DEVON ENERGY

Climate Change Assessment Report

devon

Commitment Runs Deep

Executive Summary

Scope and Context

Devon and its stakeholders are committed to understanding the potential impacts of climate change on Devon's long-range business plans. As part of Devon's efforts to collaborate with its stakeholders and better understand the potential long-term impacts of a possible carbon-constrained future, Devon retained an outside consultant (ICF)[1] to help assess Devon's oil and natural gas portfolio in relation to these potential impacts. During this assessment, Devon evaluated several possible future climate change scenarios in order to quantify the risks to Devon from aggressive global carbon reduction-policies, modeled through 2050. Devon evaluated pricing scenarios and model results from both ICF and the widely-referenced International Energy Agency (IEA).

Analysis

This report considers base case scenarios from both ICF and the IEA for the oil and natural gas market and compares each base case scenario to an alternate carbon-constrained future scenario. Because the IEA and ICF base case scenarios differ in their baseline assumptions, analyzing both of them provides a level of robustness against alternative future scenarios. To model the impacts of a carbon-constrained future, the analysis applies, under both scenarios, IEA's assumptions about demand for oil and natural gas under aggressive carbon-reduction policies.

In the carbon-constrained scenarios, demand for oil and natural gas is substantially reduced. However, even in such carbon-constrained scenarios, oil and natural gas remain a crucial component for fulfilling global energy demand. Accordingly, Devon remains confident that its asset portfolio is expected to (i) remain economically profitable in a range of future climate change scenarios and (ii) provide oil and natural gas in an environmentally responsible way.

Key Conclusions

- Even in the carbon-constrained future scenarios, oil and natural gas remain crucial to meeting global energy demand.
- Model results indicate that aggressive low-carbon scenarios will reduce oil, natural gas, and natural gas liquids (NGLs) prices by 23-37%; even in such low-carbon scenarios, the model results suggest that Devon's current portfolio is likely to be resilient to these potential impacts.
- Based on the comparison of projected regional price impacts with estimated regional breakeven prices for each of Devon's major assets, Devon concludes that its assets are likely to be well-positioned to remain profitable even in an aggressive low-carbon scenario.
- Model results under some low-carbon scenarios (e.g., the IEA Sustainable Development Scenario) reflect that oil, natural gas, and NGLs prices will be robust and Devon's current portfolio is likely to thrive under these scenarios.

[1] With more than 65 offices around the globe, ICF is internationally recognized for its consulting in carbon accounting, greenhouse gas mitigation, climate change, and resilience planning. ICF was retained as an independent consultant to generate pricing scenarios.

Business Risk from Climate Change: An Emerging Area of Importance

There is an increasing level of awareness and understanding about the potential risks to business from climate change. The risks to different types of businesses may be varied, including impacts to businesses operation, capital investments, long-range planning and strategy, and worker health and safety. The Task Force on Climate-related Financial Disclosures (TCFD), an international, industry-led body formed to develop recommendations for consistent disclosure of climate-related risk, has proposed that businesses assess risks related to the transition to a lower-carbon economy and those posed by the physical impacts of climate change. The "transition" risks include:

Policy and legal risk: Business impacts from greenhouse gas (GHG) reduction policies or policies aimed at adapting to the impacts of climate change (e.g. water conservation policies). Risks of litigation around failure to mitigate climate change impacts or to sufficiently disclose material financial risks.

Technology risk: Supplanting of current dominant technologies by new technologies developed for the purpose of transitioning to a lower-carbon economy (e.g., renewable energy, battery storage).

Market risk: Changes in supply and demand for products and services as a result of climate-related changes in the market.

Reputation risk: Changing public perceptions of firms as a result of their perceived role in mitigating or exacerbating climate change.[2]

In response to stakeholder interest, this report focuses primarily on transition risks, in particular the risks of potential changes in demand and price for oil and natural gas as a result of GHG-reduction policies. In addition to the transition risks, the TCFD also notes that companies' operations may be subject to direct physical risks from climate-change impacts, such as rising seas or more frequent heat waves. These risks are not the focus of this report, but are discussed in the Other Potential Climate-Related Risks section below.

[2] Task Force on Climate-related Financial Disclosures. "Recommendations of the Task Force on Climate-related Financial Disclosures." p. iii, 5-6. June 2017.

Devon's Risk Management Approach

Devon has a variety of governance and analytical measures in place to evaluate the risks to its core business. Devon uses a risk management framework that includes an annual analysis of the top risks to the company. This analysis asks Devon's Board of Directors, management and certain internal subject matter experts to consider the likelihood that certain risks could result in an impact to the company and to identify, among other things, the company's level of preparedness for those risks. Devon frequently engages in other exercises to identify risks to the company and conducts workshops with Devon personnel on risk mitigation strategies.

Devon also relies on various third parties to supplement Devon's analyses and works with evolving regulatory developments. Devon regularly models numerous regional and macro-level scenarios, such as changes in regulations or market conditions, as well as acquisitions or divestitures, to test the strength of its portfolio of reserves and resources. On an annual basis, these modeled scenarios inform the strategic decision-making of Devon's Executive Committee and Board of Directors, culminating in Devon's annual long-range plan. At least quarterly, Devon reviews business results, market conditions, and other factors to evaluate both progress and challenges to the long-range plan.

Going Forward: Formal Consideration of Climate Change Risks

In recognition of the emerging relevance of and stakeholder interest in climate-change risks, Devon's risk management has included, beginning in 2018, formal and ongoing consideration of the quantifiable effects of climate change on Devon's portfolio. Devon's risk evaluation uses a scenario analysis of technology and market conditions that considers pricing scenarios that are at least as challenging as IEA's Sustainable Development Scenario and runs through at least 2040 (this report analyzes through 2050).

In addition to potential market impacts of decarbonization policy, risk factors to be considered in future analyses may also include changes in state and federal methane policy, the impacts of greenhouse-gas regulation on upstream costs, climate-motivated restrictions on oil and natural gas production and transport, and changes in availability in investor funds due to activist-driven divestment efforts. Through this ongoing review, Devon plans to closely monitor climate-change related impacts in the market and policy environment and to remain prepared to adapt. Devon is also committed to continuing dialogue with its management, Board of Directors, and stakeholders about these risks.

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Analytical Approach and Results of Assessment

KEY TAKEAWAYS

- Even in the carbon-constrained future scenarios, oil and natural gas remain crucial to meeting global energy demand.
- Model results indicate that aggressive low-carbon scenarios will reduce oil, natural gas, and NGLs prices by 23-37%; even in such low-carbon scenarios, the model results suggest that Devon's current portfolio is likely to be resilient to these potential impacts.
- Based on the comparison of projected regional price impacts with estimated regional breakeven prices for each of Devon's major assets, Devon concludes that its assets are likely to be well-positioned to remain profitable even in an aggressive low-carbon scenario.
- Model results under some low-carbon scenarios (e.g., the IEA Sustainable Development Scenario) reflect that oil, natural gas, and natural gas liquids prices will be robust and Devon's current portfolio is likely to thrive under these scenarios.

Introduction to Analysis

This report considers two different base case scenarios for the oil and natural gas market and compares each to an alternate carbon-constrained future scenario, in which demand for oil and natural gas is substantially reduced. Both scenarios have been generated for this report by the consulting firm ICF, with modeling conducted for oil, natural gas, and propane (the latter as a proxy for NGLs).[3] The first scenario is based on ICF's assumptions, and the second is based on widely-referenced projections by the International Energy Agency (IEA). Because the two scenarios differ in their baseline assumptions, analyzing both of them provides a level of robustness against alternative future scenarios. To model the impacts of a carbon-constrained future, the analysis applies, under both scenarios, IEA's assumptions about demand for oil and natural gas under aggressive carbon-reduction policies. The carbon-constrained scenarios include emissions reductions on the level required to achieve the goals of the Paris Agreement and align with an emissions pathway with an approximately even probability of limiting global temperature increases to 2°C.

The following section provides a short introduction to the scenarios considered. For more detail on methodology, please refer to the appendix of this report.

[3] Propane prices are estimated by applying the average historical ratio of crude to propane (~50%).

Base Case Scenarios

ICF Base Case

This scenario represents ICF's standard baseline energy market scenario. Its assumptions fall in line with many other projections from industry consultants and banks. It assumes robust growth for natural gas in North America (40% growth through 2050), including liquefied natural gas (LNG) exports and exports to Mexico. Global oil market growth is assumed from the IEA forecast.

The ICF Base Case applies ICF-derived natural gas-price elasticities and IEA oil-price elasticities over time. It projects an average 2020-2050 WTI oil price of $64 per barrel ($/Bbl) and an average Henry Hub natural gas price of $4.00 per MMBtu ($/MMBtu) over the same period.[4]

IEA New Policies Scenario

The IEA New Policies Scenario projects global energy market trends based on currently enacted policies and the likely impacts of officially announced new policies that will affect the energy sector. This analysis uses the New Policies Scenario as a base case for the IEA projections.[5] IEA's 2017 New Policies Scenario projects an average 2020-2050 importer cost of crude of $100/Bbl (which ICF converted into an average WTI oil price of $102/Bbl) and an average Henry Hub natural gas price of $4.97/MMBtu over the same period.

In comparison with the ICF base case scenario, the higher prices in the IEA New Policies Scenario imply a less robust resource base or higher costs for oil and natural gas supply development. Natural gas market growth, much of it in North America, is also more modest in the IEA scenario (which shows 10% growth by comparison), implying less production growth. The IEA scenario falls in line with the U.S. Energy Information Administration's (EIA) forecasts.

Carbon-Constrained Scenarios

ICF Sustainable Development Case

This analysis included a low-carbon scenario to model the market impacts of aggressive carbon reductions on the ICF Base Case. To estimate the reduction in demand for oil and natural gas, the Sustainable Development Case takes the percentage change in demand from IEA's New Policies Scenario to its Sustainable Development Scenario (described below) and applies this same demand-reduction percentage to ICF's baseline assumptions. The Sustainable Development Case uses an IEA-derived oil-price elasticity of demand and an ICF-derived natural gas-price elasticity of demand. This report refers to such low-carbon scenario as the Sustainable Development Case, given its basis in IEA's Sustainable Development Scenario.

[4] All prices in this report are given in real 2016 dollars.
[5] While the published IEA scenarios only project to 2040, ICF has extrapolated them out to 2050.

IEA Sustainable Development Scenario

The analysis included an assessment of the price impacts of IEA's Sustainable Development Scenario, the primary carbon-reduction scenario in IEA's 2017 World Energy Outlook.[6] In the IEA Sustainable Development Scenario, markets are constrained by policies that achieve three objectives:

- Reductions in GHG emissions consistent with achieving of the goals of the Paris Agreement, including a near-term peak in global GHG emissions and a pathway toward net-zero emissions by 2100;
- Universal global access to modern energy by 2030; and
- A substantial reduction in non-GHG energy-related pollutants.

Demand levels in the IEA Sustainable Development Scenario reflect a suite of aggressive worldwide policy actions to restrict GHG emissions. These assumptions include carbon prices applied to the power and industrial sectors of most major economies. Assumed carbon prices in advanced economies increase from $63 per metric ton of CO_2 in 2025 to $140 per metric ton in 2040. In Brazil, Russia, South Africa, and China, assumed prices are $43 per metric ton in 2025 and $125 per metric ton by 2040.[7]

The effectiveness of the IEA Sustainable Development Scenario in limiting global temperature change to 2 degrees Celsius is dependent on global emissions trends through 2100, while IEA's current scenario only projects through 2040. This scenario, therefore, is best interpreted as a pathway that puts in place sufficient conditions to produce a likelihood of achieving that goal through further action in the latter half of the century.[8]

[6] The analysis also considered projections from IEA's 450 Scenario as described in the 2016 IEA World Energy Outlook. That scenario is based on comparable GHG restrictions to the Sustainable Development Scenario, but does not include the latter two goals listed above. Because the Sustainable Development Scenario has replaced the 450 Scenario in the World Energy Outlook as of 2017, and because the 2017 version of that scenario produces lower prices across the board as compared to the 2016 450 Scenario, this report takes a conservative approach and focuses only on the Sustainable Development Scenario.

[7] IEA World Energy Outlook 2017, pg. 48.

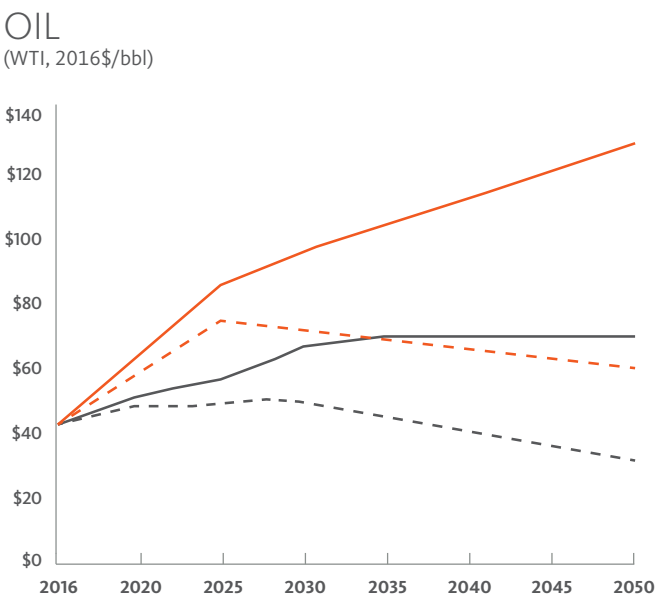
[8] IEA World Energy Outlook 2017, pg. 37-38.

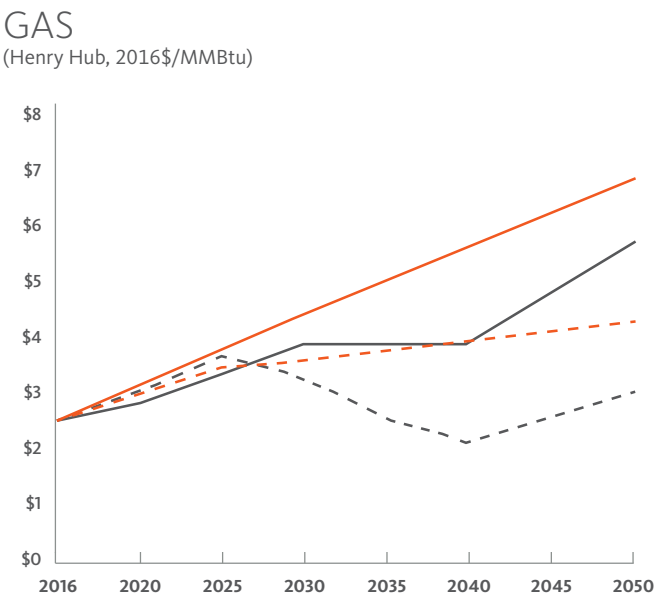
Assessment Results

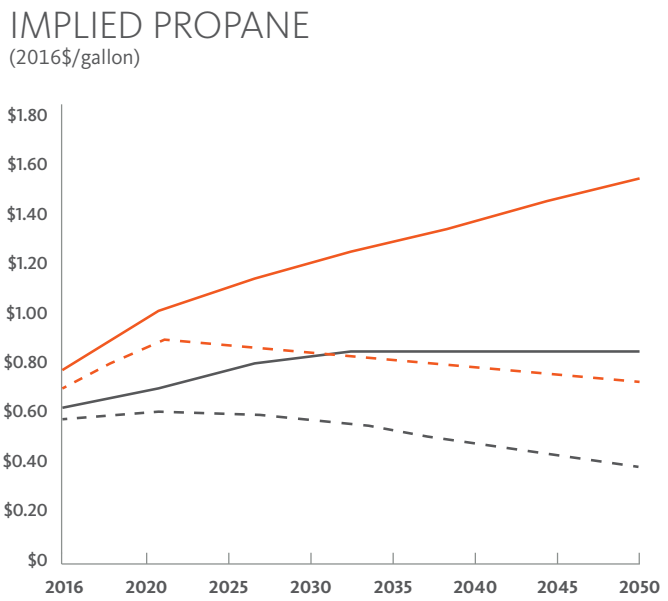
The assessment of climate impacts across these four scenarios found that aggressive carbon-restriction policies result in significantly reduced prices for oil and NGLs and marginally reduced prices for natural gas. Figure 1 shows the projected price trajectories for each product in each of the modeled scenarios.

Figure 1: Projected Price Trajectories for Oil, Natural Gas, and Propane in Base Case and Sustainable Development Scenarios

ICF Base Case
ICF Sustainable Development Scenario
IEA New Policies Scenario
IEA Sustainable Development Scenario







Source: ICF analysis of ICF and IEA data

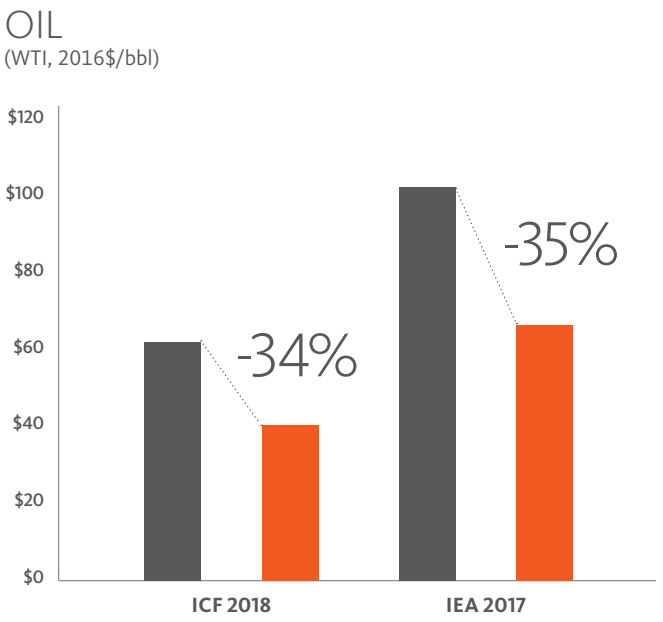
Assessment Results

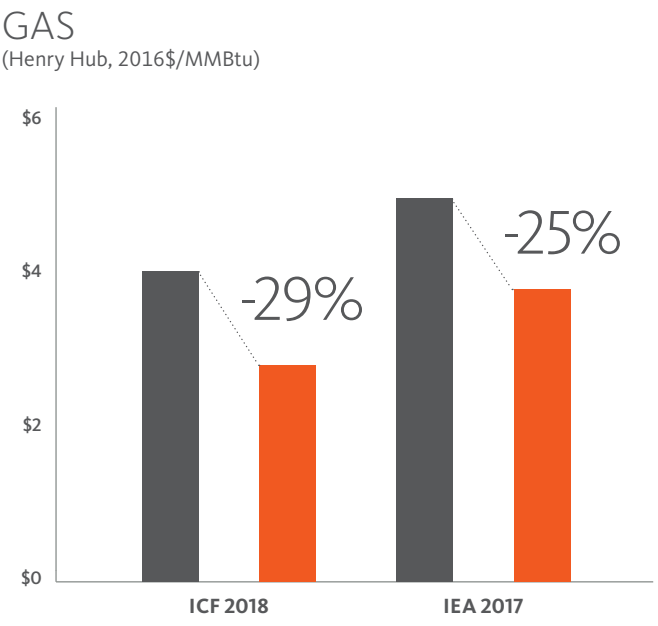
Figure 2 shows the average price for each commodity over the 2020-2050 period in each scenario, and the change between the base case and the climate scenarios.

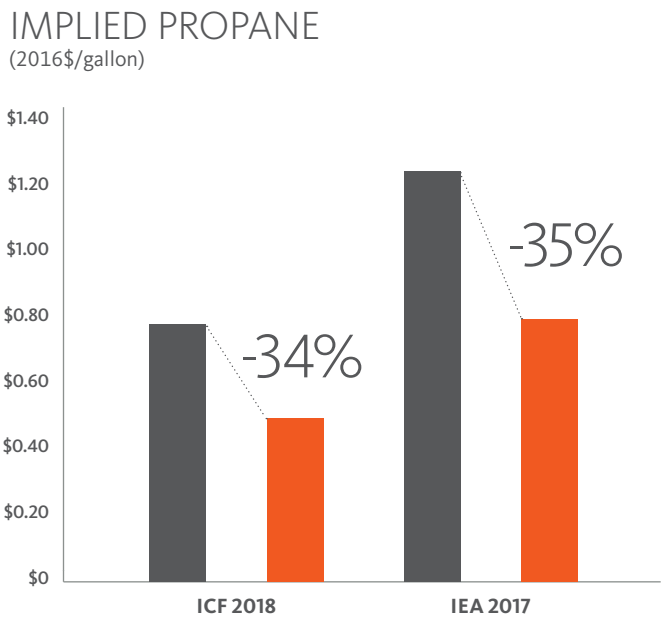
Figure 2: Change in Projected Prices by Scenario (2020-2050 average, 2016$)

Base Case (ICF) / New Policies Scenario (IEA)

Sustainable Development Case (ICF) / Sustainable Developemnt Scenario (IEA)







Source: ICF analysis of ICF and IEA data

Regional Price Differentials and Breakeven Analysis

In order to project asset-specific impacts of various potential price futures, ICF projected the regional price impacts of each modeled scenario. ICF also conducted an analysis of breakeven prices for Devon's major assets based on published third-party breakeven figures.

ICF Regional Oil Prices

Average 2020-2050 regional oil prices in the ICF Sustainable Development Case range from $32/Bbl in Western Canada to about $42/Bbl in Cushing (Figure 3). Regional price levels have been estimated by using historical price differentials between each region. The 2014-2018 average basis between the WTI Cushing price and each regional hub has been applied to the WTI price forecast. Average 2020-2050 regional oil prices in the ICF Base Case range from $48/Bbl in Western Canada to about $64/Bbl in Cushing. Basis differentials have been separately estimated for the ICF Sustainable Development Case. In that case, the 2013-2017 average basis between the WTI Cushing price and each regional hub has been applied to the WTI price forecast.

Figure 3: ICF Regional Oil Prices, Average 2020-2050, 2016$/Bbl

	ICF Base Case	ICF Sustainable Development	$ Change	% Change
WTI Cushing	$64	$42	($23)	-35%
Permian	$62	$40	($22)	-35%
Eagle Ford	$61	$39	($22)	-37%
Barnett	$64	$41	($23)	-36%
Powder River Basin[9]	$63	$41	($23)	-36%
Western Canada Select	$48	$32	($17)	-35%

Source: ICF analysis

IEA Regional Oil Prices

The IEA New Policies Scenario projects higher oil prices compared with the ICF Base Case. Average 2020-2050 regional oil prices in the IEA New Policies Scenario range from $56/Bbl in Western Canada to $66/Bbl in Cushing (Figure 4). The same methodology that was used for calculating the regional basis for the ICF cases has been used for the IEA Scenarios. Average regional oil prices in the IEA Sustainable Development Scenario are about 35 percent lower than the prices in the IEA New Policies Scenario.

As in the ICF cases, the market hub prices at different locations have been estimated using basis differentials derived from historical trends since IEA does not provide prices for different locations throughout North America.

Figure 4: IEA Regional Oil Prices, Average 2020-2050, 2016$/Bbl

	IEA New Policies	IEA Sustainable Development	$ Change	% Change
WTI Cushing	$102	$66	($36)	-35%
Permian	$100	$64	($35)	-35%
Eagle Ford	$99	$63	($36)	-37%
Barnett	$102	$66	($36)	-35%
Powder River Basin	$101	$65	($36)	-36%
Western Canada Select	$86	$56	($30)	-35%

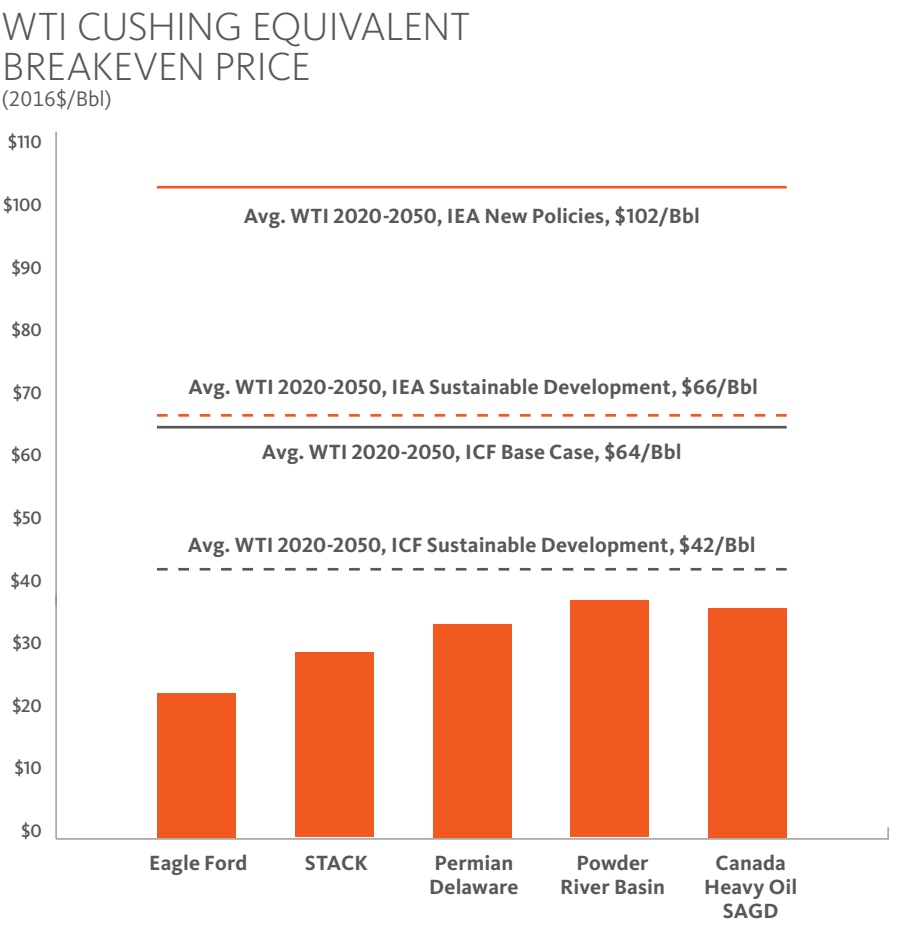
Source: ICF analysis of IEA data

[9] The historical price differential between WTI Cushing and the Bakken Guernsey price hub was used to forecast the regional oil price for the Powder River Basin. Guernsey, located in eastern Wyoming, is the most active oil trading hub in the Rockies.

Breakeven Oil Prices

The analysis of breakeven oil prices set forth in Figure 5 shows WTI Cushing equivalent breakeven prices (vertical bars) for the regions in which Devon's oil assets are located. Because Devon's internal calculations of asset-specific prices are confidential, the breakeven oil prices for Eagle Ford, STACK, Permian Delaware, and Powder River Basin oil wells are based on the Citi E&P oil price breakeven analysis[10] and the breakeven oil price for the steam-assisted gravity drainage (SAGD)[11] heavy oil projects is based on a recent SAGD heavy oil supply cost study by the Bank of Montreal (BMO).[12] For comparison with oil prices in the four scenarios, the Citi and BMO WTI equivalent breakeven prices have been converted to 2016 dollars. Citi and BMO are reputable, experienced analysts for WTI equivalent breakeven prices; Devon and ICF consider both Citi and BMO to be reasonable sources used in calculating breakeven oil prices for the regions in which Devon's oil assets are located. ICF has analyzed half-cycle breakeven oil prices—the constant price needed to recover capital expenditures (excluding sunk capital), operating costs, royalties and taxes and earn an acceptable return on investment—for the plays in which Devon operates.

Figure 5:



Breakeven price data obtained from regional analysis published by Citi Research and, for Canada Heavy Oil SAGD, BMO Capital Markets.

Figure 5 suggests that all of Devon's oil assets are expected to yield high economic returns in the $64/Bbl oil price environment in the ICF Base Case and much higher returns in the $102/Bbl oil price environment in the IEA New Policies Scenario. The $66/Bbl oil price environment in the IEA Sustainable Development Scenario is still higher than all the oil assets' breakevens and, therefore, is expected to yield positive economic returns. Even at much lower WTI oil price projections in the ICF Sustainable Development Case, $42/Bbl, all of the oil assets are expected to be economic. Consistent with historical experiences, breakeven prices have the potential to decline over time as drilling and operations techniques and technology improve. There is a limit to how much the breakeven price can decline due to production efficiencies but that limit has likely not been reached in the U.S. and Canada.

[10] Citi Research. "Citi E&P Oil Price Breakeven Analysis – Benchmarking by Sub-Basin or Play." Citi Research Annual Commodities Market Outlook 2018. December 2017.
[11] Steam-assisted gravity drainage is an enhanced oil recovery technology for producing heavy crude oil and bitumen.
[12] BMO Capital Markets Research. "Oil & Gas Global Cost Study." August 2018. The Jackfish SAGD project was used as a representative project for all of Canada Heavy Oil SAGD.

ICF Regional Natural Gas Prices

ICF's Gas Market Model (GMM) calculates the hub prices at the different locations relevant to Devon's production. Gathering and processing charges have been subtracted from those prices to derive wellhead prices at each of those locations.

Basis differentials have been separately estimated from the GMM for a lower growth case that is consistent with the IEA Sustainable Development Scenario and then applied to estimate prices at different locations. Again, gathering and processing charges have been subtracted from the estimated hub prices to derive wellhead prices.

Average 2020-2050 regional natural gas prices in the ICF Sustainable Development Case range from $3.13/MMBtu at the STACK Wellhead to about $2.85/MMBtu at Henry Hub or on average about 30 percent lower than regional prices in the ICF Base Case (Figure 6).

Figure 6: ICF Natural Gas Prices, Average 2020-2050, 2016$/MMBtu[13]

	ICF Base Case	ICF Sustainable Development	$ Change	% Change
Henry Hub	$3.99	$2.85	($1.14)	-29%
Delaware Wellhead	$3.42	$2.35	($1.07)	-31%
Eagle Ford Wellhead	$3.49	$2.40	($1.10)	-31%
Barnett Wellhead	$3.58	$2.45	($1.13)	-32%
STACK Wellhead	$3.13	$2.10	($1.04)	-33%

Source: ICF analysis of IEA data

IEA Regional Natural Gas Prices

IEA has projected natural gas prices at Henry Hub for the New Policies Scenario and the Sustainable Development Scenario. ICF has estimated market hub prices at different locations using basis differentials derived from ICF's GMM since IEA does not provide prices for different locations throughout North America. Wellhead prices have been estimated by subtracting gathering and processing charges at the relevant hubs.

The IEA New Policies Scenario projects higher natural gas prices compared with the ICF Base Case. Average 2020-2050 regional natural gas prices in the IEA New Policies Scenario range from $4.12/MMBtu at the STACK Wellhead to almost $5.00/MMBtu at Henry Hub (Figure 7). Average regional natural gas prices in the IEA Sustainable Development Scenario are about 25 percent lower than the prices in the IEA New Policies Scenario.

Figure 7: IEA Natural Gas Prices, Average 2020-2050, 2016$/MMBtu[14]

	IEA New Policies	IEA Sustainable Development	$ Change	% Change
Henry Hub	$4.97	$3.75	($1.22)	-25%
Delaware Wellhead	$4.40	$3.25	($1.15)	-26%
Eagle Ford Wellhead	$4.47	$3.30	($1.17)	-26%
Barnett Wellhead	$4.56	$3.35	($1.21)	-26%
STACK Wellhead	$4.12	$3.00	($1.12)	-27%

Source: ICF analysis

[13, 14] For both the Canada Heavy Oil Wellhead and the Rockies Wellhead, Devon's 2017 gas production was below 5% of Devon's overall natural gas production and therefore are not included in this analysis.

Breakeven Natural Gas Prices

ICF also conducted breakeven analysis for the Barnett Shale.[15] Analysis of project economics for Barnett Shale is based on breakeven natural gas price analysis by Citi Research.[16] The Henry Hub equivalent breakeven natural gas price for Barnett Shale, about $3.00/MMBtu, is lower than average natural gas price projections in all the baseline scenarios and in the IEA Sustainable Development Scenario. These three scenarios are expected to yield positive economic returns for the Barnett Shale wells. However, the much lower natural gas price environment in the ICF Sustainable Development Case, $2.85/MMBtu, falls just below the breakeven price. Consistent with the breakeven prices for oil, breakeven prices for natural gas also have the potential to decline over time as drilling techniques and technology improve.

In addition to the potential risks from changes in market prices due to future constraints on carbon emissions, there are a variety of other potential climate-related risks that Devon considers. This section provides a brief discussion of some of these additional risks, though they are not the primary focus of this report.

[15] Devon has historically maintained a strong position in the Barnett Shale and, in 2017, the Barnett Shale accounted for 55% of Devon's overall natural gas production. The natural gas production from Devon's other regions is currently a byproduct from Devon's oil production and is not included in this breakeven analysis.

[16] Citi Research. "2Q 2018 Commodities Market Outlook." April 15, 2018.

Other Potential Climate-Related Risks

Physical Climate Risks

Oil and natural gas extraction operations have been successful in some of the most extreme environments across the planet. In the areas where Devon operates and plans to operate, we are confident in our ability to continue to operate in accordance with our plans. Devon, however, analyzes potential impacts due to natural disasters and short and medium-term weather changes when evaluating and planning future development. This analysis considers the likelihood of those events occurring and how Devon could mitigate the potential impact of those events. Devon has invested significant capital in developing technologies for using alternative sources of water, which will help to improve our ability to respond to lack of fresh water availability. Devon also plans in the medium term for potential infrastructure shut downs due to a variety of factors, and appropriate responses to each of them. This evaluation considers floods, tornados, hurricane risk, and other potential physical risks to infrastructure and Devon's assets.

State and Federal Methane Regulations

Methane emissions from the oil and natural gas industries have been identified by policymakers and stakeholders as a significant source of GHG emissions. The U.S. began imposing regulations in 2012 to mitigate these emissions. Individual states had regulated emissions prior to this time and others have continued since then. The Canadian federal government and provincial governments have also announced or implemented methane regulations. Federal regulations announced in April 2018 are based on Canada's target of 40-45% reduction of methane emissions from oil and natural gas by 2025.[17]

Fugitive and vented emissions from all segments of the natural gas industry comprise well less than 2% of natural gas production[18] and many producers, including Devon, have made significant reductions in emissions through voluntary actions and in response to regulation. Significant additional reductions could require more aggressive measures, modifications to basic infrastructure, and changes to standard operating procedures. Some of the costs would be offset by the value of natural gas that is recovered through reduced losses of production, however, lower natural gas prices would decrease the value of the recovered natural gas and not all reductions would result in salable recovery. Achieving near-zero emissions would be very challenging.

[17] Environment and Climate Change Canada. "Technical Backgrounder: Federal methane regulations for the upstream oil and gas sector." April 2018. Available at: https://www.canada.ca/en/environment-climate-change/news/2018/04/federal-methane-regulations-for-the-upstream-oil-and-gas-sector.html.

[18] ICF Analysis of U.S. EPA Inventory of U.S. Greenhouse Gas Emissions.

Supply-Side Restrictions

In addition to policies that aim to limit demand, proponents of tighter greenhouse gas emission standards are also proposing and supporting various initiatives that restrict fossil fuels development on the supply side. Examples of such supply-side policies include drilling bans (e.g., New York or Maryland), higher standards for drilling activity (e.g., increased drilling setback requirements in Colorado), organized efforts to oppose pipeline expansion projects (including appeals through the legal process), and imposition of additional regulatory hurdles (e.g., New York State water permitting requirements). Resistance to pipeline projects, in particular, creates greater uncertainty that projects reach completion and, therefore, increases the financial risk. All types of initiatives aimed at regulating access to oil and natural gas supply increase the cost of production and resource development.

Reduced Access to Capital Resulting from Activist-Driven Divestment

In recent years, activists concerned about climate change have campaigned for investors to divest from companies involved in the production and sale of fossil fuels. A number of institutional investors have announced plans to divest or active consideration of such plans.[19] Some stakeholders may be concerned that an increase in the scale of divestments could reduce the ability of Devon and other oil and natural gas companies to access capital.

The direct potential of divestment efforts to limit Devon's access to debt or equity capital may be minimal. A 2013 report from Oxford University concluded that the capacity of divestment to cause direct financial damage to oil and natural gas companies is severely limited by several factors. Chief among these is the large universe of neutral lenders and investors—especially in the North American market in which Devon operates—that will value oil and natural gas investments based on their intrinsic value as defined by expected future cash flows, correcting for any decrease in demand for debt or equity motivated by non-value concerns.[20] Similarly, as Bloomberg New Energy Finance has noted, the scale of global oil and natural gas investments and the high probability of significant future demand makes divestment from oil and natural gas more challenging than divestment from coal.[21] While the political salience of the divestment movement is linked to reputational and policy risks, the former do not normally limit access to capital and the latter are addressed elsewhere in this report.

[19] Attracta Mooney. "Growing Number of Pension Funds Divest from Fossil Fuels." The Financial Times. April 27, 2017. Available at: https://www.ft.com/content/fe88b788-29ad-11e7-9ec8-168383da43b7.

[20] Atif Ansar, Ben Caldecott, and James Tilbury. "Stranded Assets and the Fossil Fuel Divestment Campaign." Stranded Assets Programme at Oxford University. October 2013. p. 30, 33. Available at: https://www.smithschool.ox.ac.uk/publications/reports/SAP-divestment-report-final.pdf.

[21] Nathaniel Bullard. "Fossil Fuel Divestment: A $5 Trillion Challenge." Bloomberg New Energy Finance. 2014. p. 16. https://data.bloomberglp.com/bnef/sites/4/2014/08/BNEF_DOC_2014-08-25-Fossil-Fuel-Divestment.pdf.

Conclusion

While this report is not part of the Devon's overall securities and governance disclosures, it represents an important step forward in assessing potential transition risks due to climate change, particularly in relation to the demand and price impacts of possible low-carbon future scenarios. This report is only one piece of Devon's overall communications' strategy on environmental topics. Please refer to Devon's Sustainability Report and Form 10-K disclosures for additional information.

Devon and its stakeholders are committed to understanding the potential impacts of climate change risks on Devon's long-term business plans. In particular, certain stakeholders are concerned that energy companies may not be able to remain economically competitive in a potential carbon-constrained future. Informed in part by the conclusions reflected in this report, Devon remains confident that its asset portfolio is expected to produce oil and natural gas efficiently and profitably in a carbon-constrained scenario.

Devon recognizes, however, that there are potential negative implications of a lower-carbon economy. In order to minimize risk and maximize profits, Devon has historically analyzed pricing scenarios that are even more conservative than the Base Case Scenarios and the more aggressive carbon-constrained scenarios. As a dynamic energy company, Devon responds to changes in the industry by strategically re-positioning its portfolio and incorporating new technological innovations and industry practices to remain economically profitable and environmentally responsible.

Climate-related risk management is a continuously evolving process and Devon will remain a proponent of conservation and the advancement of emission-reduction technologies. Devon is committed to maintaining discussions with its management, Board of Directors, and stakeholders to continue to address and analyze the potential impacts of a lower-carbon economy.

Methodological Appendix

This section details the methodology that ICF used to generate its price forecasts and to adapt and further analyze price forecasts from IEA.

ICF Oil Prices

ICF's oil prices have been estimated using a combination of near-term futures prices and a long-term assessment of oil market fundamentals. For 2018 and 2019, WTI futures have been used to forecast oil prices. For 2020 and 2021, a blend of futures prices and ICF's fundamentals forecast is used. For the long-term, ICF assumes an equilibrium marginal production cost of $70/Bbl. That $70/Bbl Refiner Acquisition Cost of Crude Oil (RACC) has been converted to a WTI Cushing price for this analysis. In this report, estimated prices rely on ICF's Q2-2018 Base Case Projection.

Oil prices for the ICF Sustainable Development Case have been estimated by applying a derived price elasticity[22] for oil to the demand change between the IEA New Policies Scenario and the IEA Sustainable Development Scenarios. For example, in 2025, IEA forecasted an 8% reduction in demand and a 13% reduction in price for the IEA Sustainable Development Scenario compared to the IEA New Policies Scenario. In this example, ICF used the resulting 0.59 price elasticity of demand for 2025 to determine the expected price change that would result if the same demand change that occurred between the IEA Scenarios occurred between the ICF Base Case and the ICF Sustainable Development Case in the year 2025.

The IEA price elasticity is about 0.50 in the near term and 0.75 in the long term. The average elasticity over the entire 2020-2050 projection period is about 0.65.

IEA Oil Prices

For both its New Policies Scenario and the Sustainable Development Scenario, IEA provided an average worldwide oil importer price through 2040. ICF extrapolated the price to 2050 and converted the worldwide oil importer price to a WTI price forecast by carrying forward the 2016 difference between the IEA importer average price and the 2016 average WTI price. This difference was about $2/Bbl.

ICF Natural Gas Prices

ICF's natural gas prices have been estimated using ICF's GMM, a model widely used to project natural gas supply, demand, and prices for the North American natural gas market. Estimated prices rely on ICF's Q2-2018 Base Case Projection. The GMM solves for hub prices at the different locations relevant to Devon's production. Gathering and processing charges have been subtracted from those prices to derive wellhead prices at each of those locations. Prices have been extrapolated beyond 2040 because the ICF Base Case is only run through 2040.

[22] Oil price elasticity of demand measures the responsiveness of oil demand with the change in oil price. The elasticity is calculated by dividing the percentage change in oil demand by the percentage change in oil price. Natural gas price elasticity of demand is calculated with the same methodology as oil price elasticity of demand using IEA's natural gas price and demand forecast.

The ICF Q2-2018 Base Case projects associated natural gas[23] supply growth from tight oil plays (such as the Permian in west Texas and New Mexico) due to a rise in oil prices and also growth from Marcellus, Utica and Haynesville gassy shale plays. This natural gas supply growth places a downward pressure on natural gas prices in the short term and results in lower Henry Hub prices, below $3.50/MMBtu, through 2025. The combination of Gulf Coast LNG exports and domestic demand growth places upward pressure on natural gas prices in the long term and raises the Henry Hub price to $5.60/MMBtu by 2050.

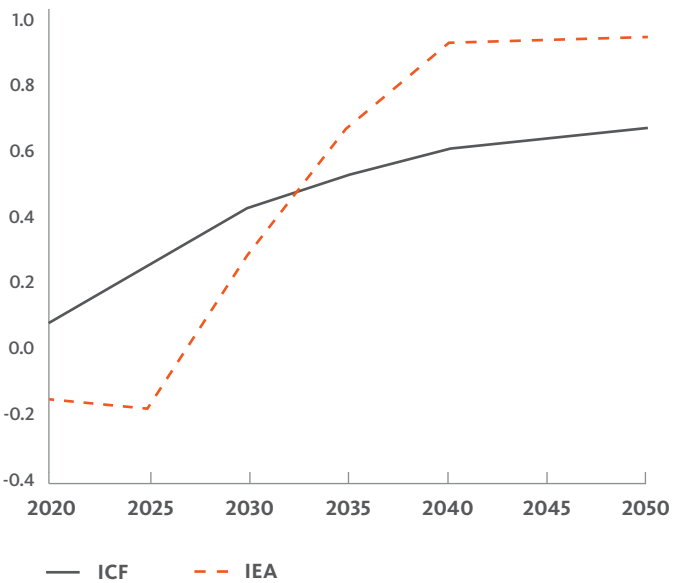
Natural gas prices for the ICF Sustainable Development Case were estimated by applying an ICF-derived price elasticity for natural gas to the demand change between the IEA New Policies Scenario and the IEA Sustainable Development Scenario. ICF's long-term natural gas price elasticity is about 0.6 (Figure 7).

IEA Natural Gas Prices

IEA has projected natural gas prices at Henry Hub for the IEA New Policies Scenario and the IEA Sustainable Development Scenario through 2040. ICF has extrapolated these projections forward through 2050. IEA's price elasticity is negative in the near term, but rises to a much higher value of 0.9 in the longer term (Figure 8). The average elasticity over the entire projection period is about the same for the two projections.

Figure 8:

NATURAL GAS ELASTICITY OF DEMAND
(% Change of Demand / % Change of Henry Hub Price)



Source: ICF analysis of ICF and IEA data

ICF and IEA Implied Propane Prices

Propane prices are estimated using the historical relationship between the WTI Cushing oil price and the Mont Belvieu propane price. ICF halved the oil price and then converted the per barrel price into a per gallon price in order to forecast propane prices.

[23] Associated gas or associated dissolved gas refers to natural gas that is produced along with crude oil from oil wells.

Forward-Looking Statements

This report includes "forward-looking statements." Such statements include those concerning strategic plans, expectations and objectives for future operations, and are often identified by use of the words and phrases “expects,” “believes,” “continue,” “will,” “would,” “could,” “may,” “aims,” “forecasts,” “likely to be,” “intends,” “projections,” “estimates,” “plans,” “expectations,” “targets,” “considers,” “opportunities,” “potential,” “anticipates,” “suggests,” “outlook” and other similar terminology. All statements, other than statements of historical facts, included in this report that address activities, events or developments that Devon expects, believes or anticipates will or may occur in the future are forward-looking statements. Such statements are subject to a number of assumptions, risks and uncertainties, many of which are beyond the control of Devon. Statements regarding Devon’s business and operations are subject to all of the risks and uncertainties normally incident to the exploration for and development and production of oil and gas. These risks include, but are not limited to: the volatility of oil, gas and NGL prices; uncertainties inherent in estimating oil, gas and NGL reserves; the extent to which we are successful in acquiring and discovering additional reserves; the uncertainties, costs and risks involved in oil and gas operations; regulatory restrictions, compliance costs and other risks relating to governmental regulation, including with respect to environmental matters; risks related to Devon’s hedging activities; counterparty credit risks; risks relating to Devon’s indebtedness; cyberattack risks; Devon’s limited control over third parties who operate its oil and gas properties; midstream capacity constraints and potential interruptions in production; the extent to which insurance covers any losses we may experience; competition for leases, materials, people and capital; Devon’s ability to successfully complete mergers, acquisitions and divestitures; and any of the other risks and uncertainties identified in Devon’s Form 10-K and its other filings with the SEC. Investors are cautioned that any such statements are not guarantees of future performance and that actual results or developments may differ materially from those projected in the forward-looking statements. The forward-looking statements in this report are made as of the date of this report, even if subsequently made available by Devon on its website or otherwise. Devon does not undertake any obligation and expressly disclaims any duty to update the forward-looking statements as a result of new information, future events or otherwise. In addition, while this report describes future events that may be significant, the significance of those potential events should not be read as equating to materiality as the concept is used in the company’s filings with the SEC.

List of Acronyms

Bbl – Barrels of oil

BMO – Bank of Montreal

CO_2 – Carbon dioxide

ERM – Enterprise Risk Management

GHG – Greenhouse gas

GMM – Gas Market Model (ICF)

IEA – International Energy Agency

LNG – Liquefied natural gas

MMBtu – Million British thermal units

NGL – Natural gas liquids

SAGD – Steam-assisted gravity drainage

TCFD – Task Force on Climate-related Financial Disclosures

WEO – World Energy Outlook (IEA annual report)

WTI – West Texas Intermediate (benchmark oil price)