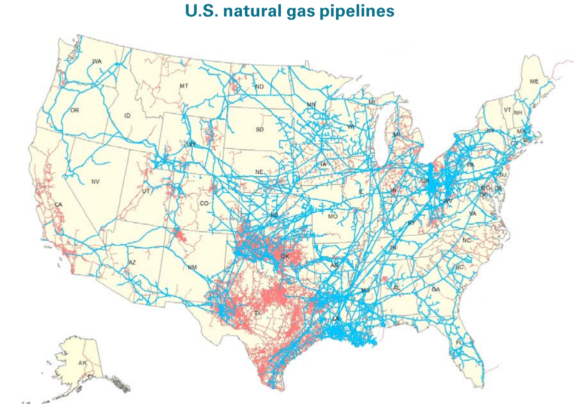
The case for energy infrastructure as a real asset

Real assets are defined as physical assets that have an intrinsic worth due to their substance and properties. Real assets typically include precious metals, commodities, real estate, land, equipment and natural resources. Tortoise defines essential assets as assets and services that are indispensable to the economy and society. In our view, midstream energy infrastructure is one of the most essential real assets, resulting in relatively inelastic demand. Midstream energy companies share some key characteristics such as lower correlation to broad equity markets, steady cash flows and inflation protection because they own and operate the long-lived assets that make up the midstream energy infrastructure.

Midstream energy infrastructure fundamentals	Operating characteristics
Essential assets	Critical assets that fuel our economy
Inelastic demand	Commodities used for daily needs
Recurring revenues	Fee-based, long-term contracts
Inflation protection	Long-term contracts, tariff escalators
Long-lived	Economic lives > 50 years

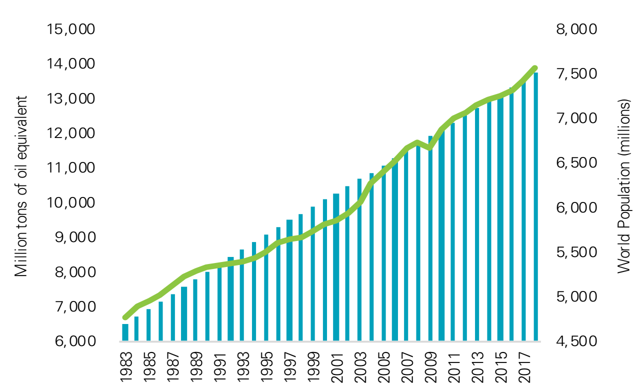
Today, the U.S. has more than two million miles of energy pipelines, the largest network in the world. Across the U.S., natural gas is transported almost entirely by pipeline, and more than 90% of crude oil and refined petroleum products are transported by pipeline at some point. According to the BP Statistical Review of World Energy, global energy demand growth has grown 36 of the past 38 years driven by economic and population growth. Now that the U.S. is a net exporter of energy, providing low cost to the rest of the world, the robust network of pipelines are essential, domestically and across the globe.

U.S. natural gas pipelines



Source: American Energy Mapping (AEM) 2013

Global demand growth



Source: Bloomberg, BP Statistical Review of World Energy 2019

Inflation protection and resilience in a rising interest rate environment

A pipeline attribute that aligns with those of real assets is the potential protection from inflation and rising interest rates. Pipelines typically have long-term contracts with inflation protection from regulated tariff escalators. Tariffs on regulated pipelines often include an inflation escalator. This allows increases aligned with the Producer Price Index (PPI) offering some protection from inflation.

Pipeline transport contracts

Term 5-20 years, complemented with shorter-term contracts for remaining capacity

Tariffs Interstate-FERC regulated | Intrastate-Public Utility

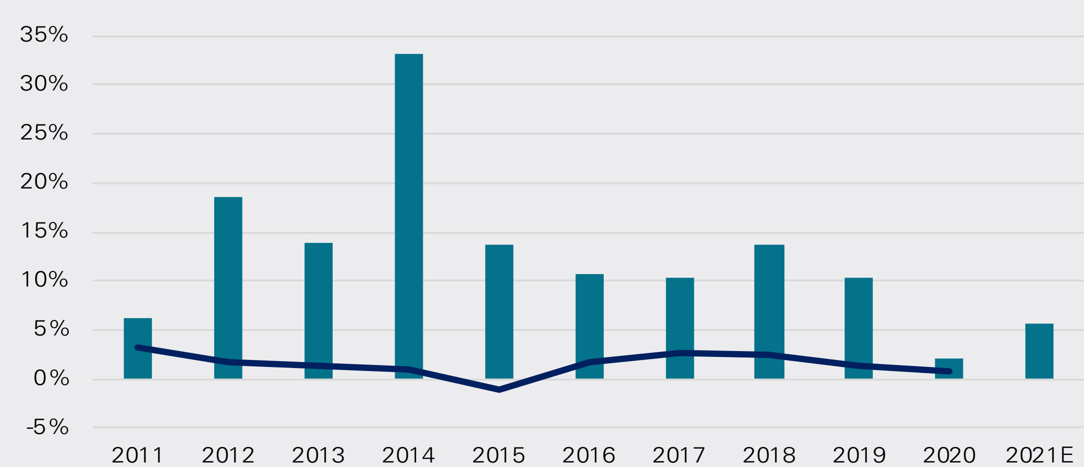
	Oil	Natural gas
Contracted service	Actual volume	Firm access to volume or interruptible volume
Tariff structure	Delivered volume	Capacity reserved and/or volume transported
Inflation escalation	PPI + 0.78	Expectations built into contracts and access to regulatory rate filing proceedings

Source: Bureau of Labor Statistics, FERC. As of 3/31/21. [1]Average PPI of the preceding year's 12-monthly periods, effective through June 30, 2020 for certain oil pipelines.

An estimated PPI tariff escalator of 4.2% is expected to take affect on July 1, 2021 based on the change in PPI plus a fixed rate of 0.78%. Fixed rate is adjusted by Federal Energy Regulatory Commission (FERC) every five years and is based on average annual change in cost of service for the pipelines reporting to FERC less the annual change in PPI for the same period.

If inflation were to pick up, the PPI escalator could increase further in 2022. In fact, in April 2021, PPI rose 0.6%, according to the U.S. Bureau of Labor Statistics and over the past 12 months the gauge spiked 6.2%. This marked the largest increase since the agency started tracking the data in 2010.

Inflation protection and durability



Source: Bloomberg as of 12/31/2020. EBITDA growth is median of TNAP Index. Inflation is measured by the annual change in the PPI Index. The projections above are based on industry estimates and are no guarantee of future outcomes.

Tortoise

In periods where interest rates have risen, midstream returns have proved differentiated from other yield-oriented asset classes. Midstream companies as measured by the Tortoise North American Pipeline Index℠ outperformed bond returns in 12 of 15 periods of rising rates since 2000 by an average margin of 9.0%. Similarly, midstream companies outperformed Equity REIT returns in 11 of 15 periods of rising rates since 2000 by an average margin of 6.3%. Historically, midstream energy companies have experienced short-term volatility when interest rates increased, followed by a rebound and solid long-term performance. We believe that although these real assets are not immune to rising interest rates, they remain attractive long-term investments in both periods of economic growth and uncertainty.

Time periods with rising rates since 2000	10-year Treasury yield change	TNAP Index returns	Bond returns	Equity REIT returns
Averages	0.9%	7.4%	-1.6%	1.1%

10-year Treasury yield change source = Bloomberg. Pipeline returns source = Tortoise North American Pipeline Index℠ (as of 1/1/2000). Bond returns = Bloomberg Barclays U.S. Aggregate Bond Index. Equity returns source = S&P 500® Index. It is not possible to invest directly in an index. **Past performance is no guarantee of future results.**

Time Period*	10yr Treasury Yield Change	TNAP Index Returns	Bond Returns	Equtiy REIT Returns
3/01-6/01	0.5%	(1.4%)	1.1%	9.2%
11/01-3/02	1.2	1.7%	(1.9)	13.4
10/02-11/02	0.6	2.7%	(0.5)	(1.4)
6/03-8/03	1.1	2.6%	(2.9)	6.5
4/04-5/04	0.8	(2.8%)	(3.0)	(9.2)
9/05-6/06	1.1	5.0%	(1.2)	10.7
4/08-5/08	0.6	11.5%	(0.9)	6.0
1/09-6/09	1.3	10.9%	1.9	(15.0)
12/09	0.6	7.0%	(1.6)	6.6
9/10-3/11	1.0	32.1%	(0.8)	18.0
5/13-8/13	1.1	(2.6%)	(3.7)	(14.3)
2/15-6/15	0.7	(1.9%)	(2.2)	(12.4)
8/16-1/17	1.0	10.6%	(3.0)	(9.6)
9/17-4/18	0.8	(3.5%)	(2.3)	(7.2)
10/20-3/21	1.1	39.1%	(2.7)	15.4
Averages	**0.9%**	**7.4%**	**(1.6%)**	**1.1%**

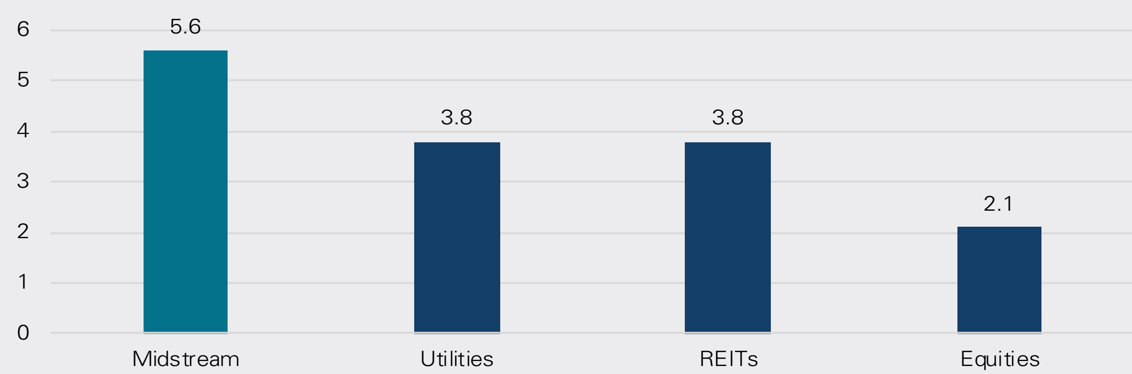
As of 6/2/2021 *Time periods are determined using end of month yields and returns. Periods shown are those where the 10-year Treasury yield increased by at least 50 basis points over one or more consecutive months. Returns are period-specific and are not annualized.

Higher rates historically are a result of increasing inflation expectations. Pipelines benefit from both increased economic growth with energy demand correspondingly increasing and from inflation with tariff protection.

Long-term performance potential with steady cash flows

Midstream energy companies offer attractive total return potential in a defensive sector. The contract structure of the pipeline assets they own, combined with steady long-term demand growth has led to predictable and steady recurring cash flow growth over time. These fee-based cash flows have remained stable, even through volatile markets. They exhibit attractive, sustainable yields that is compelling relative to other yield-oriented securities.

10-year average yields[2]



Midstream energy also demonstrates a lower correlation to broad equity and fixed income markets, providing potential portfolio diversification.

10-year correlation vs. midstream energy

	TNAP Index
Utilities	0.41
REITs	0.66
Equities	0.74
Crude oil	0.55
Bonds	0.10

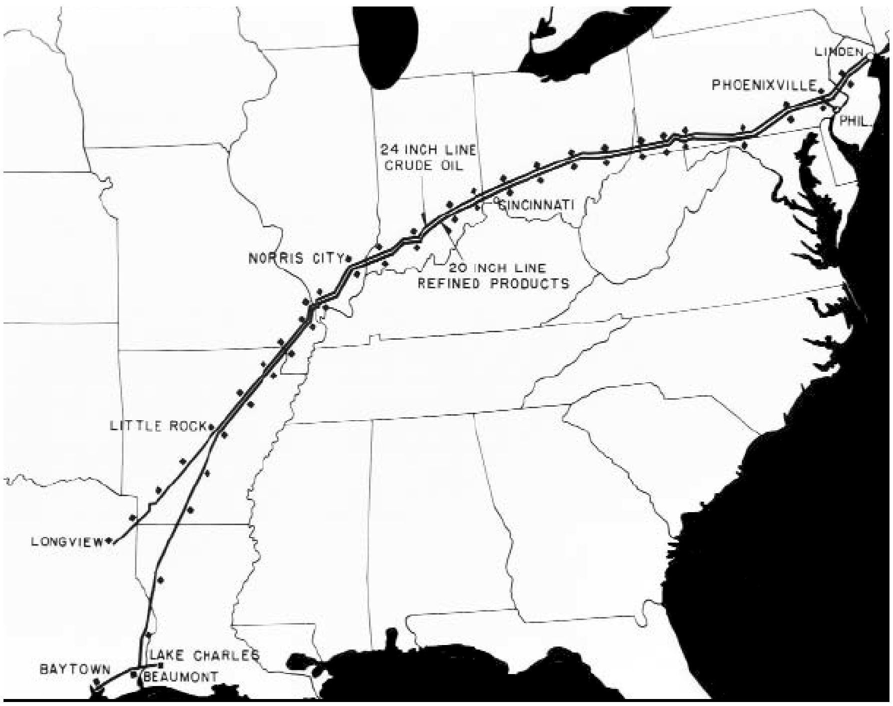
Source: [1]Bloomberg and Tortoise as of 12/31/2019. [2]Bloomberg, NAREIT (REITs yield) and Tortoise as of 12/31/2019.
DCF = distributable cash flow. Pipelines = Tortoise North American Pipeline Index℠ (TNAP). Utilities = S&P Utilities Select Sector Index. REITs = FTSE NAREIT All Equity REITs Index. Equities = S&P 500® Index. It is not possible to invest directly in an index. **Past performance is no guarantee of future results.**

Pipelines are long-lived assets: Big Inch and Little Big Inch pipelines

The Inch pipelines (Big Inch and Little Big Inch) are petroleum pipelines that were built during World War II as emergency war measures. Prior to the war, oil tankers transporting petroleum products were attacked by German submarines, threatening oil supply to the northeast and subsequent shipments to Great Britain. The Inch pipeline project was championed as a more secure way to transport petroleum products.

History of energy infrastructure

Big Inch and Little Big Inch Pipelines of WWII



Source: Courtesy the Library of Congress, U.S. Farm Security Administration/Office of War Information Black & White Photographs.

The pipelines were owned and financed by the government, but built and operated by a non-profit corporation backed by some of the largest U.S. oil companies. The concept received praise as an excellent example of private and public sector cooperation. In 1947, the Texas East Transmission Corporation (TETCO) purchased the pipelines for $143,127,000. With demand for natural gas rising, the corporation converted them to natural gas. The conversion served as a solution to the large amounts of natural gas flaring occurring in the Texas oilfields.

In 1957, the Little Big Inch portion, south of Ohio, was transferred from TETCO to the subsidiary Texas Eastern Petroleum Products Corporation (TEPPCO), and converted back to use for petroleum products. TEPPCO was later spun off into a separate company that was purchased by Enterprise Products in 2010. The pipeline remains in full operation today and is considered a prime asset within Enterprises' portfolio.

In 1989, TETCO, which still owned the Big Inch pipeline, was purchased by the Panhandle Eastern Corporation, and in 1997 this company merged with Duke Power, forming the Duke Energy Corporation. A decade later in 2007, the pipeline was spun off from Duke Energy, to form part of Spectra Energy Partners, an affiliate of Spectra Energy. Yet another decade later in 2017, Enbridge Inc. purchased Spectra Energy and Spectra Energy Partners, creating the largest energy infrastructure company in North America. Enbridge continues to own and operate the Big Inch pipeline system today. Now simply known as the Texas Eastern, the system comprises more than 9,200 miles of pipeline and connects the Gulf Coast supply centers to high demand markets in the northeast. The natural gas moving along the system supplies local power companies. The pipeline network can transport 6.7 Bcf/d of natural gas and offers approximately 75 Bcf of gas storage long various points along the route. It is also interesting to note that the pipeline expanded many times throughout the years as both increased demand and new locations required additional natural gas.

Expansion history:

- 1996 - The pipeline was connected to the Egan Natural Gas Hub
- 1996 - ITP Phase I & Philadelphia Lateral completed
- 1997 - Columbia, Virginia & Line 1-A Expansion completed
- 1998 - Lebanon Lateral Expansion completed
- 1999 - CNG Lease Expansion completed
- 2000 - Ironwood Lateral & Vermillion Lateral completed
- 2001 - Liberty Expansion completed
- 2002 - TIME Expansion, Hanging Rock Lateral & Freehold Lateral completed
- 2004 - M-1 & Dominion Expansion completed
- 2007 - TIME II Expansion Phase 1 completed
- 2008 - Cedar Bayou Lateral & TIME II Expansion Phase 2 completed
- 2008 - Open season launched for TIME III Project connecting Rocky Mountain natural gas supplies
- 2009 - Northern Bridge Project completed
- 2011 - TEMAX/TIME III, Hot Spring Lateral Project
- 2012 - Spectra announced FERC approval for a 20 km extension into New York city
- 2012 - TEAM 2012 Expansion & Philadelphia Lateral Expansion Project completed
- 2013 - Spectra Energy Secures Long-Term Contracts for Gulf Market Expansion Project
- 2013 - NJ-NY Project
- 2014 - TEAM 2014 Expansion completed

As you can see, the Big Inch and Little Big Inch pipelines have played an integral role in the buildout and economic expansion of the U.S. These two pipelines have not only persisted for almost 80 years, but continue to be critical assets to the areas they serve. The Inch pipelines are just one example of the many long-lives assets that in the U.S.

Conclusion

In our view, energy infrastructure is one of the most essential real assets as it is critical to our everyday lives. Midstream energy investments can also play an essential role in a portfolio, potentially providing attractive long-term performance with steady cash flows, inflation protection and lower correlation to broad equity markets.

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The Producer Price Index (PPI) measures the average change over time in the selling prices received by domestic producers for their output. The prices included in the PPI are from the first commercial transaction for many products and some services. The Tortoise North American Pipeline Index℠ is a float-adjusted, capitalization-weighted index of pipeline companies headquartered in the U.S. and Canada. The index includes pipeline companies structured as corporations, limited liability companies and master limited partnerships. The Bloomberg Barclays U.S. Aggregate Bond Index is a broad-based flagship benchmark that measures the investment grade, U.S. dollar-denominated, fixed-rate taxable bond market. The index includes Treasuries, government-related and corporate securities, mortgage-backed securities (agency fixed-rate and hybrid adjustable rate mortgage pass-through securities), asset-backed securities and commercial mortgage-backed securities (agency and non-agency). The S&P 500® Index is an unmanaged, market-value weighted index of stocks that is widely regarded as the standard for measuring large-cap U.S. stock market performance. The S&P Utilities Select Sector Index is a modified capitalization-weighted index. The Index is intended to track the movements of companies that are constituents of the S&P 500 in the utility sector (as defined by the Global Industry Classification Standard). The FTSE NAREIT All Equity REITs Index is a free-float adjusted, market capitalization-weighted index of U.S. equity REITs. Constituents of the index include all tax-qualified REITs with more than 50% of total assets in qualifying real estate assets other than mortgages secured by real property. Tortoise North American Pipeline Index℠ is the exclusive property of Tortoise Index Solutions, LLC, which has contracted with S&P Opco, LLC (a subsidiary of S&P Dow Jones Indices LLC) to calculate and maintain the Indices. The Index is not sponsored by S&P Dow Jones Indices or its affiliates or its third party licensors (collectively, "S&P Dow Jones Indices"). S&P Dow Jones Indices will not be liable for any errors or omission in calculating the Indices. "Calculated by S&P Dow Jones Indices" and its related stylized mark(s) are service marks of S&P Dow Jones Indices and have been licensed for use by Tortoise Index Solutions, LLC and its affiliates. S&P® is a registered trademark of Standard & Poor's Financial Services LLC ("SPFS"), and Dow Jones® is a registered trademark of Dow Jones Trademark Holdings LLC ("Dow Jones"). It is not possible to invest directly in an index. Index returns and yields shown are presented before management fees and other expenses of Tortoise advisory products and services. Clients or investors in Tortoise products and services will experience returns and yields reduced by advisory fees and other product expenses.

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