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FUNDS

NATURAL GAS *White Paper*

The Growing Importance of Natural Gas

Fueled by advances in drilling technology, natural gas has become an abundant energy source and is quickly becoming America's domestic energy solution. In fact, it is believed that the U.S. now has a 100-year supply – even with increasing demand.¹

Recent changes in the natural gas industry have had significant implications on the way individuals and businesses consume energy and view energy independence in America. In this paper, we provide an overview of this transformation and offer a glimpse of the impact on the U.S. economy.

Executive Summary

For the past decade, the natural gas industry has been undergoing a revolutionary transformation. Due to advances in drilling technology, vast amounts of natural gas have been unlocked. With an abundant supply within the U.S. borders and under America's control, natural gas is quickly replacing other fossil fuels as America's energy source of choice.

In just a few years, demand has risen appreciably and is expected to continue to do so for decades to come. According to the U.S. Energy Information Administration (EIA), consumption of natural gas is projected to increase over 40% globally by 2040.¹ Natural gas is environmentally friendly, relatively inexpensive and has wide application in American commerce. Demand drivers are far-reaching and include numerous industries and initiatives. Currently, natural gas is making significant headway as a replacement for coal in power generation, as exports via pipelines and liquefied natural gas (LNG), and as a feedstock for chemical companies.

With abundant supplies available, natural gas has enabled America to rethink its energy needs, and numerous changes, sparked by technological advances across multiple industries, are underway. America has the opportunity to be energy independent over the long term; in fact, the EIA projects that the U.S. will export more natural gas than it imports in 2017 and throughout 2018.

We believe that we are currently in the early stages of a major energy transformation in the U.S. and that natural gas will play a primary role over the next several decades.



NATURAL GAS – AMERICA’S ENERGY SOURCE OF CHOICE

Due to advances in drilling technology over the past several years, vast reserves of natural gas have been uncovered in the United States. This discovery has significant implications for the usage of natural gas compared to other fuel sources, and it paves the way for rising demand. With an estimated supply of over 100 years within U.S. borders, the possibilities for natural gas to transform domestic energy consumption are far-reaching.¹

THREE IMPORTANT ADVANTAGES

I. ENVIRONMENTALLY FRIENDLY

The environmental impact of America’s various energy sources causes much debate with regard to global warming, natural climate change and potential contributing factors caused by burning fossil fuels. Compared to coal and oil, natural gas offers important environmental advantages:

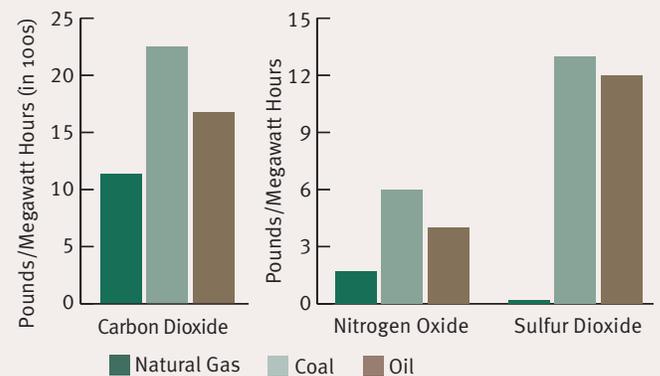
- 1. Less Carbon Dioxide** - Natural gas as a fuel source is much “greener” than alternative fossil fuels. A byproduct of the combustion of fossil fuels is carbon dioxide (CO₂). Burning any organic matter will emit levels of CO₂, but the amounts vary widely. When used as fuel, natural gas produces roughly half as much CO₂ as coal and 32% less than oil, according to the Environmental Protection Agency (EPA).
- 2. Fewer Pollutants** - In addition to emitting lower levels of CO₂, natural gas emits far fewer pollutants into the air. Burning natural gas produces less than

1% of the amount of sulfur dioxide compared to coal or oil.

Sulfur dioxide is a major pollutant that has been linked to respiratory disorders and heart disease. Additionally, natural gas emits less than half the amount of nitrogen oxide (the main component of smog) of oil and less than a third than that of coal.

POLLUTANT EMISSIONS FROM FOSSIL FUEL COMBUSTION

The combustion of natural gas emits far fewer harmful chemicals than the burning of coal or oil.



Source: U.S. EPA, eGRID 2000

II. LOWER RELATIVE COST DRIVES NEW INITIATIVES

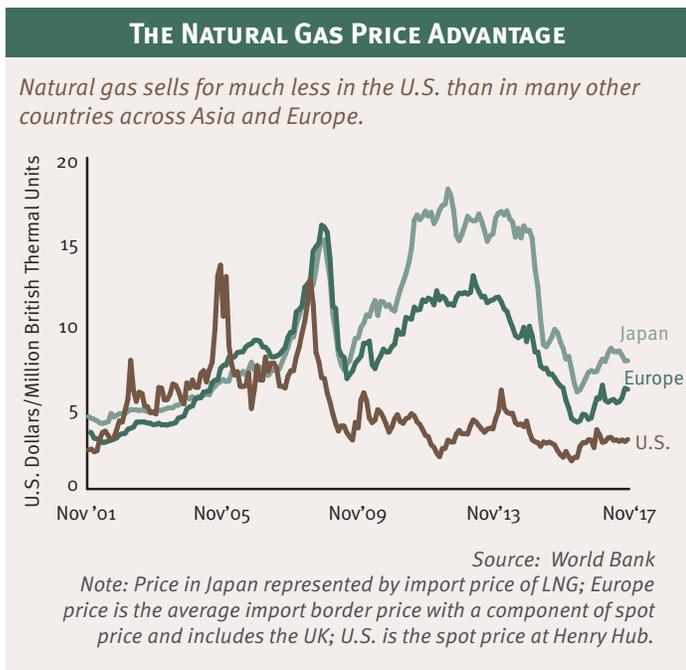
Due to abundant reserves within U.S. borders, natural gas has seen a steady decline in price and is often less expensive than equivalent units of alternative fuels.

After years of having closely aligned prices, natural gas has become a less expensive energy source relative to crude oil. The disparity in price began in 2005 and continues as of the date of this report. Regardless of the significant drop in crude oil prices resulting from ample supply and moderating demand that began in mid-2014, oil prices remain elevated compared to natural gas. Because of the growing supplies of natural

1. U.S. Energy Information Administration.

gas, this gap is expected to continue for the next few decades.

Not only is natural gas priced lower than oil, natural gas is also less expensive in the U.S. compared to many other countries. In fact, even after shipping, natural gas remains cheaper than it is across many continents. As of November 2017, the LNG prices at the terminals in South America and Asia were more than double the terminal price in the U.S., presenting a huge potential market for U.S.-based exporters.²



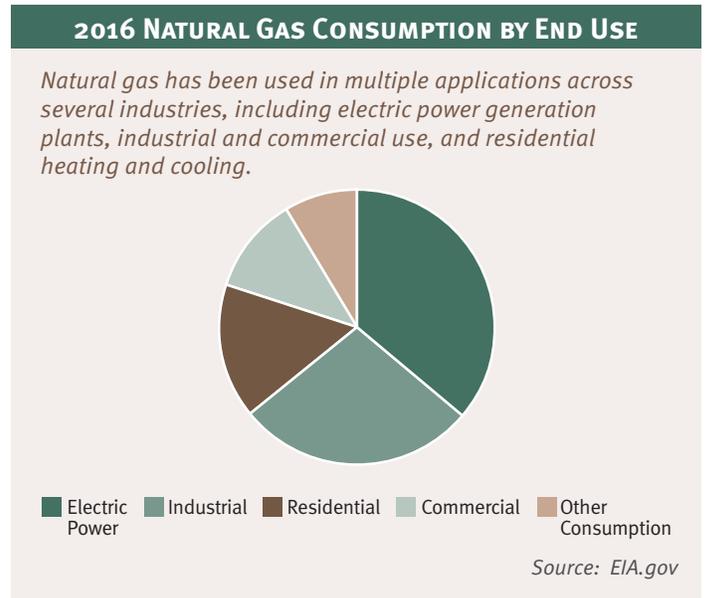
III. THE POSSIBILITY OF ENERGY INDEPENDENCE

The vast supply of the natural gas within U.S. borders may provide America the opportunity to become energy independent and less reliant on politically unstable countries for its energy needs. In fact, according to a 2016 report by the International Index of Energy Security Risk, the U.S. was among the top

five most energy-secure nations. While the U.S. has significant oil reserves, the OPEC countries, including Iran, Iraq and Venezuela, still dominate oil production. As such, these nations have a significant influence on oil prices. A natural gas-based economy can allow America the opportunity to control its own energy destiny.

SIGNIFICANT DEMAND INITIATIVES

Because of the advantages that natural gas offers, it has quickly become the energy source of choice for many applications. In fact, we believe we are only at the beginning of a long-term secular trend that favors natural gas over alternative fuels. Many industries, including chemical manufacturers and transportation, are turning to natural gas to increase efficiency and operate at a lower cost. With one terminal open and additional facilities approved and construction underway in 2016, U.S. companies began exporting natural gas.



2. Federal Energy Regulatory Commission, “National Natural Gas Market Overview: World LNG Landed Prices,” November 2016.



With an abundant supply, low and stable prices and the positive environmental impact of natural gas, we anticipate increased demand for many years to come. The following provides a brief overview of select applications that are quickly transforming the way natural gas is used.

- 1. Power Generation:** One of the largest demand drivers for natural gas is its application as a fuel source for electricity generation power plants. In 2016, electric power plants comprised 36% of natural gas consumption in the U.S. Over the next several years, this share is anticipated to increase due to a drive to provide clean energy solutions and reduce toxic air pollution.

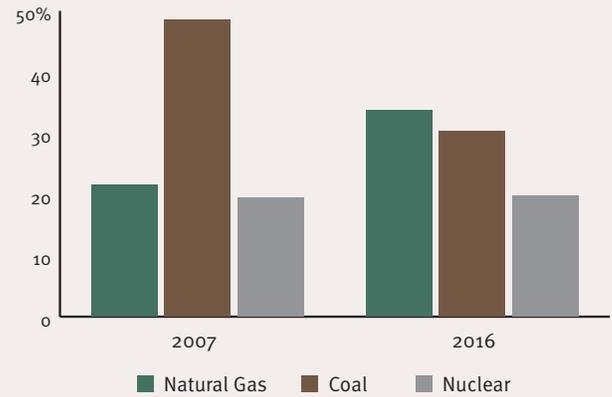
The EPA's 2011 Mercury and Air Toxics Standards for Power Plants have played a role in the retiring of coal-fired electricity generation plants, as stricter standards were set for reducing hazardous air pollutants. While retrofitting units to install pollution controls is an option for coal-fired generators, the cost is usually prohibitive. Hence, aging coal-fired plants have constituted the majority of generating capacity retired in recent years.

Of new and additional generating capacity, natural gas has been a fuel of choice for power plants due to its cleaning burning qualities. In fact, natural gas use has exceeded coal use in monthly electric power generation consistently since mid-2015.

- 2. Exportation:** U.S. natural gas production has increased to not only satisfy domestic demand but also help meet foreign needs via U.S. shipments of LNG overseas and growing pipeline exports to

THE ENERGY SOURCE OF CHOICE

What a difference a decade makes in U.S. energy. While total energy generation slightly declined from 2007 to 2016, natural gas generation grew 54%, while coal generation declined 39%.



Source: EIA

Mexico. In fact, the EIA projects that the U.S. will export more natural gas than it imports in 2017 and throughout 2018.

In 2016, U.S. exportation of natural gas began in earnest with the opening of the new LNG Sabine Pass terminal in Louisiana. From February 2016 through September 2017, several LNG shipments left the U.S. and headed to various countries around the world. Top countries receiving cargoes include Mexico, South Korea, China, Chile and Japan.³ In addition, the Panama Canal expansion project widened the waterway to accommodate LNG tankers, which has significantly reduced shipping costs and travel time from the U.S. to key markets in Asia and the west coast of Latin America.

Over the next several years, numerous U.S. export terminals are expected to come online. With five additional LNG projects under construction as of August 2017, the EIA projects that total U.S.

3. U.S. Department of Energy, Office of Oil & Natural Gas.

liquefaction capacity could more than triple by the end of 2019.

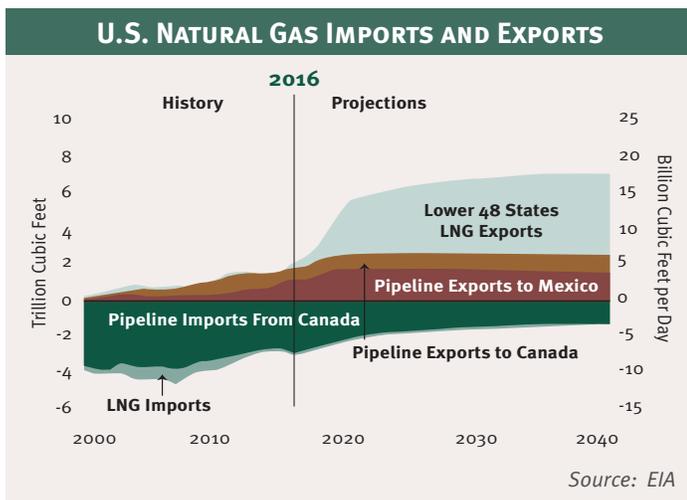
With new pipeline projects in the U.S., we anticipate increased volumes of natural gas to be exported to Mexico. Growing use of natural gas in Mexico’s power sector as well as declining production has led to an increase in natural gas imports from the U.S.⁴

In addition, pipeline imports from Canada are expected to decline, as the U.S. has decreased its reliance on Canadian imports to meet demand. These factors cumulatively have led to the projection that natural gas exports will grow five-fold between 2016 and 2040.

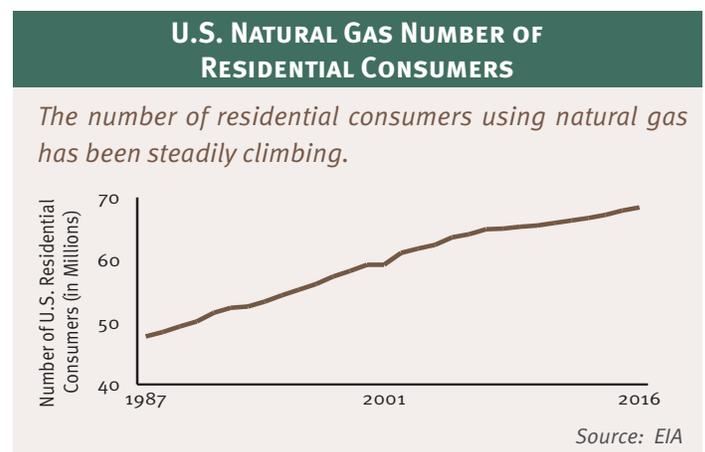
companies to build new plants, as well as expand or improve their facilities to increase capacity in the U.S. The American Chemistry Council has estimated that over 310 projects and \$185 billion in potential capital chemical industry investments from shale gas were announced from 2010 through July 2017.⁵ Due to these investments, the U.S. chemical industry will likely continue capturing market share relative to the rest of the world as well as increasing their use of natural gas and ethane.

- Residential:** Due to the favorable price of natural gas compared to heating oil, Americans have increasingly sought to heat their homes using natural gas. In fact, according to the EIA, the number of natural gas residential customers has nearly doubled since 1970, although energy efficiency has kept total residential consumption virtually the same over the past four decades.

Throughout the U.S., multiple pipeline projects are underway that will allow for additional natural gas end users throughout the country. Thirty-nine states now have innovative programs that incent upgrades and expansions of pipelines.



- Chemical/Industrial Use:** The energy renaissance has triggered a manufacturing boom in the U.S., especially in the chemical industry. Chemical companies use ethane, a liquid derived from shale gas, as a feedstock to produce more than 90% of all U.S. manufactured goods.⁴ Competitively priced natural gas and ethane have spurred chemical



4. American Chemistry Council.
5. American Gas Association.



There have also been residential conversions from oil to natural gas, where available, as current economics favor natural gas. We believe an ongoing expansion of natural gas usage in residential communities, which previously relied on oil for home heating and cooling, will continue.

- 5. Transportation:** While petroleum is the most-consumed fuel used in the transportation sector, the use of natural gas is growing. Medium- and heavy-duty vehicles make up approximately 5% of total highway traffic but account for about one-fifth of oil use in the U.S. transportation sector. Due to domestic efforts to reduce greenhouse gas emissions and the nation's reliance on oil, the EPA and the U.S. Department of Transportation has put forth vehicle and engine performance standards to promote the use of more fuel-efficient trucks.

Currently, public transit buses currently represent the largest vehicle user of natural gas, with about 20% running on compressed natural gas (CNG) or LNG. Every year, approximately 60% of new trash collection vehicles and 40% of new buses sold are powered by natural gas, according to NGVAmerica, a national organization dedicated to the natural gas vehicle market. With this increase of new vehicles, infrastructure for refueling continues to accelerate: From 2012 to the end of 2016, the number of CNG stations increased 50% to over 1,700.⁶

AN INDUSTRY WITH MANY COMPONENTS

With the natural gas boom, growing consumer demand and America's competitive advantage, we believe investors may benefit from exposure to companies involved in the production, transportation and storage

of natural gas, each of which plays an important role in delivering natural gas to the end user. With a highly developed supply chain, natural gas companies can generally be segmented by their function into two broad categories:

- 1. Extraction & Production (E&P)** firms are involved in locating land with natural gas reserves and extracting natural gas through hydraulic fracking and other methods.
- 2. Distribution companies** are focused on storing, transporting and delivering natural gas to end users:

Pipeline: Pipeline companies transport natural gas. They build and operate the high capacity interstate pipelines that carry gas from extraction sites to the distribution firms that control supply to the end user.

Distribution: As the name implies, distribution firms deliver natural gas to customers. While some larger industrial customers may receive natural gas directly from a high capacity pipeline, most users obtain their natural gas supply from their local gas utility company. Local companies are either owned by investors or are operating as public gas systems owned by regional and local governments. Distribution firms take delivery of gas from large high volume pipelines and distribute it to end users for heating, transportation or power generation.

Liquefied Natural Gas (LNG): The process of converting gaseous natural gas to its liquid form is important for transporting purposes. LNG takes up 1/600th the volume of natural gas in its gaseous state and is therefore much easier to transport over great distances to places not currently serviced

6. NGVAmerica and the International Energy Agency.

by pipelines. The growing importance of LNG provides the opportunity for U.S. operators to export natural gas overseas where the current price of the commodity is higher.

Storage: Like many other commodities, natural gas can be stored for almost indefinite periods of time. Storage firms are in the business of storing natural gas reserves. There are several reasons that firms may do this: One reason is to maintain the orderly flow of

natural gas in the pipelines, and another is to meet and balance the supply of natural gas given rising demand.

E&P companies tend to be affected by the price of natural gas, whereas companies involved in distribution of natural gas tend to benefit from lower prices. Lower commodity prices are a driver for growth in the distribution area of the industry.

Final Thoughts

In just a few short years, natural gas has changed the way America consumes energy. With our new-found vast domestic supply, we believe natural gas' advantages relative to alternative fuels are becoming readily apparent. Numerous industries are turning to natural gas because it is clean, cheap, abundant and under our political control. With consumption of natural gas rising and projected to do so for decades to come, we believe that investors may potentially have the opportunity to benefit from the growing importance of natural gas well into the future.

About The Authors

Ryan Kelley, CFA Portfolio Manager

Ryan brings nearly 20 years of analyst, trading and portfolio management experience to Hennessy Funds. Ryan has served as the Portfolio Manager of the Hennessy Gas Utility since 2013. He began as an associate in corporate finance at FBR & Co., a leading investment bank headquartered in the Washington, D.C. area and later joined their institutional equity research team. In 2005 Ryan became a member of the FBR Funds portfolio management team and transitioned to Hennessy portfolio management when the firm acquired FBR in 2012.

Ryan received a BA from Oberlin College and is a CFA charterholder and member of the Boston Society of Financial Analysts.

Brian Peery Portfolio Manager

Brian has over 20 years of experience in the financial services industry, having held institutional sales, trading, research and analyst positions. He began his financial career at a boutique investment research shop working as an equities analyst and went on to manage research and trading for a full service brokerage firm. Brian has been with Hennessy Funds since 2002, where he has served on the Investment and Research Committee and held roles as our Director of Sales and Director of Research.

Brian holds a Bachelor's degree in Economics from the University of Richmond (VA).



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About Hennessy Funds

Founded in 1989, Hennessy Funds has a longstanding track record of performance and offers a broad range of mutual funds, with strategies that can play a role in nearly every investor's portfolio allocation. Our line-up includes traditional equity, specialty category and sector funds, as well as more conservative balanced and fixed income products. Each of the Hennessy Funds employ a consistent and repeatable investment process, combining time-tested stock selection strategies with a highly disciplined, team-managed approach. Our goal is to provide products that investors can have confidence in, knowing their money is invested as promised, with their best interest in mind.

The **Hennessy Gas Utility Fund (GASFX)** offers investors exposure to the natural gas sector. The Fund owns all publicly traded companies that comprise the American Gas Association (AGA) Stock Index. The American Gas Association is comprised of companies that deliver natural gas throughout the U.S., supplying over 90% of American natural gas customers. The AGA Stock Index is market cap weighted and adjusted for the percentage of natural gas assets on each company's balance sheet. The Fund invests in companies approximately in the same proportion as its weighting in the Index, with no company representing greater than 5% of its assets.

Shareholder Services
800-966-4354
fundsinfo@hennessyfunds.com

Financial Professional Help Desk
800-890-7118
advisors@hennessyfunds.com

Important Disclosure

Investors should consider the investment objectives, risks, charges and expenses carefully before investing. This and other important information can be found in the Fund's statutory and summary prospectuses. To obtain a free prospectus, please call 800-966-4354 or visit hennessyfunds.com. Please read the prospectus carefully before investing.

Mutual fund investing involves risk. Principal loss is possible. A non-diversified fund, one that may concentrate its assets in fewer holdings than a diversified fund, is more exposed to individual stock volatility than a diversified fund. Investments in foreign securities may involve political, economic and currency risks, greater volatility and differences in accounting methods. Investments are focused in the natural gas distribution and transmission industry; sector funds may be subject to a higher degree of market risk.

AGA Stock Index is a market capitalization weighted index consisting of member companies of the American Gas Association (AGA). One cannot invest directly in an index. Fund holdings and sector weightings are subject to change and should not be considered a recommendation to buy or sell any security.

References to other mutual funds should not be interpreted as an offer of these securities.

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