- As of December 31, 2017, we had 6,855 Bcfe of proved undeveloped reserves. During 2017, we invested $23 million in connection with converting 46 Bcfe, or 60%, of our proved undeveloped reserves as of December 31, 2016 into proved developed reserves and added 6,829 Bcfe of proved undeveloped reserve additions in Appalachia. The significant increase in our proved undeveloped reserve additions in 2017 was the result of adding new undeveloped locations throughout the year through our successful drilling program, improved operational performance and increased commodity pricing across our portfolio.

Our December 31, 2019 proved reserves included 929 Bcfe of proved undeveloped reserves from 90 locations that have a positive present value on an undiscounted basis in compliance with proved reserve requirements but do not have a positive present value when discounted at 10%. These properties have a negative present value of $50 million when discounted at 10%. We have made a final investment decision and are committed to developing these reserves within five years from the date of initial booking.

We expect that the development costs for our proved undeveloped reserves of 6,300 Bcfe as of December 31, 2019 will require us to invest an additional $3.0 billion for those reserves to be brought to production. Our ability to make the necessary investments to generate these cash inflows is subject to factors that may be beyond our control. The current commodity price environment has resulted, and could continue to result, in certain reserves no longer being economic to produce, leading to both lower proved reserves and cash flows. We refer you to the risk factors "Natural gas, oil and NGL prices greatly affect our revenues and thus profits, liquidity, growth, ability to repay our debt and the value of our assets" and "Significant capital investment is required to replace our reserves and conduct our business" in Item 1A of Part I of this Annual Report and to "Management's Discussion and Analysis of Financial Condition and Results of Operations – Cautionary Statement about Forward-Looking Statements" in Item 7 of Part II of this Annual Report for a more detailed discussion of these factors and other risks.

Our Reserve Replacement

The reserve replacement ratio measures the success of an E&P company in adding new reserves to replace the reserves that are being depleted by its current production volumes. The reserve replacement ratio, which we discuss below, is an important analytical measure used by investors and peers in the E&P industry to evaluate performance results and long-term prospects. There are limitations as to the usefulness of this measure, as it does not reflect the type of reserves or the cost of adding the reserves or indicate the potential value of the reserve additions.

In 2019, we replaced 203% of our production volumes with 1,195 Bcfe of proved reserve additions and net upward revisions of 385 Bcfe, all of which were from Appalachia. The following table summarizes the changes in our proved natural gas, oil and NGL reserves for the year ended December 31, 2019:

	Appalachia			
(in Bcfe)	Northeast	Southwest	Other [1]	**Total**
December 31, 2018	**4,366**	**7,554**	**1**	**11,921**
Net revisions				
Price revisions	(57)	(660)	—	**(717)**
Performance and production revisions	127	975	—	**1,102**
Total net revisions	70	315	—	**385**
Extensions, discoveries and other additions				
Proved developed	185	6	—	**191**
Proved undeveloped	677	327	—	**1,004**
Total reserve additions	862	333	—	**1,195**
Production	(459)	(319)	—	**(778)**
Acquisition of reserves in place	—	—	—	**—**
Disposition of reserves in place	(2)	—	—	**(2)**
December 31, 2019	**4,837**	**7,883**	**1**	**12,721**

(1) Other includes properties outside of Appalachia.

Our ability to add reserves depends upon many factors that are beyond our control. We refer you to the risk factors "Significant capital investment is required to replace our reserves and conduct our business" and "If we are not able to replace reserves, we may not be able to grow or sustain production." in Item 1A of Part I of this Annual Report and to "Management's Discussion and Analysis of Financial Condition and Results of Operations – Cautionary Statement about Forward-Looking Statements" in Item 7 of Part II of this Annual Report for a more detailed discussion of these factors and other risks.