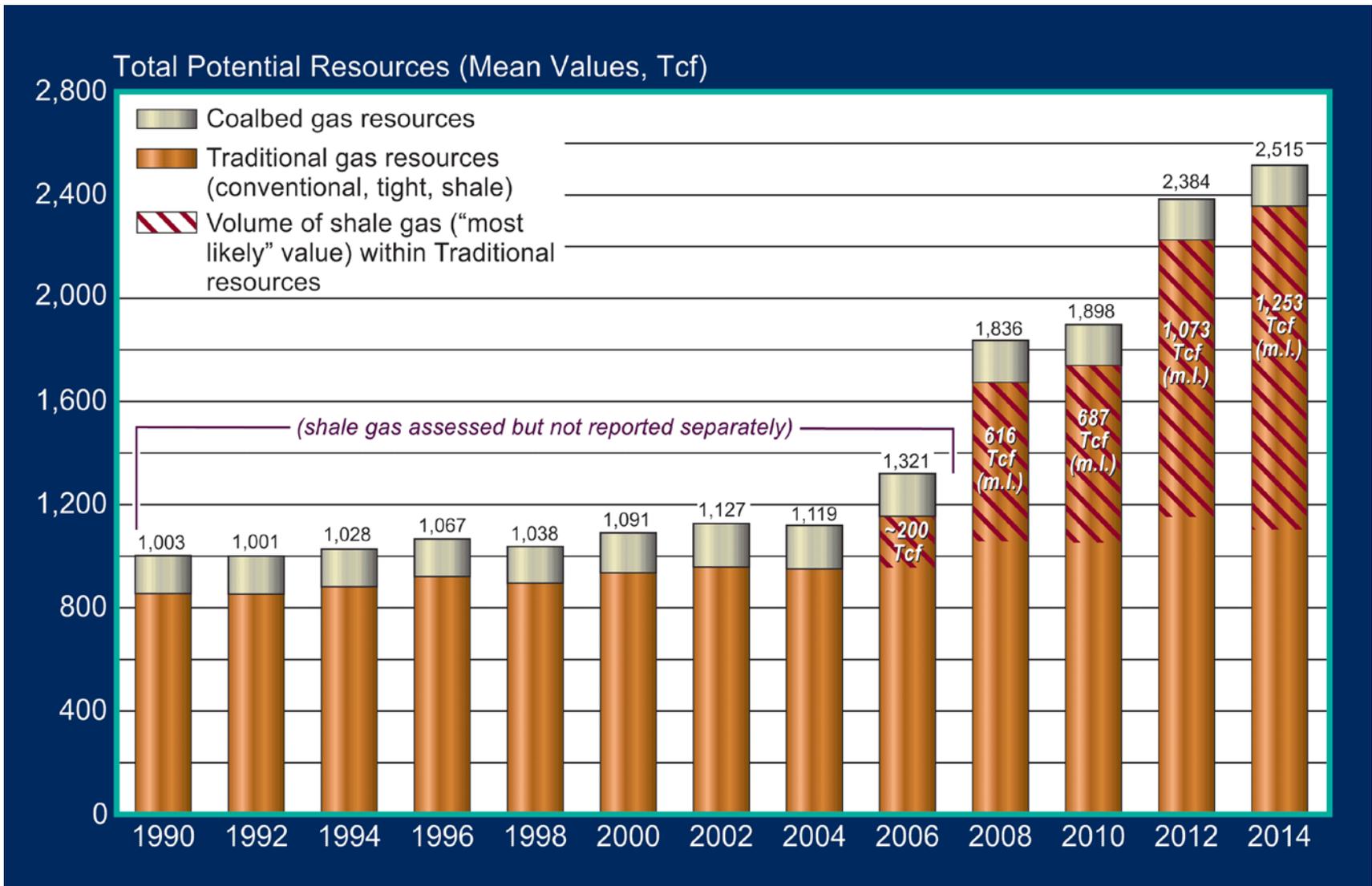
Shale plays now account for close to one-half of domestic natural gas supply in the United States and that may continue to grow.

Shale Gas Resources in the United States



Source: Energy Information Administration based on data from various published studies.

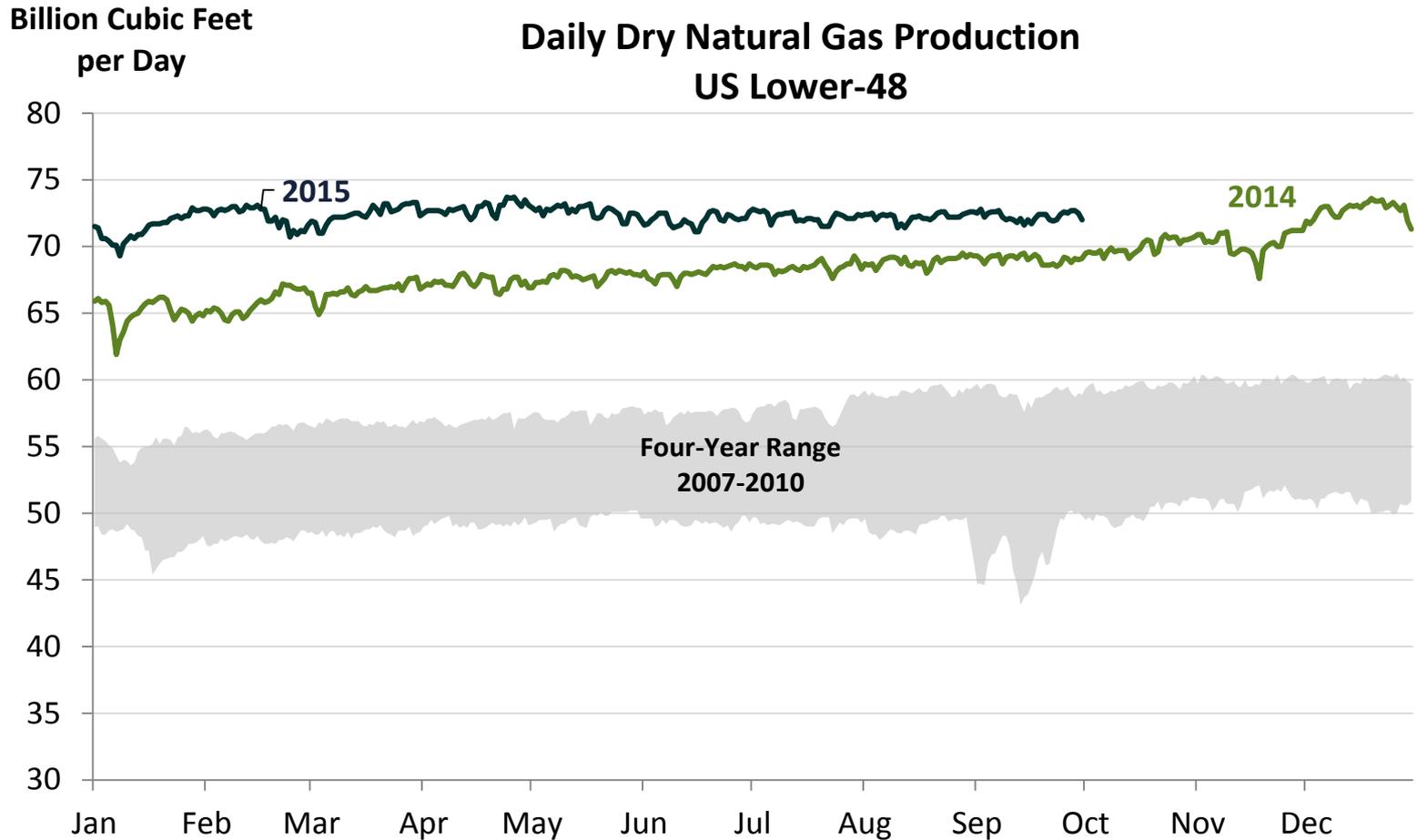
Natural Gas Supply Projections 1990 -2014



Data Source: Potential Gas Committee, Colorado School of Mines, April 2015

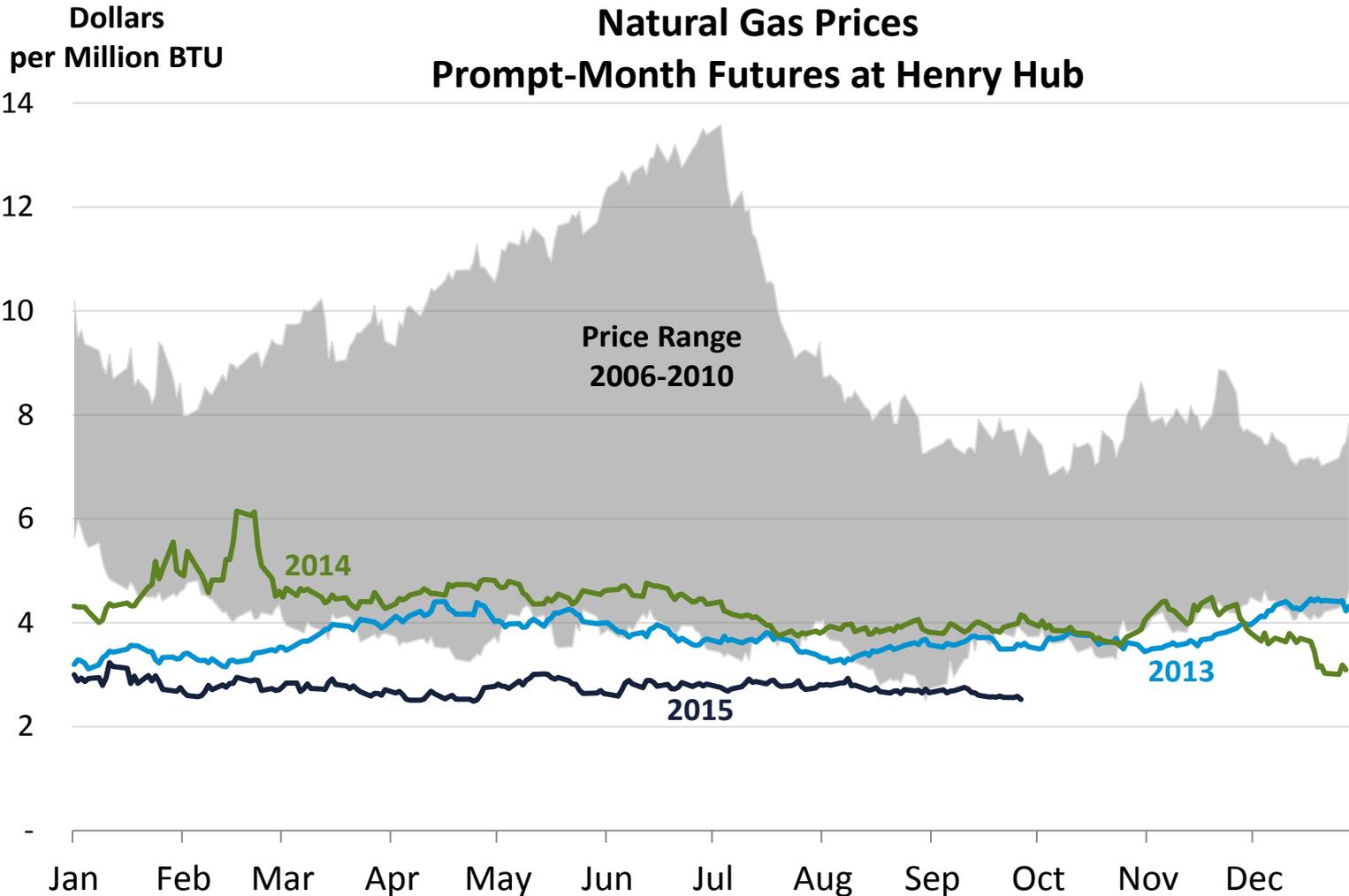
Production and Price Impact of Shale Gas

Record Production Levels in 2015



Source: *Bentek Energy LLC*

Relatively Low and Stable Natural Gas Prices

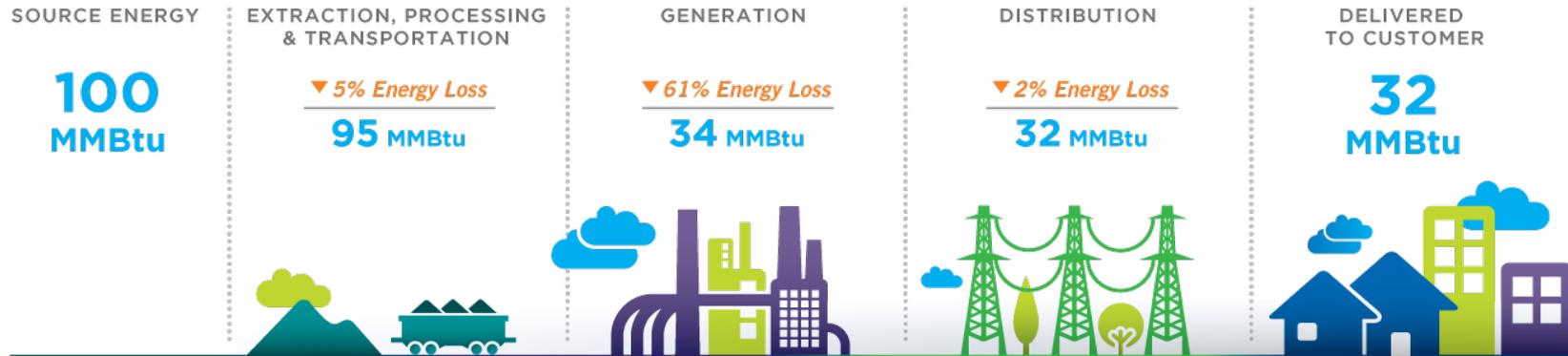


Source: Energy Information Administration

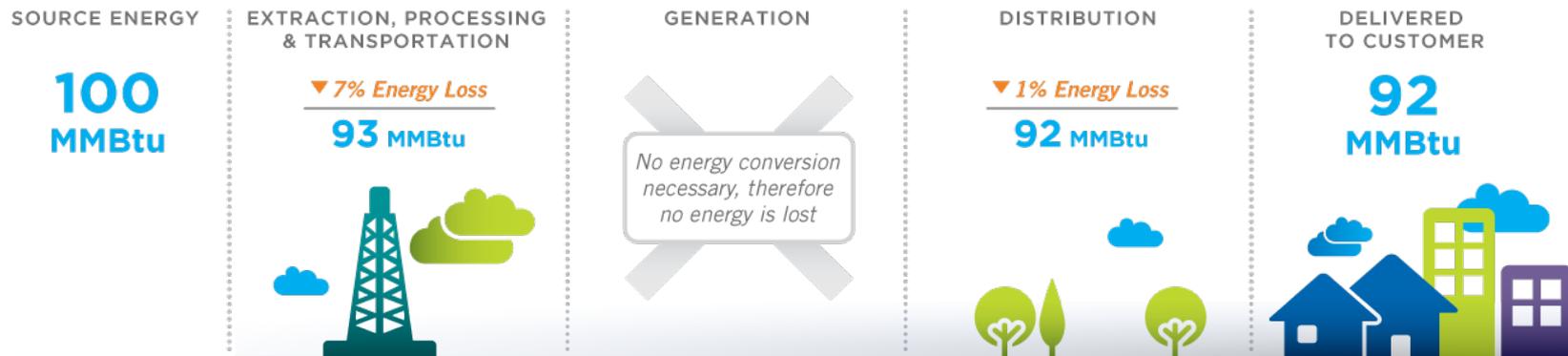
Energy Value

Value Chain Efficiency

Electricity

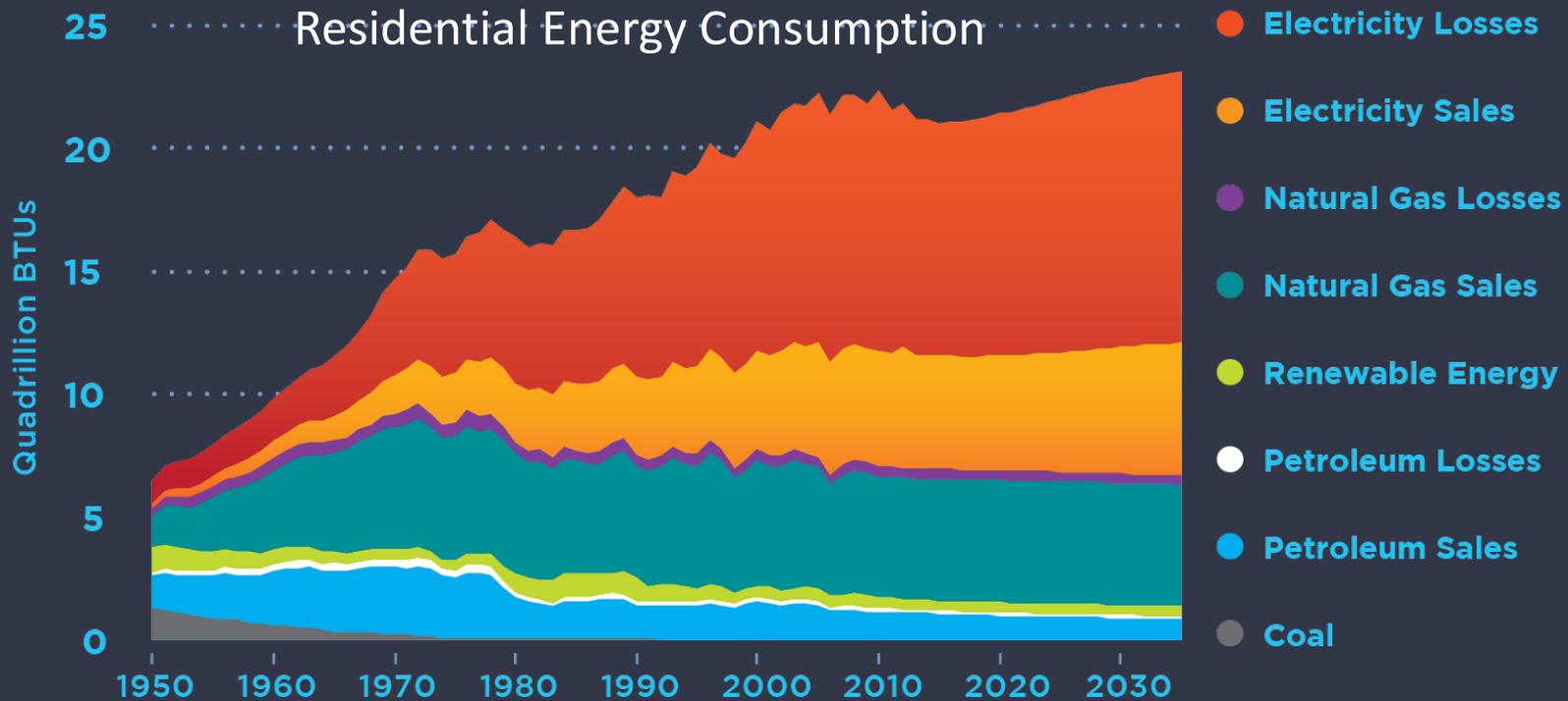


Natural Gas



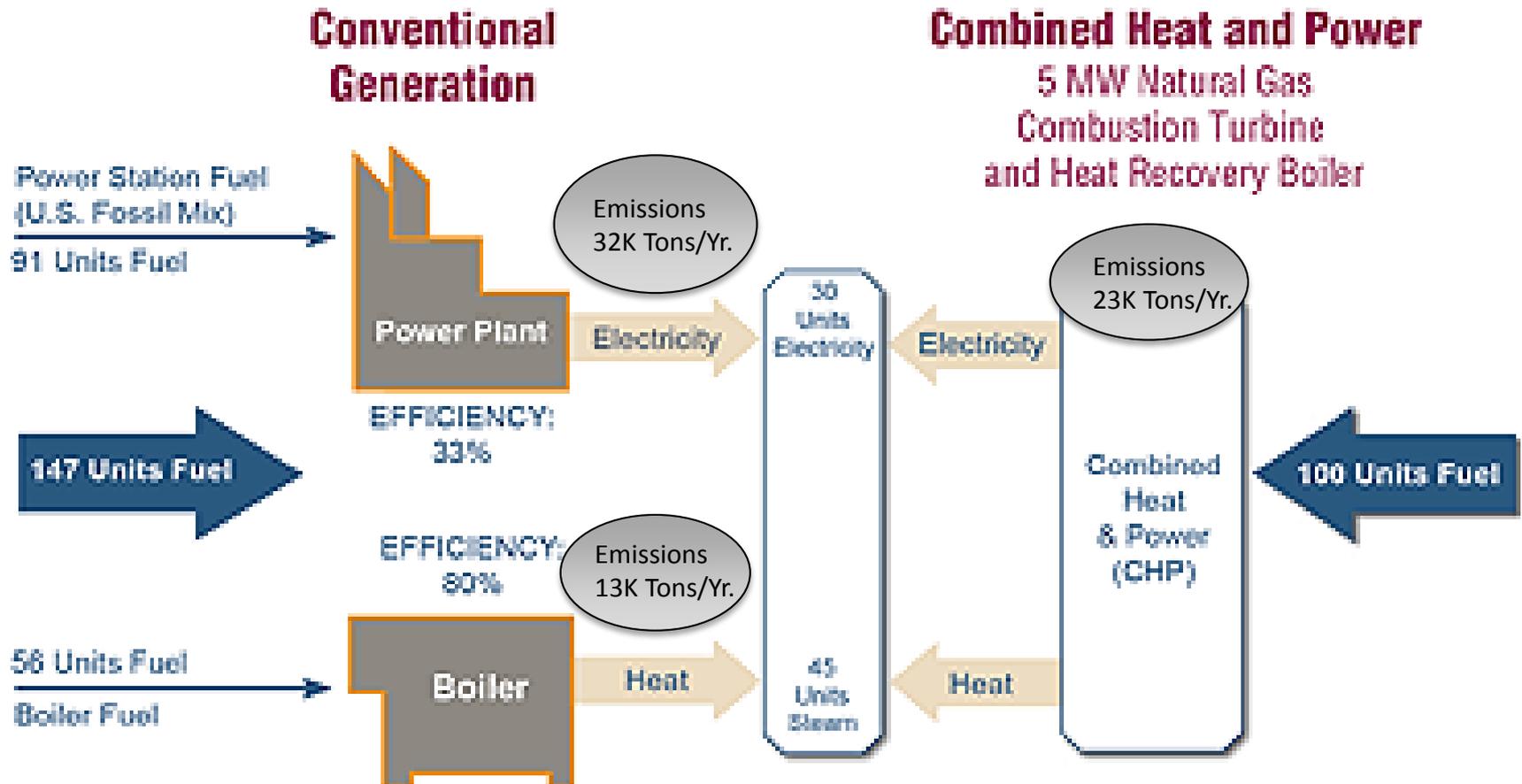
Opportunities to Reduce Overall Energy Consumption and Emissions

Expanding the direct use of natural gas in homes and businesses can reduce the energy lost in the generation and distribution of electricity.



Source: U.S. Department of Energy, Energy Information Administration

45k Tons/Yr. ... CO2 EMISSIONS ... 23k Tons/Yr.



51%

...OVERALL EFFICIENCY...

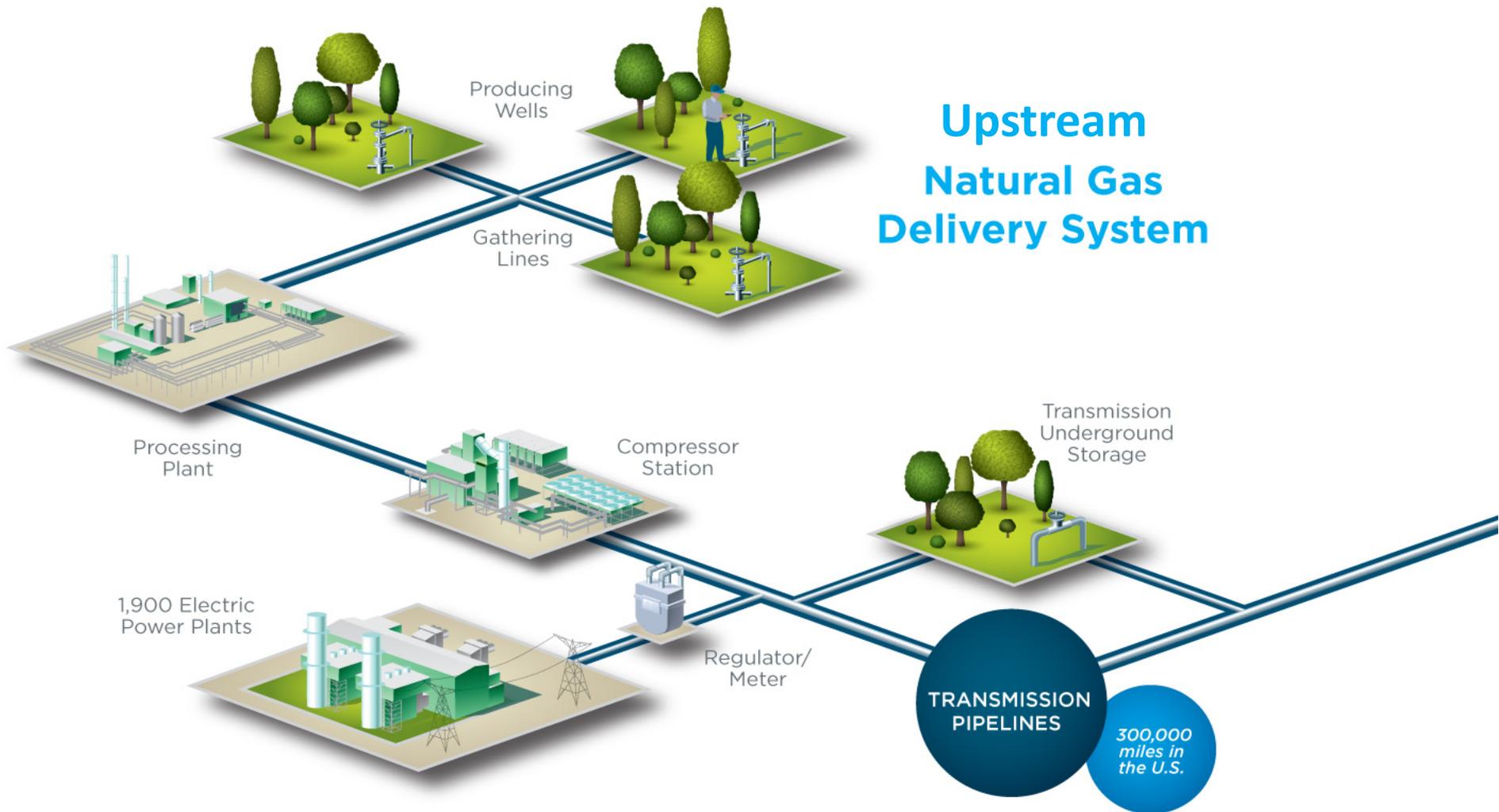
75%

The background is a solid blue color with several large, overlapping, semi-transparent circular and oval shapes in various shades of blue, creating a layered, abstract effect on the left side of the page.

Safe and Reliable Delivery Network

Natural Gas

Getting It to Homes, Businesses and to Work for America



5.3 Million Commercial Customers
Offices, Hospitals, Hotels and Restaurants

66.7 Million Households

Utility
Underground
Storage

Regulator/
Meter

Regulator/
Meter

Local Utility
Regulator

Supplemental Fuels
Liquefied Natural
Gas, Propane Air for
Peak Demand Days

Regulator/
Meter

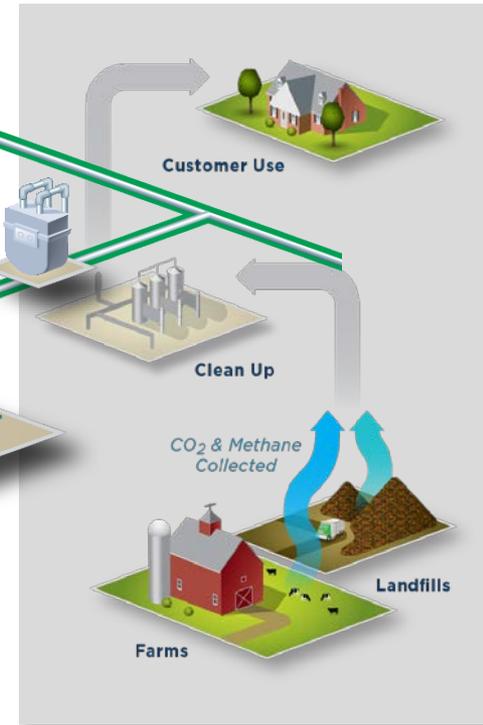
City Gate
Station

DISTRIBUTION
AND SERVICE
PIPELINES

Regulator/
Meter

192,000 Factories and
Manufacturers

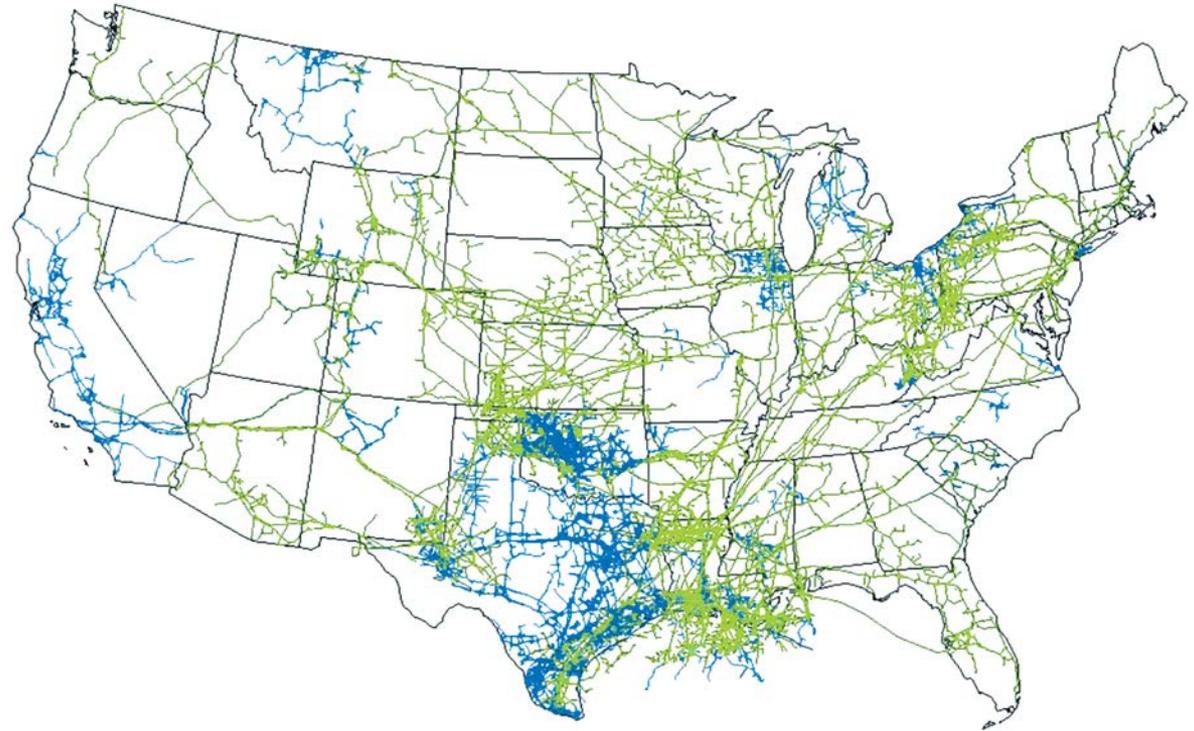
Approximately
2.1 million
miles in U.S.



Downstream Natural Gas Delivery System

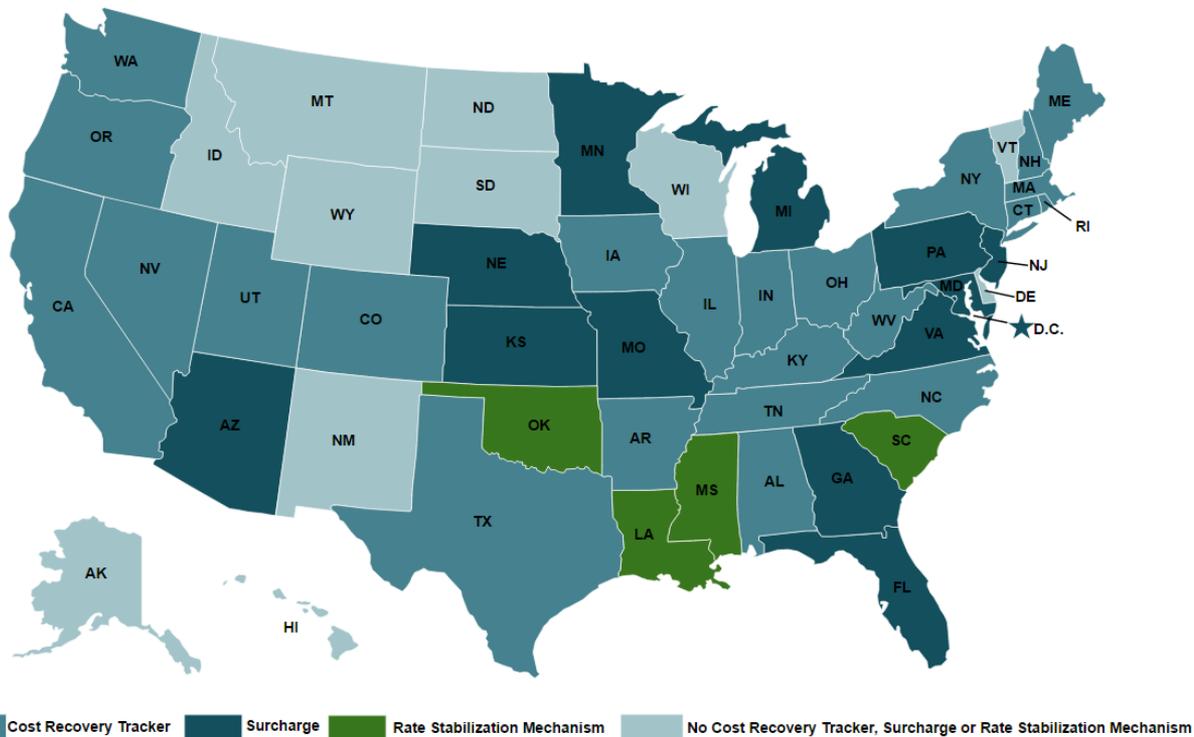
SAFELY TRANSPORTED Across the Country

- Natural gas pipelines are an **essential** part of the nation's Infrastructure
- Together, natural gas pipeline and utility companies spend approximately \$7 billion per year to help ensure the **safety and reliability** of the natural gas infrastructure

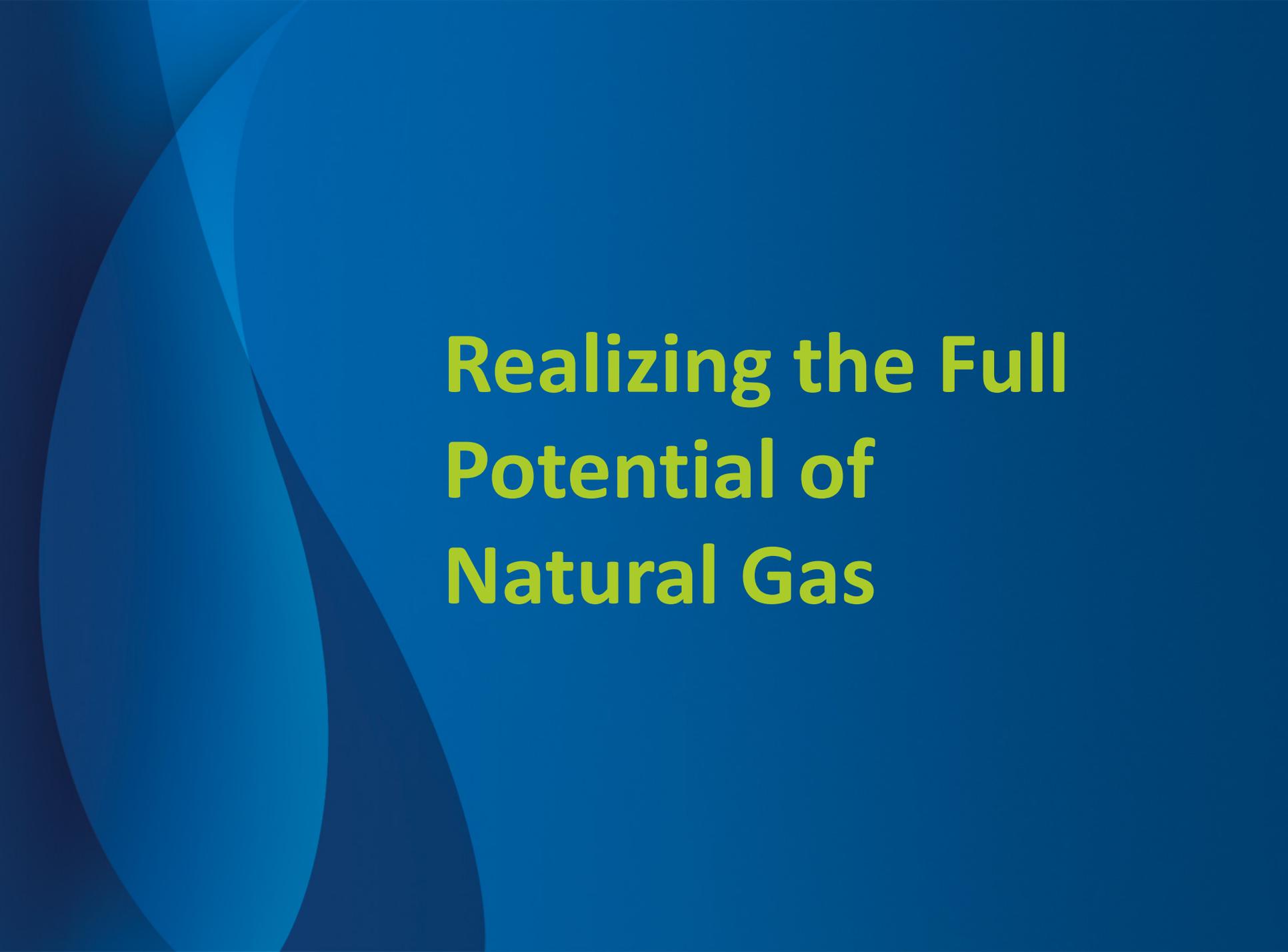


- Interstate Pipelines
- Intrastate Pipelines

States with Accelerated Infrastructure Replacement Programs



- *The overall trend is positive*
- *Nine states moved to adopt programs in 2013, alone*
- *NJ, MA, PA & DC adopted pipeline safety measures in 2014*
- *West Virginia passed legislation earlier this year*
- *States address this issue differently*
- *The basis for these decisions is always just and reasonable rates for consumers*

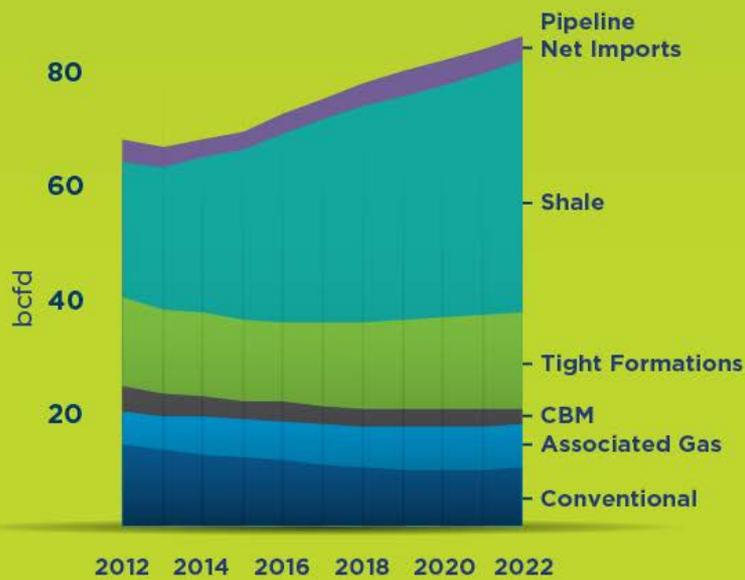
The background is a solid dark blue color. On the left side, there are several overlapping, semi-transparent circles in various shades of blue, creating a layered, abstract effect. The text is centered on the right side of the image.

Realizing the Full Potential of Natural Gas

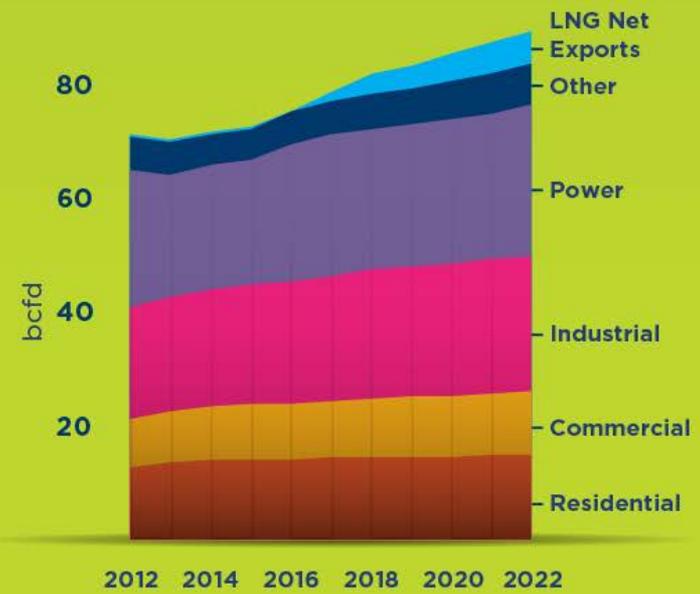
The Promise of Natural Gas

For the next decade and beyond, domestic natural gas supplies are expected to be sufficiently robust. Strong changes in natural gas demand across all sectors can be met primarily by domestic natural gas production led by continued development of shale gas resources and more traditional supplies.

Natural Gas Supply

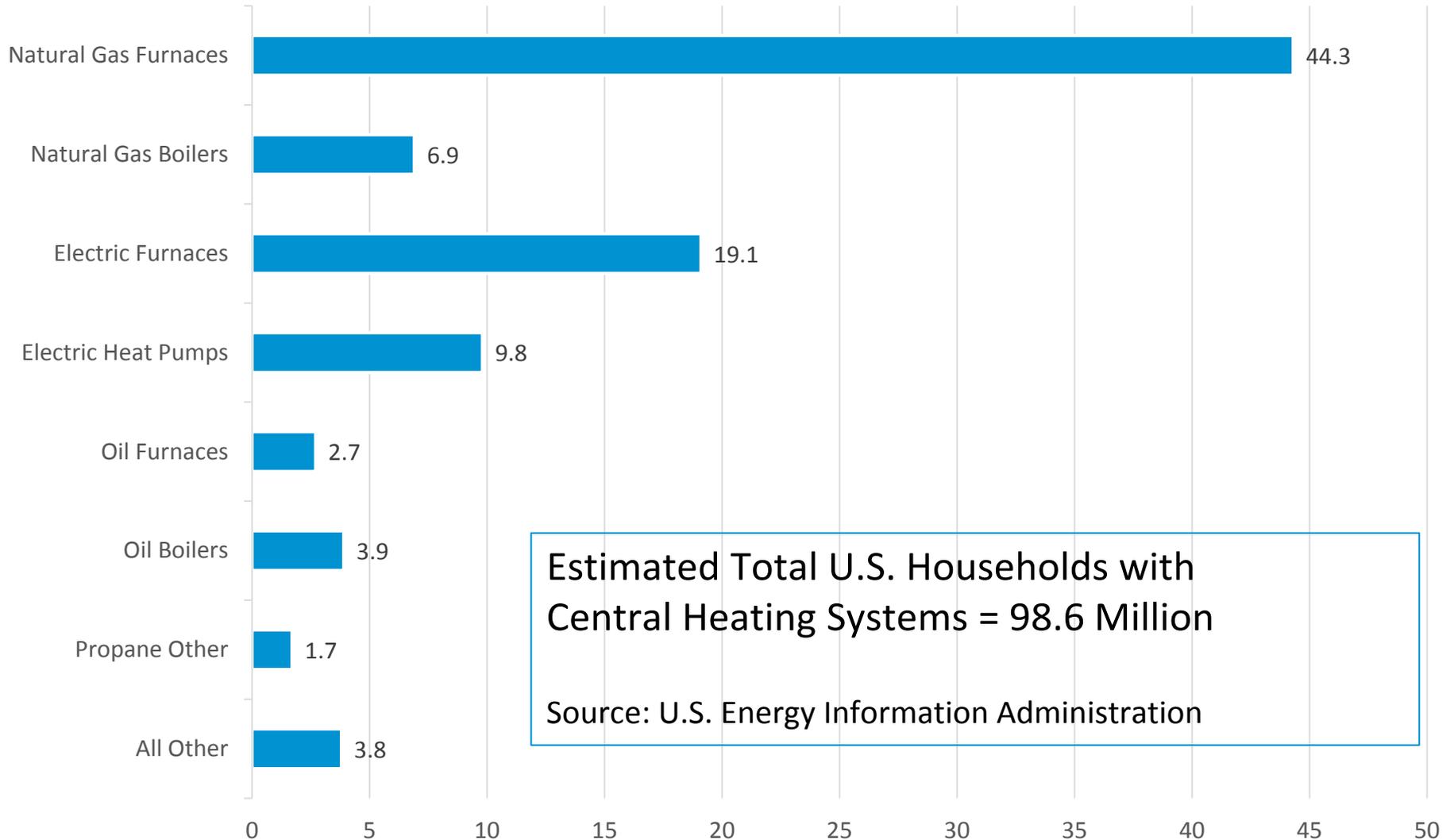


Natural Gas Use



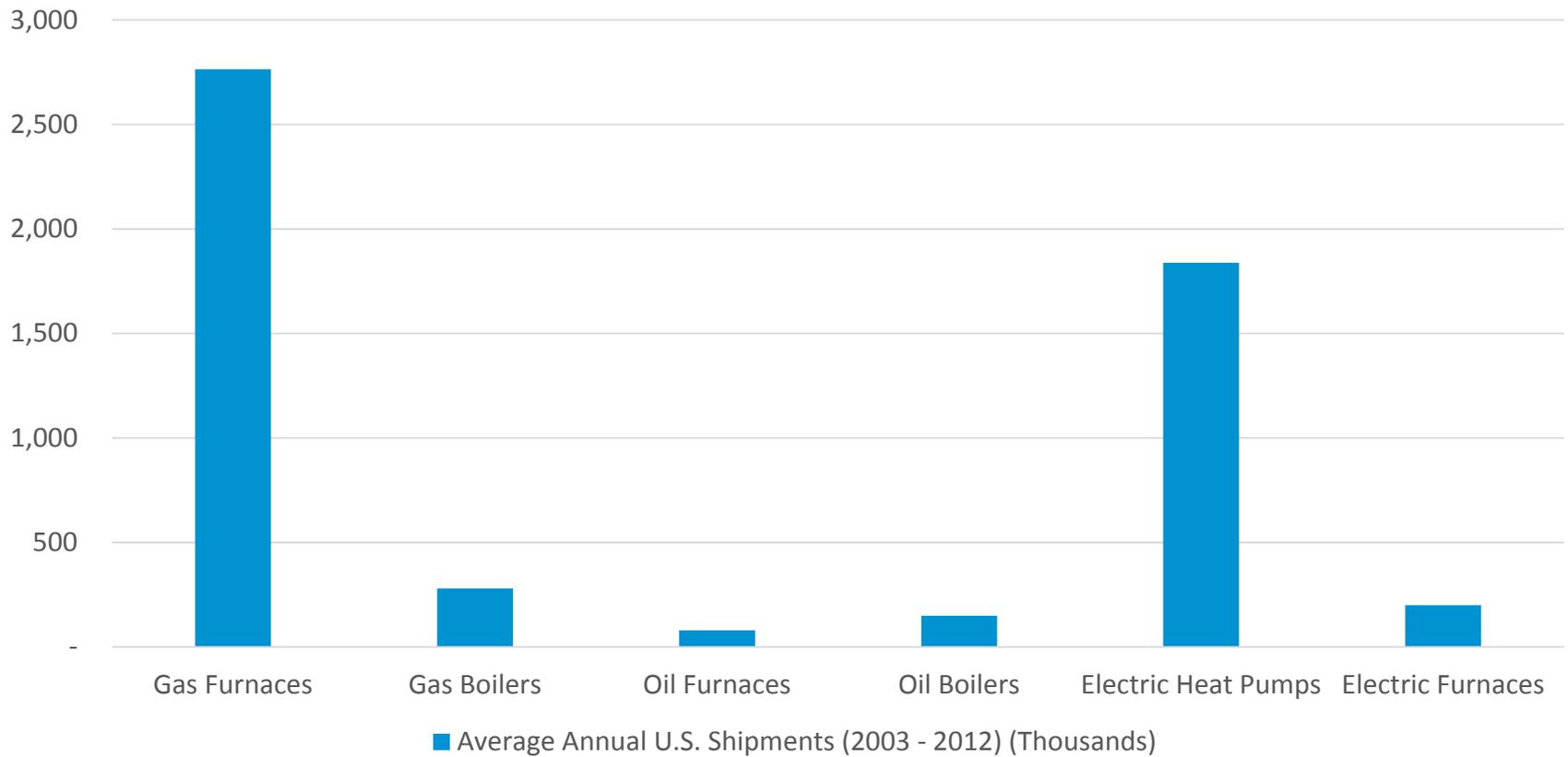
U.S. Homes with Central Heating Systems

Number of Homes (Millions) By Type of Heating System



Estimated Average Annual Shipments of Central Heating Systems – (2003 -2012)

Shipments By Type of Heating System (Thousands)



The background is a solid blue color with several large, overlapping, semi-transparent blue shapes on the left side, creating a layered, abstract effect. The text is centered on the right side of the slide.

Policies Impacting Future CHP Deployment

EPA Clean Power Plan Uses Section 111(d) of the Clean Air Act

Affected Sector: Existing Power Plants CO₂ Emissions



- **Legal Debate over Setting Goals:** EPA's authority to look "outside the fence" *in setting emission reduction goals*
- **Separate Issue- How to Achieve the Goals:** Flexibility to achieve the goals using "outside the fence" measures

EPA's Clean Power Plan:

Goal Setting for Each State

EPA Has Set Goals for Each State Based on Reductions Achievable with Three “Building Blocks”

1. Power Plant Heat Rate Improvements
2. Shift Dispatch to Cleaner Affected Units (i.e. NGCC Turbines)
3. Increased Use of Renewables and Nuclear Plants



Pleasants Power Plant, Belmont, WV

EPA's Clean Power Plan:

Flexible Compliance Options for States to Achieve Goals

States are not restricted or limited to use the measures EPA used to set goals

Measures that reduces demand for and thus emissions from existing fossil fuel power plants could be included in state plans including:

- Distributed Renewables
- Demand-side energy efficiency programs
- **Combined Heat and Power systems**

Summary of Key Themes and Takeaways

- **Shale Gas Abundance**
- **Production and Price Impacts**
- **Relative Market Stability**
- **Demand Growth is Needed**
- **Technology From Wellhead to Burner Tip**
- **Expanding Pipelines and Capacity**
- **Affordable and Efficient Residential Scale CHP could be a game changer**

Richard Murphy

Managing Director, Sustainable Growth

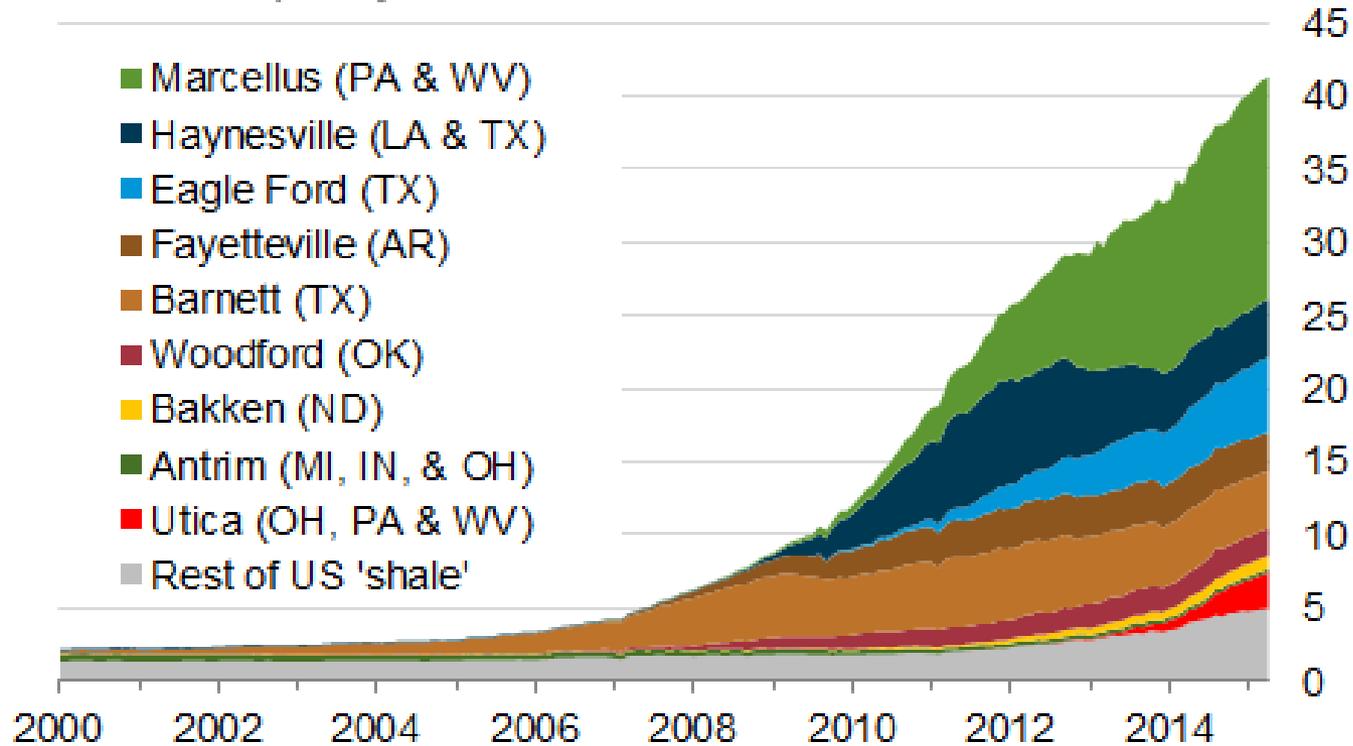
rmurphy@aga.org

P: 202.824.7301



US Shale Gas Production

Monthly dry shale gas production
billion cubic feet per day

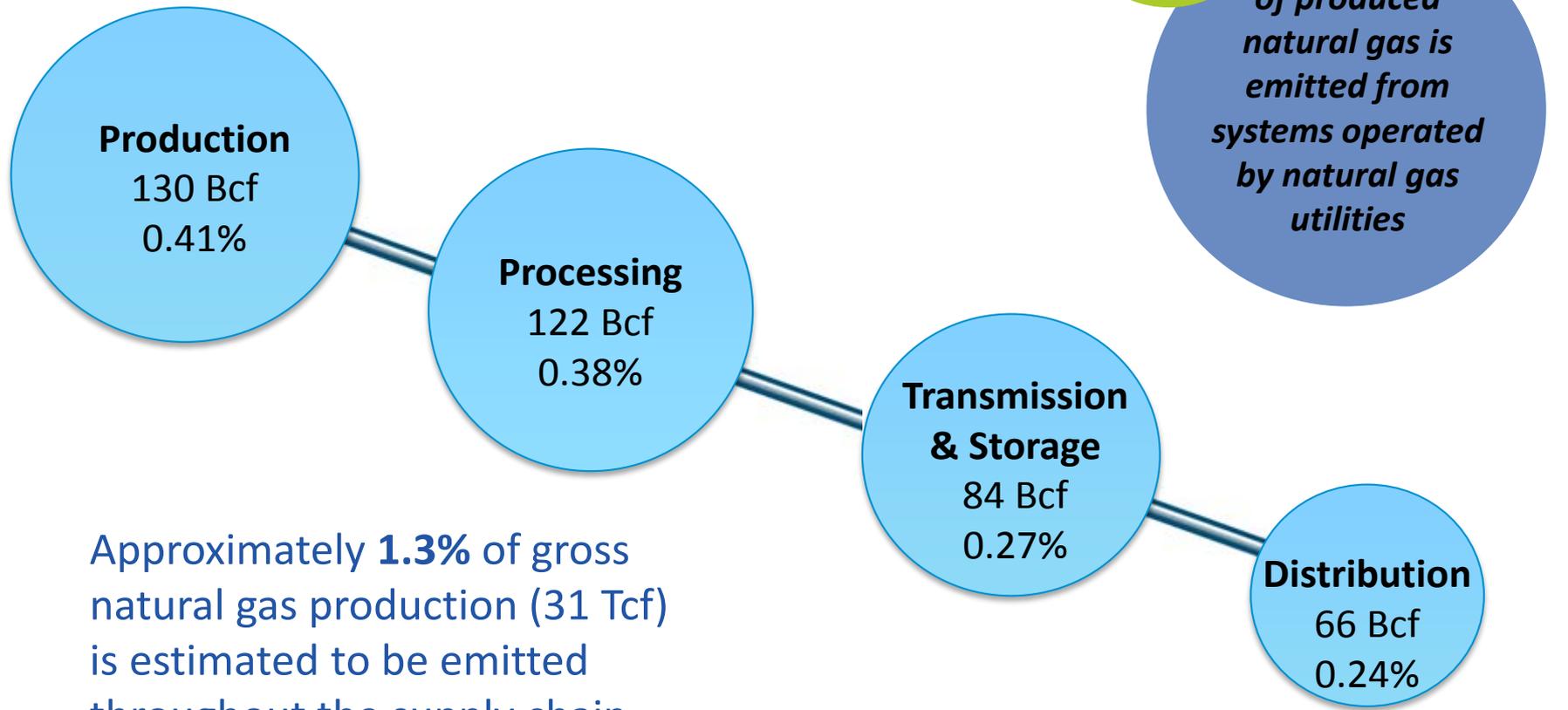


Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through April 2015 and represent EIA's official shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).



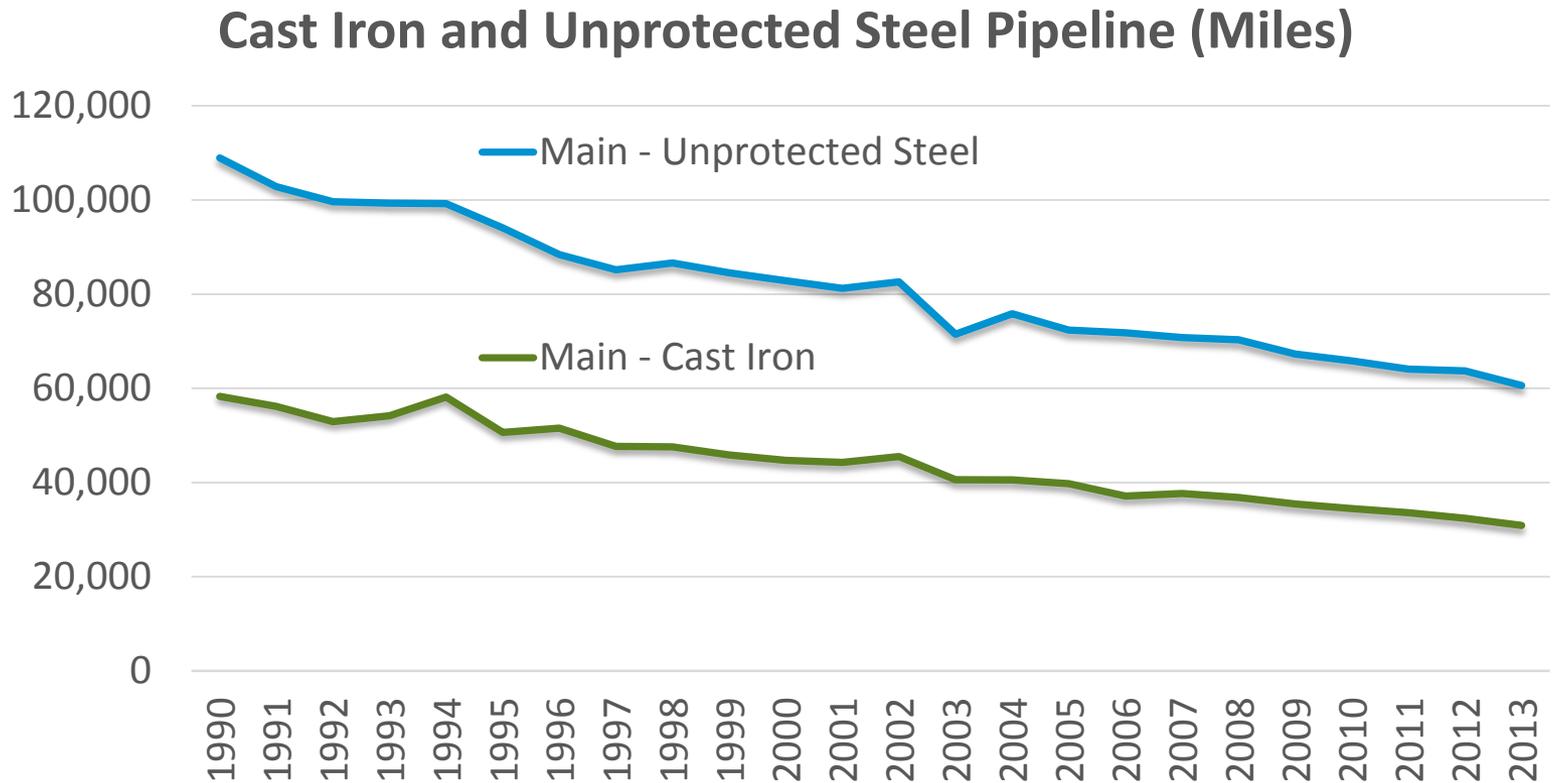
Source: US Department of Energy, Energy Information Administration.

Natural Gas Value Chain Emissions Leakage Rates



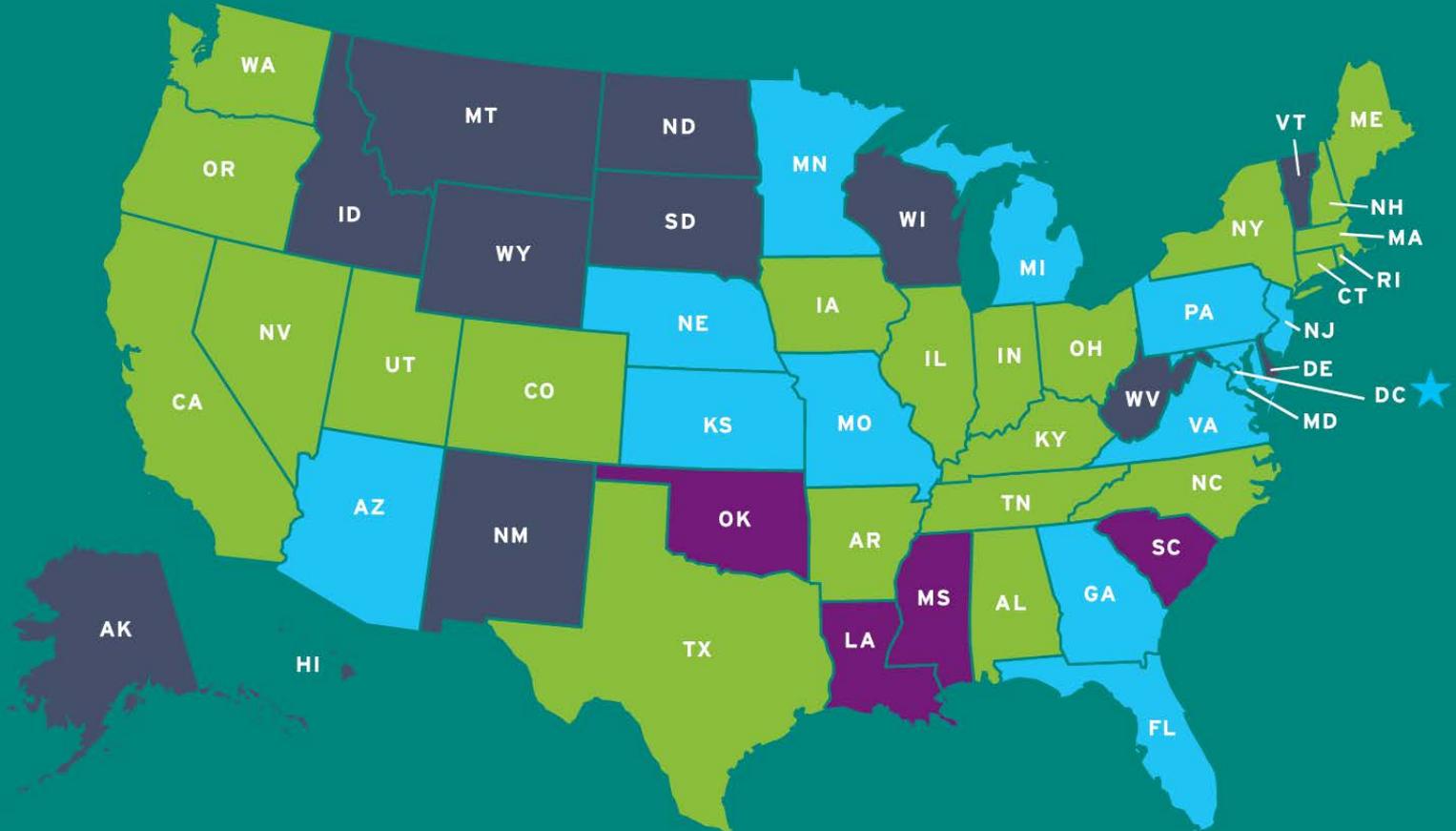
Approximately **1.3%** of gross natural gas production (31 Tcf) is estimated to be emitted throughout the supply chain.

System Modernization Has Been a Decades Long Process and Will Continue



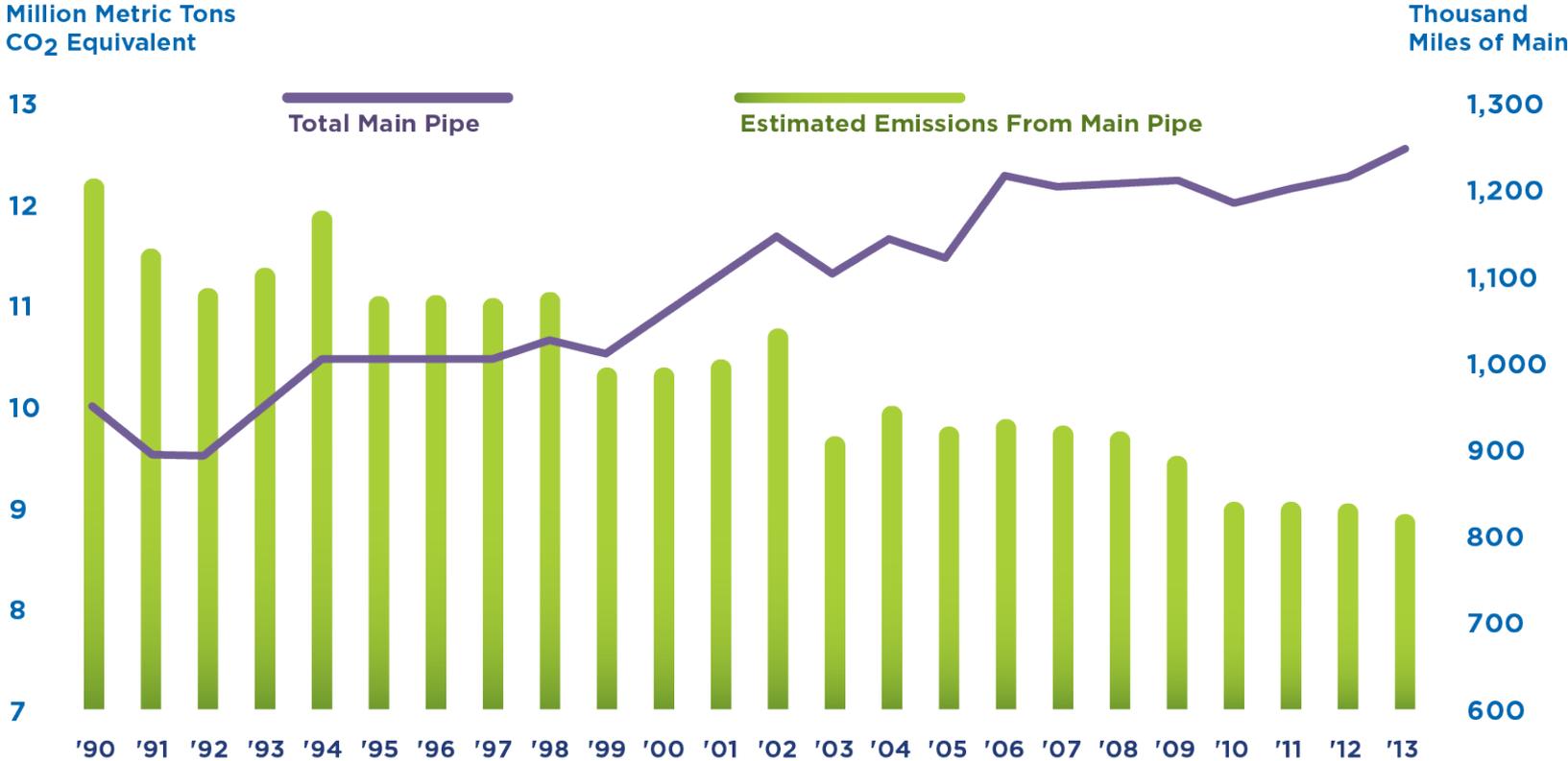
Source: Department of Transportation

States with Innovative Infrastructure Cost Recovery Mechanisms



- Cost Recovery Tracker (22)
 - Surcharge (12)
 - Rate Stabilization Mechanism (4)
 - No Cost Recovery Tracker or Surcharge (12)
- * As of December 2014

Emissions Have Declined Even as Pipelines Have Expanded

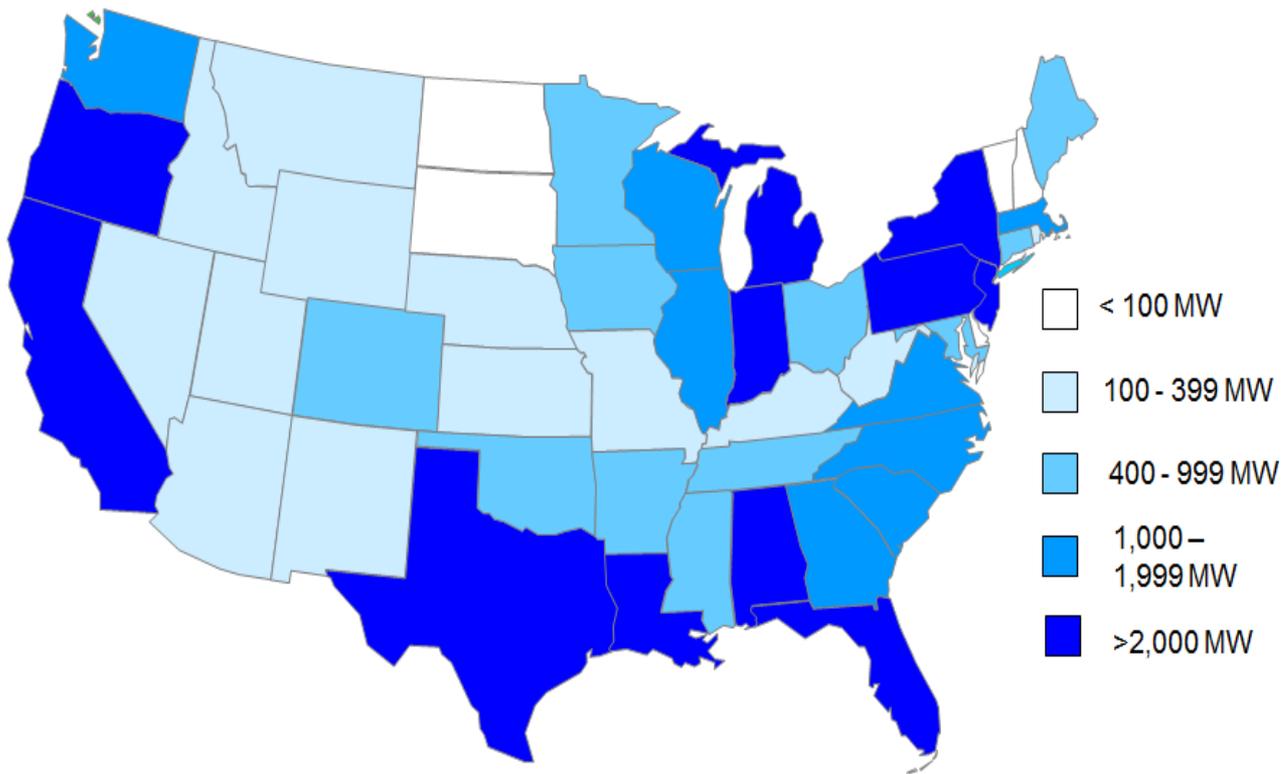


Replacing pipelines with protected steel and plastic materials can reduce emissions more than 95%.

Securing Pipeline Capacity

- **The pipelines operate as they are designed on peak days**
 - Facilities are designed to support primary firm obligations
- **Most generators in region do not have firm contracts**
 - On peak days, only firm services will be assured flow
 - Absent firm commitments, generators may not have gas supplies to meet electric generation needs
- **Generators indicate that the regional electric market does not provide incentives for them to enter into firm contract arrangements, or to utilize alternate fuel back-up**
- **Infrastructure counts...**
 - Pipeline investments would ease regional gas constraint points and lower prices... *pending customer commitments*

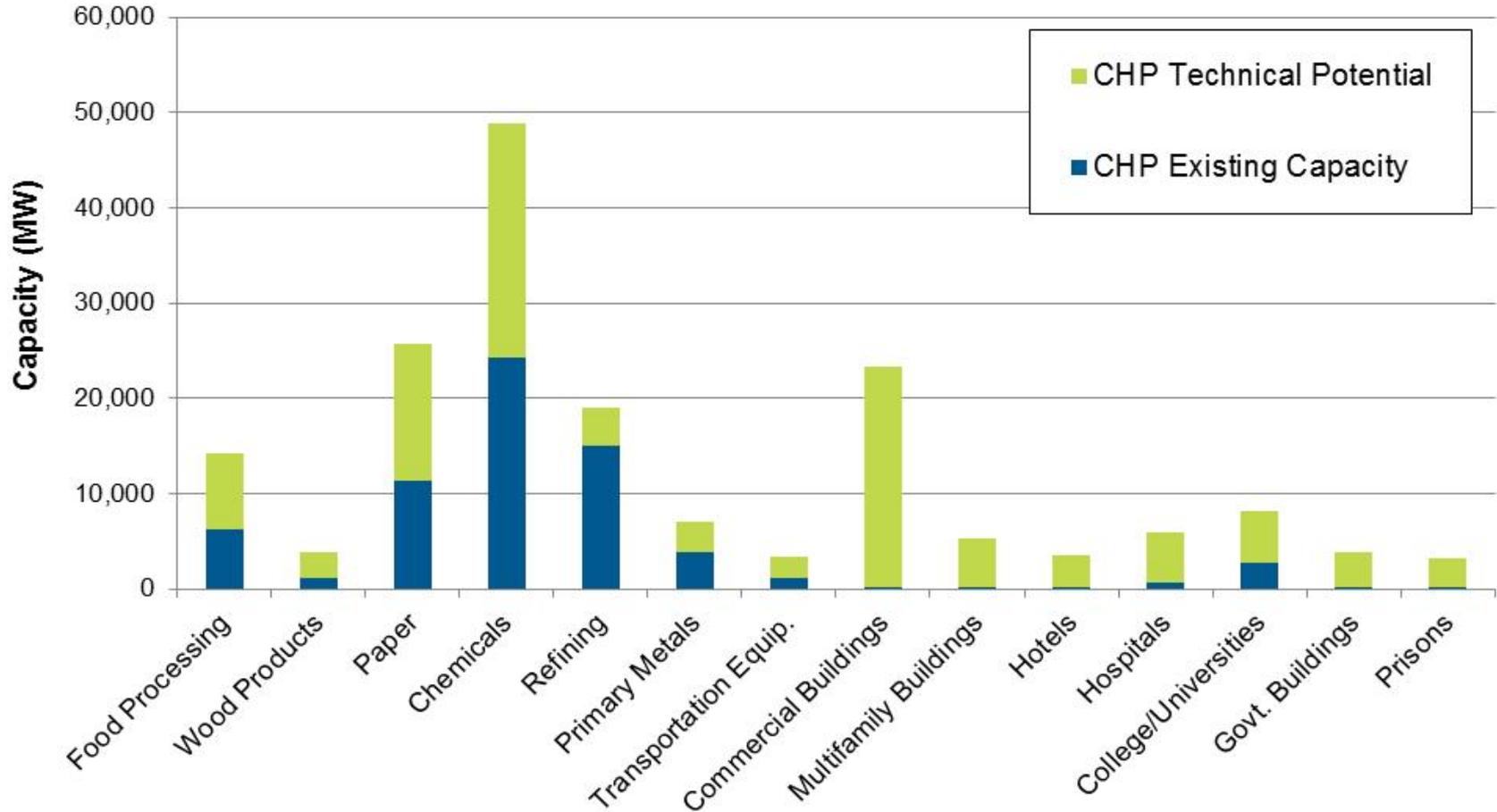
Existing Installed CHP



- 82 GW of installed CHP at over 4,100 industrial and commercial facilities (2012)
- Natural gas based CHP concentrated in Northeast, Gulf Coast, Midwest and California
- Northwest and Southeast have high concentration of sites in forest products and paper industries

71% is natural gas based, consuming an estimated 4.2 Tcf annually

Technical Potential of 123.3 GW (CHP systems > 50 KW and < 100 MW)



Source: ICF International