

Portfolio Resilience: Using Scenarios to Understand Risks, Opportunities

Along with the COVID-19 pandemic and a steady push to adopt new policies encouraging a lower carbon future, climate-related uncertainties continue to impact the domestic oil and natural gas sector. To best mitigate these uncertainties, we conduct a robust scenario analysis to assist in quantifying climate-related risks and opportunities and provide additional perspective on how a lower carbon future may impact the company's long-range business plans and portfolio optimization.

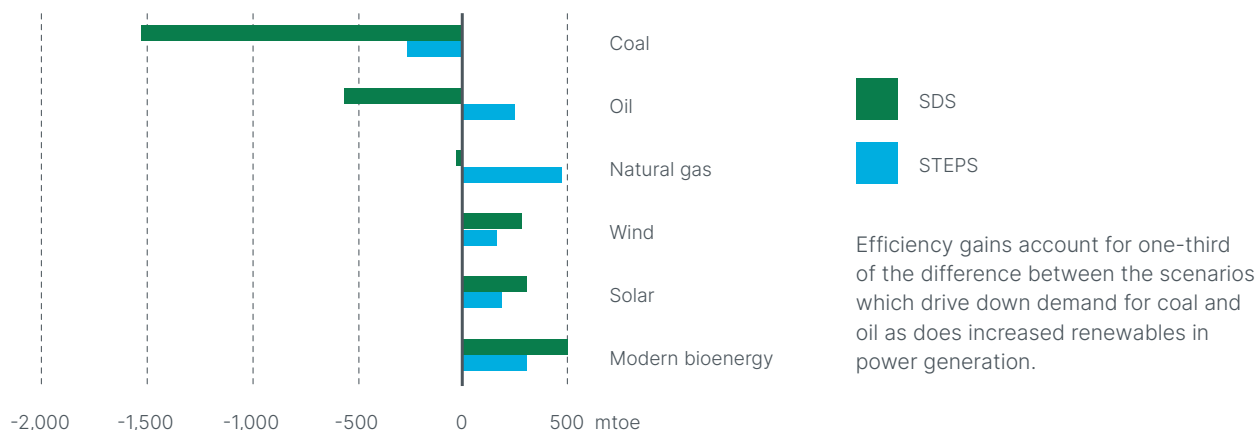
For our long-term planning, Chesapeake considers a variety of energy and policy forecasts and analyses from public and private institutions. However, for purposes of this climate-related report, we used scenarios from the International Energy Agency's (IEA) 2020 World Energy Outlook (WEO) to test our portfolio resiliency. Recommended by the Task Force on Climate-related Financial Disclosures (TCFD), this outlook includes climate change policies that align with the goals of the Paris Agreement.

While the 2020 WEO presents four unique scenario assessments, we based our analysis on the two scenarios we believe are pre-eminent benchmarks for projecting oil and natural gas demand and offer the most realistic view of future outlooks. The two referenced WEO scenarios include predicted fluctuations of product price and energy demand through 2040. Emissions impact is also analyzed, including measuring each scenario's ability to meet Paris Agreement objectives.

- The **Stated Policies Scenario (STEPS)**, which reflects current policy intentions and targets, includes the Nationally Determined Contributions Under the Paris Agreement, and assumes that the pandemic's impact to public health and the economy is gradually under control in 2021.
- The **Sustainable Development Scenario (SDS)** considers a surge in clean energy policies and investment that places the energy system on track to achieve sustainable energy objectives in full, including the Paris Agreement, while maintaining the same public health assumptions as the STEPS scenario.

Under the 2020 WEO modeling scenarios, oil and natural gas will remain a significant source of the energy makeup through 2040. With this, the STEPS scenario depicts world supply, demand and commensurate pricing for both oil and natural gas to realize a moderate uptick through 2040. However, the SDS scenario depicts a moderate decline in both world oil and natural gas supply and demand through 2040.

Change in Total Primary Energy in the Stated Policies and Sustainable Development Scenarios, 2019 – 2030⁽¹⁾



Although these scenarios provide studied constructs of the future, they're not forecasts. They represent a potential future, identifying possible trends or factors that could influence business models should a scenario's key assumptions occur.

Oil Demand and Pricing

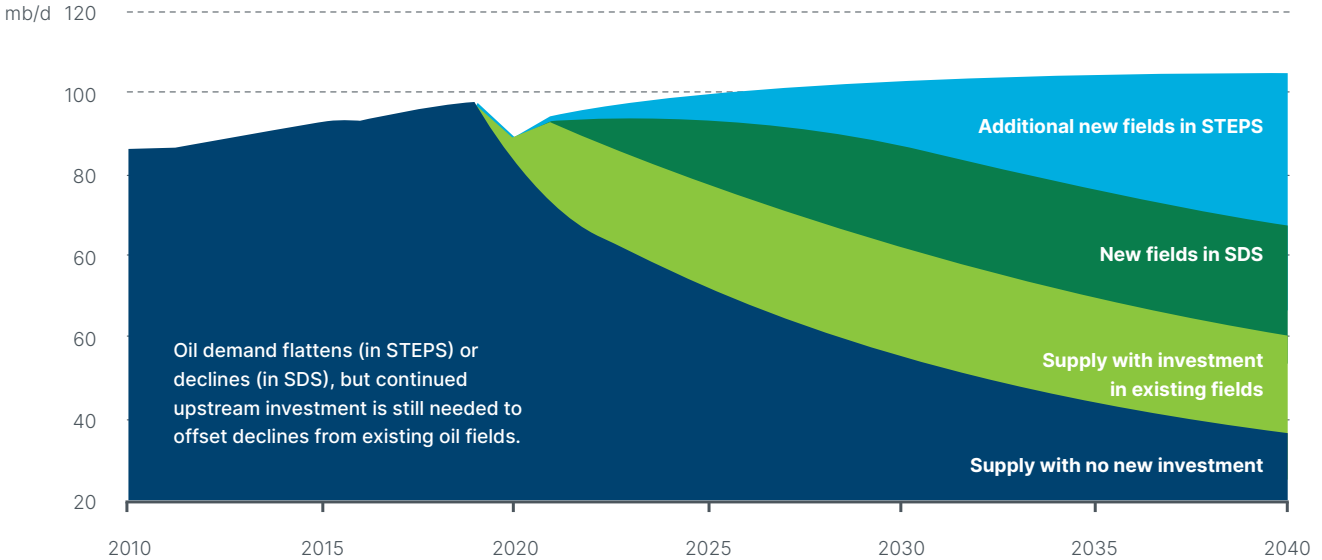
While global oil demand has increased for decades, impacts due to the COVID-19 pandemic and public policies supporting a lower carbon future have begun to stall growth. However, even with the carbon reductions identified in IEA's 2020 SDS scenario, oil continues to supply 23% of the world's primary energy demand in 2040, as opposed to the 31% makeup in 2019. In fact, while the SDS scenario projects lower oil demand in the 2040 timeframe, the IEA states that "decline in production from existing fields creates a need for new upstream projects, even in rapid energy transition."

Oil and Total Liquids Demand and Supply by Scenario (mb/d)⁽¹⁾

	STEPS		SDS	
	2025	2040	2025	2040
World oil demand	99.9	104.1	92.5	66.2
World liquids demand	102.8	109.2	96.9	73.6
World oil production	97.5	101.3	90.2	64.4
World oil supply	99.9	104.1	92.5	66.2

IEA anticipates a continued increase in oil demand under the STEPS scenario, with demand rising to pre-pandemic levels around 2023. After this time, demand is projected to rise by 0.7 mb/d each year on average through 2030, where it then reaches a plateau with annual growth tapering off to 0.1 mb/d per year.

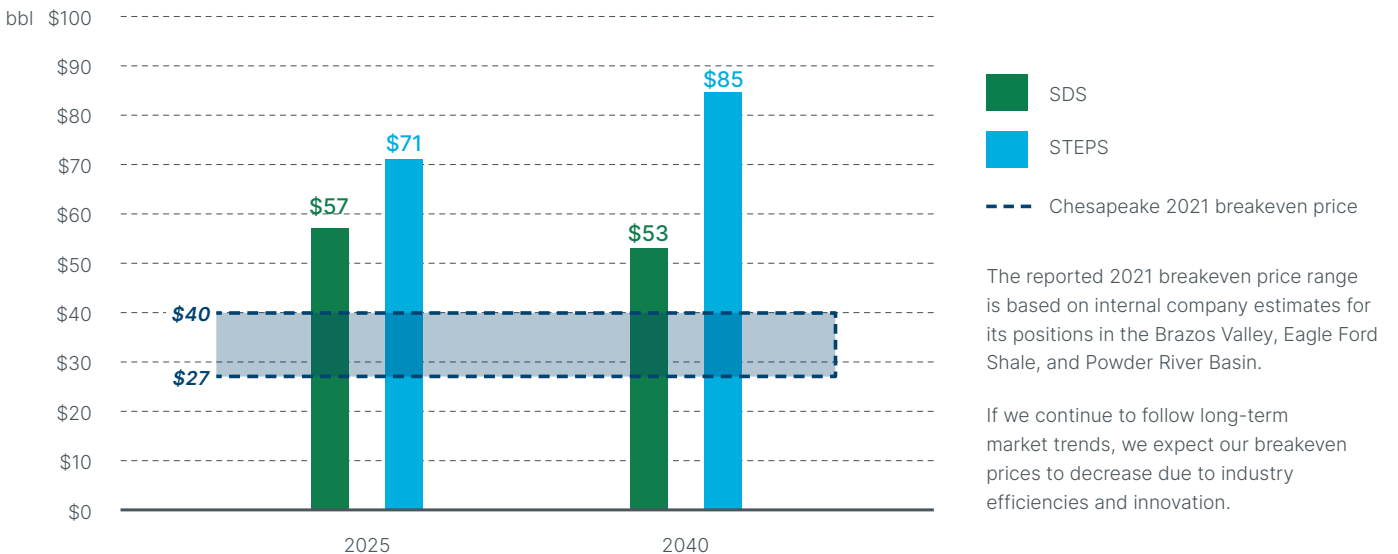
Global Oil Demand by Scenario and Declines in Supply from 2019⁽¹⁾



Even with oil demand peaking around 2023 according to the most stringent SDS scenario, the analysis suggests that companies developing high-value projects at streamlined costs will continue to remain competitive. In fact, upstream oil and natural gas investment is currently projected to average about \$320 billion in 2021, approximately 20% lower than the past five-year period. Assuming there will be a significant capital push to drive a lower carbon future in the energy sector, IEA's SDS continues to call for approximately \$400 billion per year in upstream oil and natural gas investment.

Oil Price by Scenario⁽¹⁾

as compared to Chesapeake breakeven pricing



Based on the pricing data provided and using conservative planning assumptions, we believe Chesapeake will continue to offer efficient investment returns through even the most restrictive scenarios' end date of 2040. This demonstrates both the robust nature and allocation optionality that exists today with Chesapeake's current portfolio, as well as our proven history of flexibility to respond to new innovations and changes in the energy landscape.

Natural Gas Demand and Pricing

While natural gas supply and demand fare best among fossil fuels under the two 2020 WEO scenarios, different policy contexts produce strong variations for the fuel's outlook through 2040. These outlook impacts are largely dependent on a few key factors, including:

- A push to improve air quality and support growth in manufacturing, combined with the expansion of gas infrastructure and demand for fuel in emerging markets and developing economies.
- Broad variability in the supply of associated gas, given the pricing and supply/demand balance regarding oil.
- Achieving a smooth balance between liquified natural gas (LNG) supply and demand, based on infrastructure, financing and policy constraints.
- Reduced long-term opportunities for coal-to-gas switching in developed economies due to stimulus spending directed toward renewables and a push for greater transparency and enhanced methane emissions abatement throughout gas-supply chains.
- Opportunities for the natural gas industry to retool itself via demonstrable progress with developments such as low-carbon hydrogen and carbon capture, utilization and storage (CCUS).

Under the STEPS scenario, global natural gas demand increases through 2040; however, under the more restrictive SDS, natural gas demand initially rises through 2025, then stabilizes and experiences moderate demand declines.

Natural Gas Demand and Supply by Scenario (bcm)⁽¹⁾

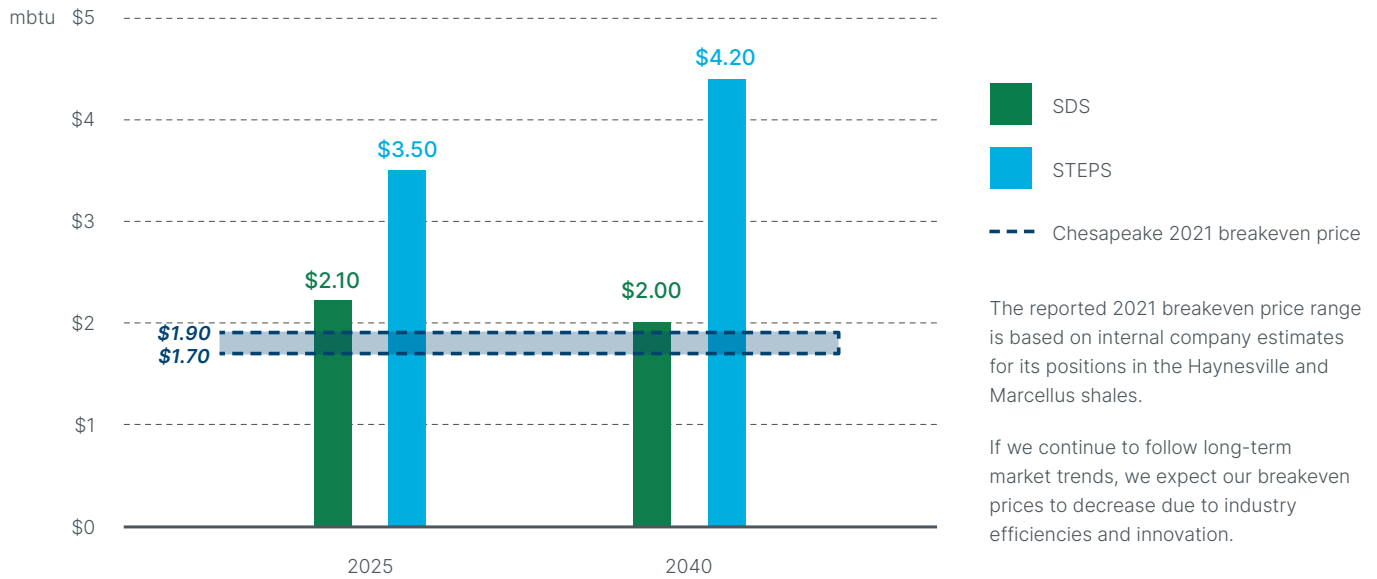
	STEPS		SDS	
	2025	2040	2025	2040
World natural gas demand	4,358	5,221	4,166	3,554
World natural gas production	4,358	5,221	4,166	3,554

Natural gas fulfills 25% and 23%, respectively, of world energy demand in 2040 under the STEPS and SDS scenarios.

The STEPS scenario anticipates North America will remain the world's largest natural gas producer through 2040. The SDS scenario is largely the same, although natural gas production from Eurasia slightly eclipses North America in 2040.

Natural Gas Price by Scenario⁽¹⁾

as compared to Chesapeake breakeven pricing



Similar to our oil price outlook, Chesapeake's cash-cost efficiency suggests a strong future for our natural gas projects. Chesapeake's current breakeven price reinforces the strength of our operational strategy and capital allocation flexibility as both demand and pricing evolve under these two scenarios.

Based on our 2020 scenario planning analysis, we're confident that our portfolio of assets will continue to deliver strong returns well into the future. It's also highly unlikely that we'll have any "stranded" assets as we align globally with the ambitions of the Paris Agreement.

(1) Based on IEA data from World Energy Outlook 2020 © OECD/IEA 2020, www.iea.org/statistics, all rights reserved, as modified by Chesapeake Energy Corporation