Economic Impacts of a No Fracking Scenario

For U.S. Oil and Gas Development, the U.S. Economy and American Households

Prepared for the American Petroleum Institute

Prepared By OnLocation, Inc.

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Executive Summary

Modeled impacts of banning fracking and eliminating further development of new production of oil and gas on state and federal leases:

Economic Impacts

- ✓ GDP Declines: Cumulative total GDP loss of over $7.1 trillion (2018$)
- ✓ Jobs Lost: Job losses in the U.S. economy could average over 3.8 million through 2030, peaking at 7.5 million jobs lost or 4.8% of total jobs in 2022
  - ➢ In 2025, Oklahoma, North Dakota, Louisiana, New Mexico, Wyoming, Montana and Arkansas have projected unemployment rates exceeding 12% (12-18%) losing a total of 855 thousand jobs in these relatively unpopulated states
  - ➢ In 2025 alone in just 5 states over 2.3 million jobs are lost (Texas, California, Florida, North Carolina and Louisiana)
- ✓ **Annual** Household incomes decline on average $5,040 **per year** (4.3%) (2018$), $9,800 in nominal dollars; Household energy bills increase $618 per year average (2018$), ranging from $365 to $790 per year in nominal dollars

Energy Security Impacts

- ✓ US shifts from energy independence to leaning on foreign energy suppliers for 21% of its total energy needs by 2030
  - ➢ Having just become a net exporter of oil and petroleum products, US reverses direction and returns to heavy dependence on imported oil and petroleum importing over 40% of its supplies by 2030
  - ➢ Reversing the recent trend of going from net natural gas importer to a net natural gas exported, the US shifts back to importing almost 30% of its natural gas needs in 2030

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Outline

- Objective
- Approach: Scenario Development
- Impact Analysis
  - ✓ Economic Consequences
  - ✓ Employment Impacts
  - ✓ Energy Prices
  - ✓ Fossil Energy Production and Consumption/Demand
- Caveats
- Appendix – NEMS Model Changes

Objective

- Some have proposed policies that would ban hydraulic fracturing everywhere and eliminate state and federal leases for all types of oil and gas development
- The goal of this analysis is to estimate the impact that these restrictions on US oil and gas development could have on oil and gas production, energy prices, the economy, employment and the American consumer
- By modifying assumptions going into the Energy Information Administration's National Energy Modeling System (NF-NEMS), which is a well-known and vetted model, we can develop an objective assessment of the potential impacts on the US
  - To distinguish the model and analysis from that conducted by EIA, the model is referred to as NF-NEMS, see Caveats and Assumptions at the end of the report
  - EIA Caveats on NEMS and the Reference Case are copied below and are available here https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf

Highlights

ECONOMIC IMPACTS

Imposition of a Fracking and Leasing Ban

- ✓ GDP Declines
  - Total loss of over $7.1 Trillion in GDP (2018$) - cumulative to 2030; In 2022, GDP losses exceeds $1.2 Trillion (2018$)
- ✓ Jobs Lost
  - Loss of an average of 3.8 million jobs per year 2020 to 2030, peaking at 7.5 million jobs lost in 2022; In 2025 alone in just 5 states over 2.3 million jobs are lost (Texas, California, Florida, North Carolina and Louisiana)
- ✓ Household Incomes Decline 4.3%
  - Annual Household incomes decline on average $5,700 per year (4.3%) (2018$), $9,800 per year in nominal dollars
  - Total expenditures on home heating, electricity and transportation increase $0.9 trillion through 2030. Household energy bills increase an average of $618 per year (2018$), ranging from $365 to $790 per year in nominal dollars

Highlights

ENERGY SECURITY IMPACTS

Imposition of a Fracking and Leasing Ban

- ✓ US shifts from energy independence to leaning on foreign energy suppliers for 21% of its TOTAL energy needs by 2030
  - Having just become a net exporter of oil and petroleum products, US reverses direction and returns to heavy dependence importing over 40% by 2030
  - Reversing the recent trend towards net exporter to net importer of natural gas, the US shifts to importing almost 30% of its natural gas needs in 2030

Approach

SCENARIO DEVELOPMENT

Construct a No Fracking (NF) scenario that assumes constraints on domestic oil and natural gas production

Applied a ban on hydraulic fracking of oil and natural gas on both public and private land

Turned off undiscovered unconventional oil, undiscovered tight gas, undiscovered shale gas, developing shale gas and developing tight gas

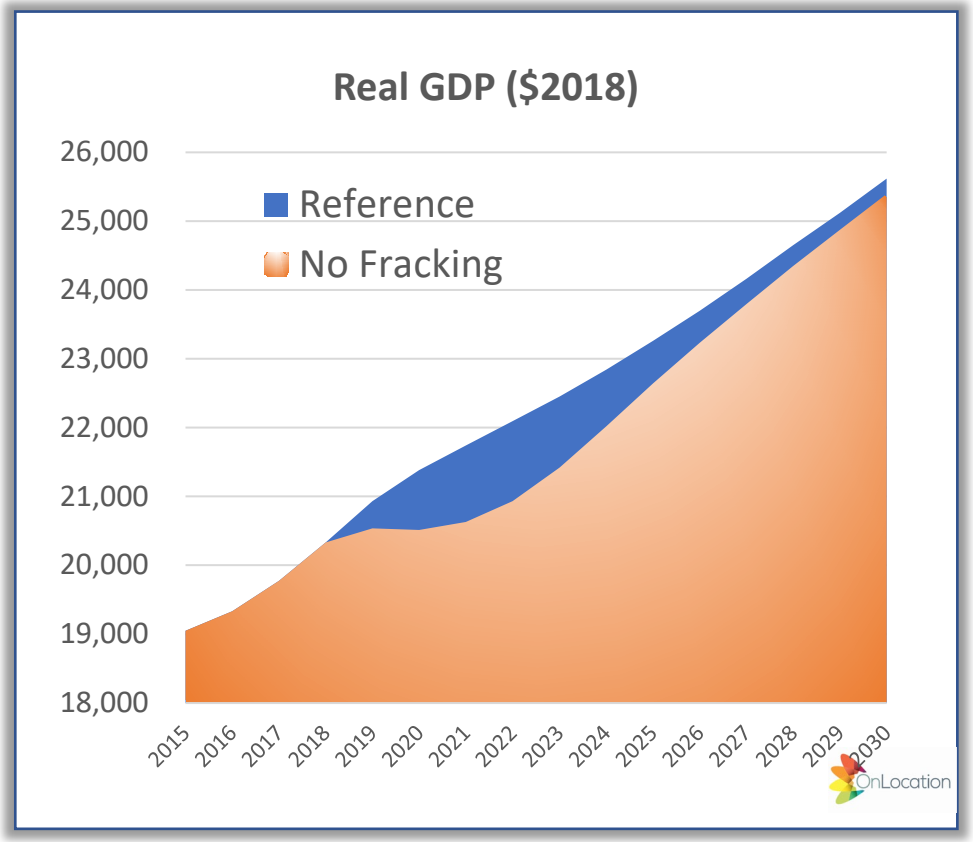
Eliminated development of new production of oil and gas on state and federal leases

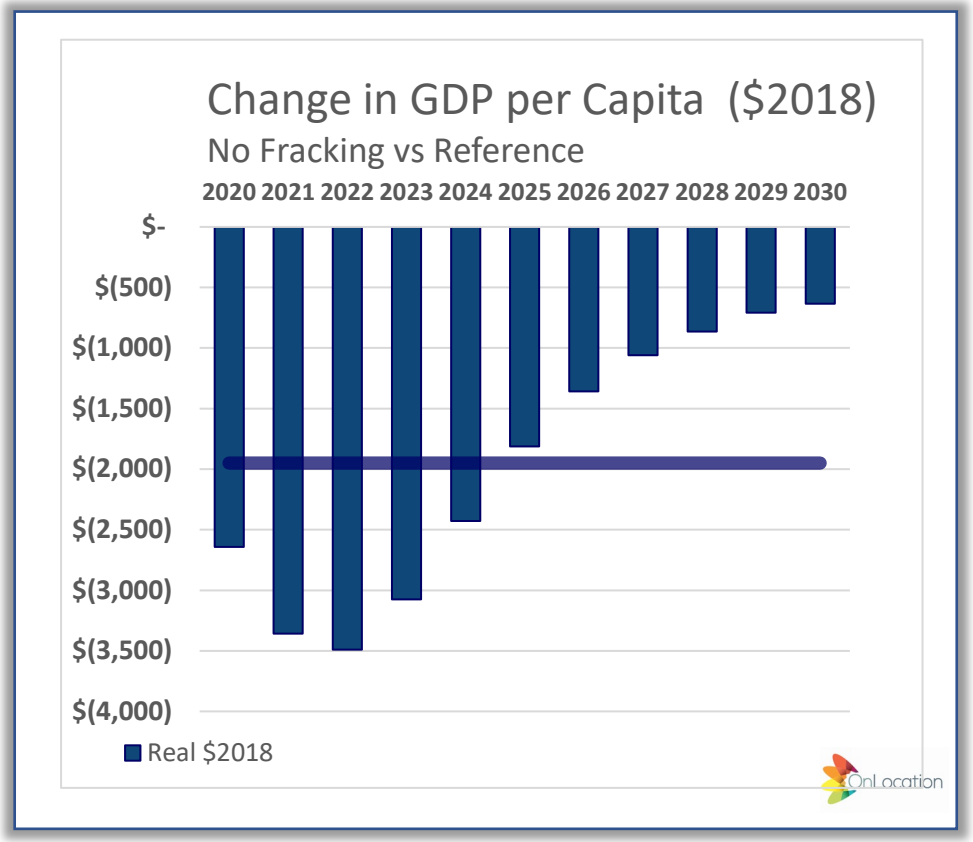
Stopped all future development and exploration of offshore oil and gas.

The No Fracking (NF) scenario is compared to the AEO2019 Reference case (REF)

Economic Impacts

ECONOMIC IMPACTS OF A FRACKING and LEASING BAN
GDP Losses are cumulative $7.1 Trillion ($2018) over 2020-2030





- Immediately following the Fracking and Leasing Ban, the US enters into a recession
- Lower U.S. energy production and higher energy prices reduce GDP by $1.2 trillion ($2018) in 2022

- GDP per capita decline $1,950 ($2018) on average and peak at $3,500

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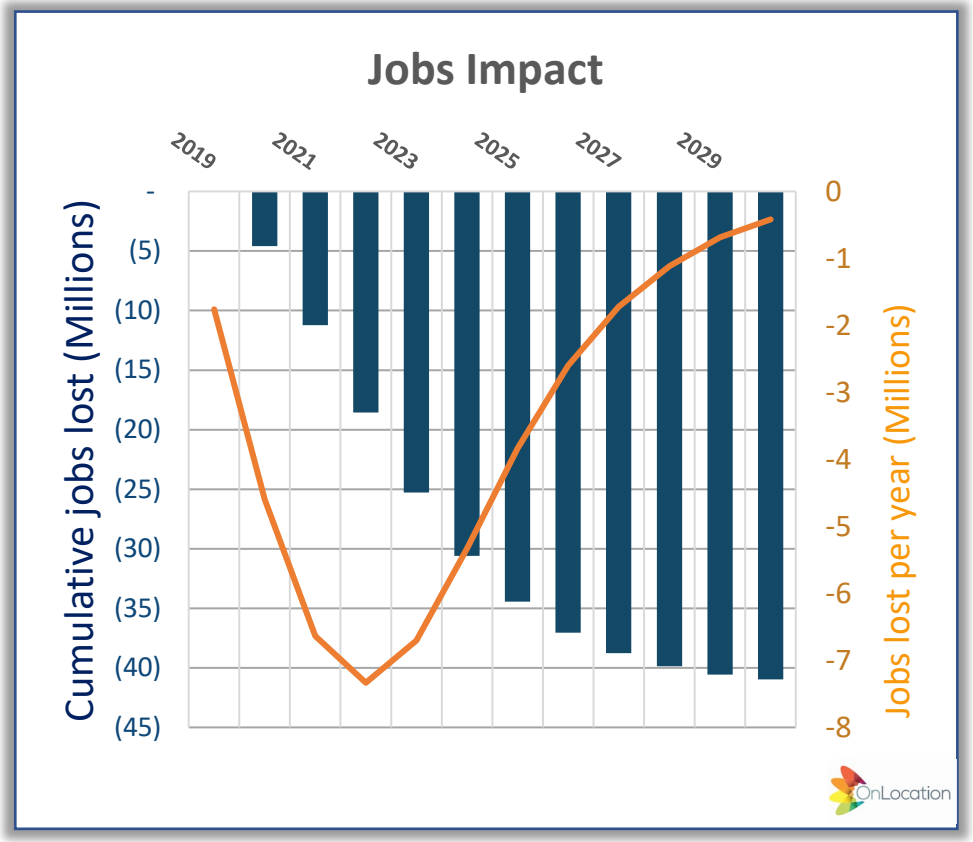
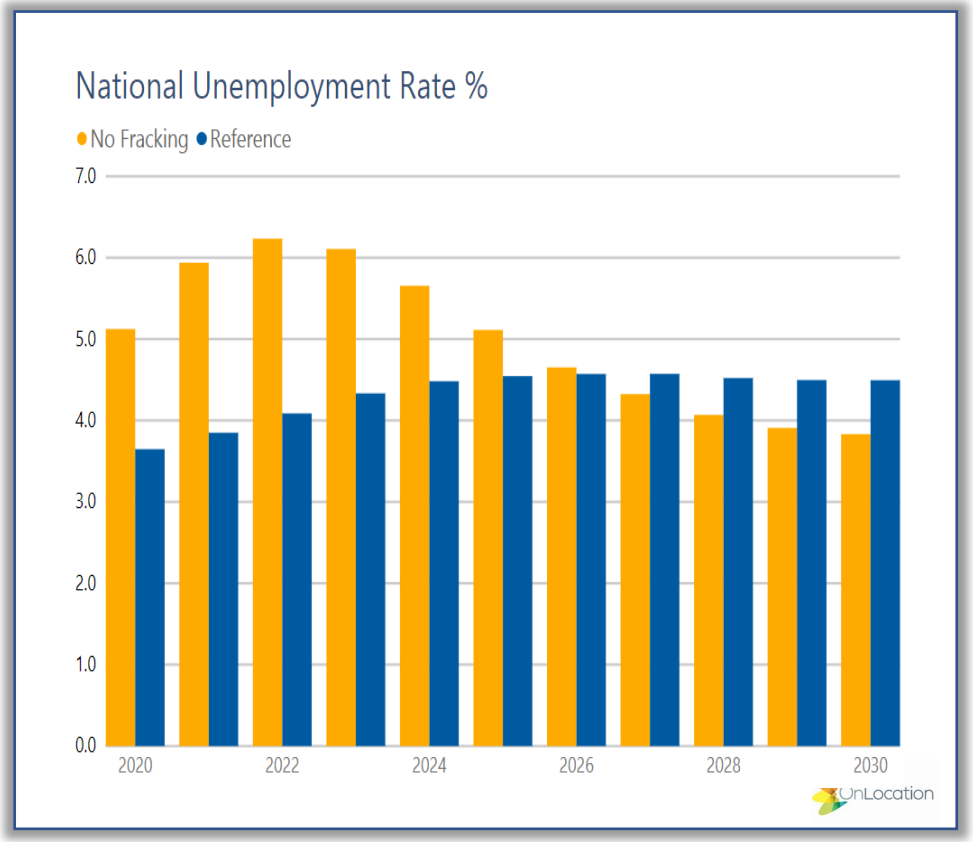
ECONOMIC IMPACTS OF A FRACKING and LEASING BAN
Average of 3.8 million less employed





- ✓ **Jobs Lost: Job losses in the U.S. economy could average over 3.8 million through 2030, peaking at 7.5 million jobs lost or 4.8% of total jobs in 2022**

- ✓ **In 2025, Oklahoma, North Dakota, Louisiana, New Mexico, Wyoming, Montana and Arkansas have projected unemployment rates exceeding 12% (12-18%) losing a total of 855 thousand jobs in these relatively unpopulated states**
- ✓ **In 2025 alone in just 5 states over 2.3 million jobs are lost (Texas, California, Florida, North Carolina and Louisiana)**

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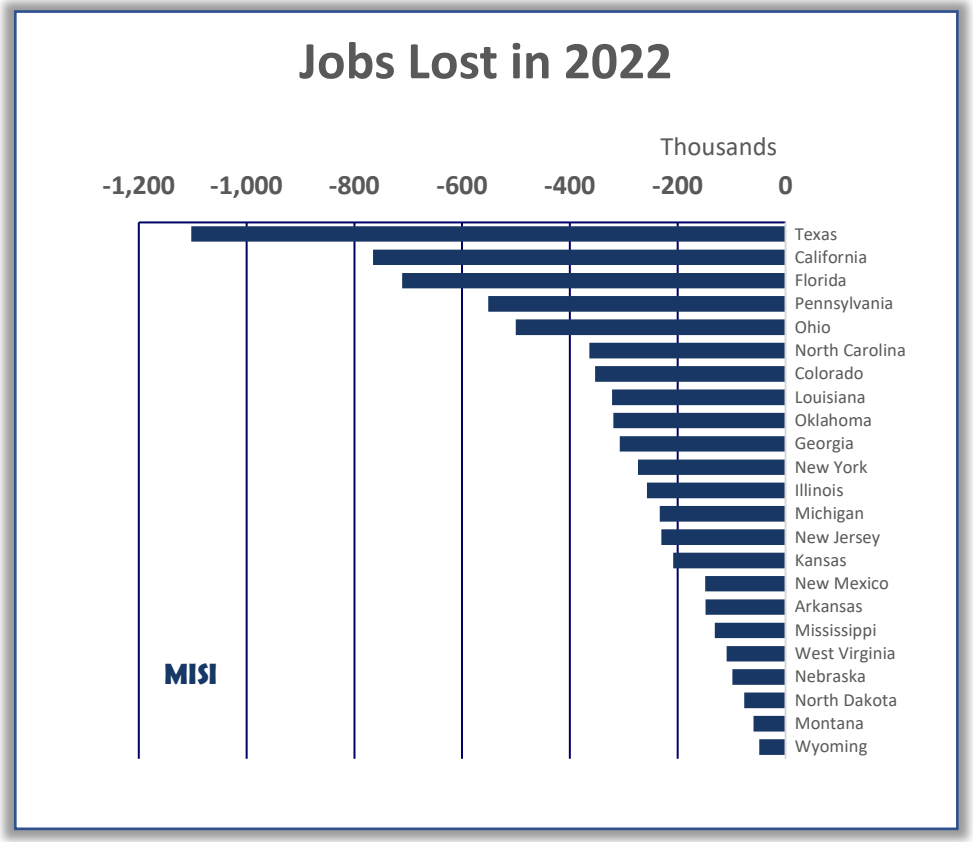
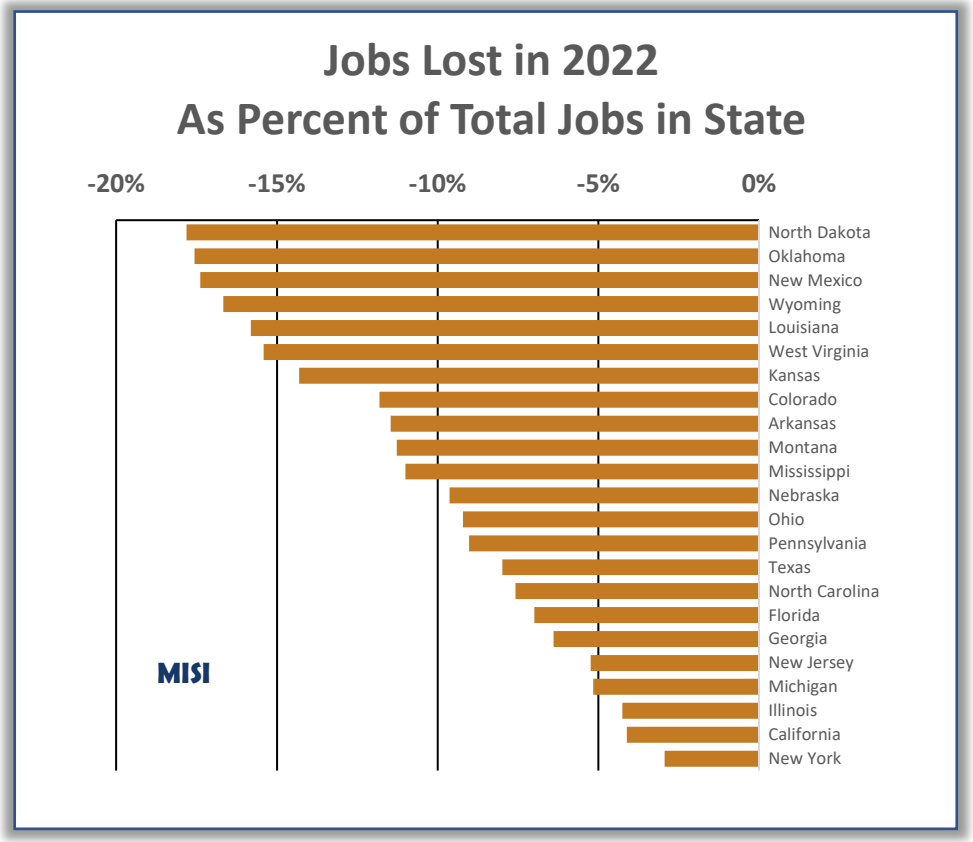
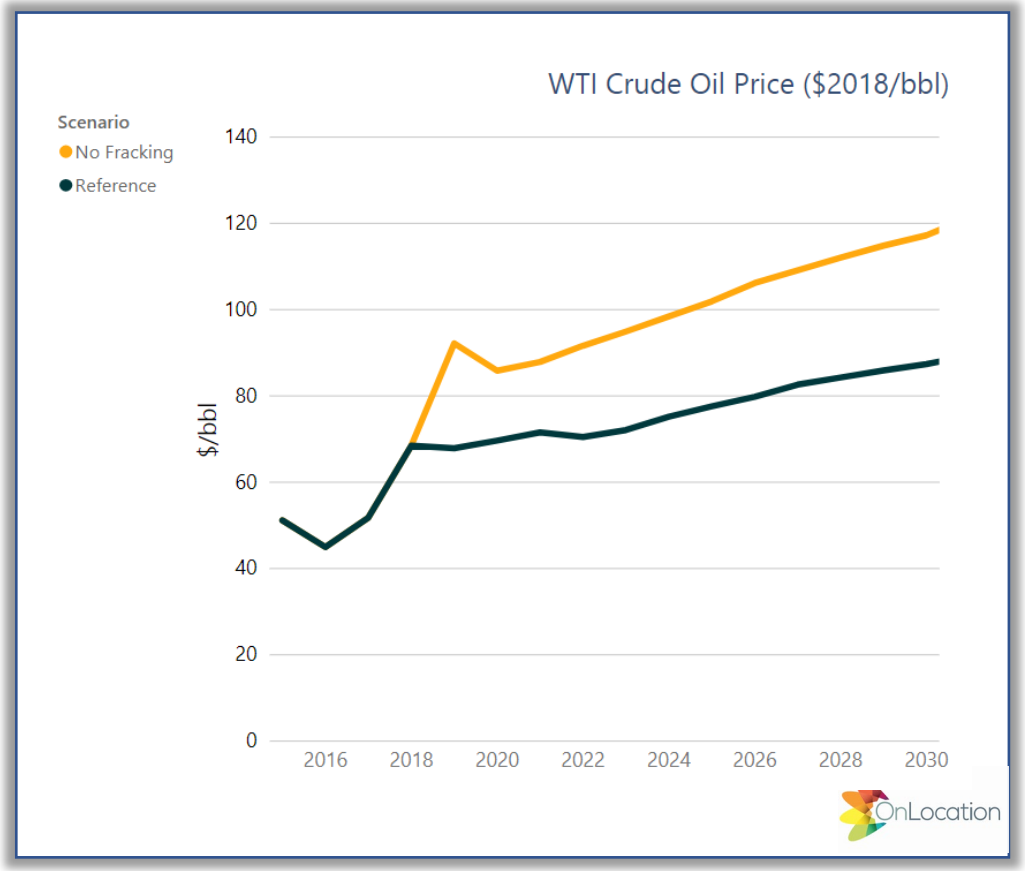
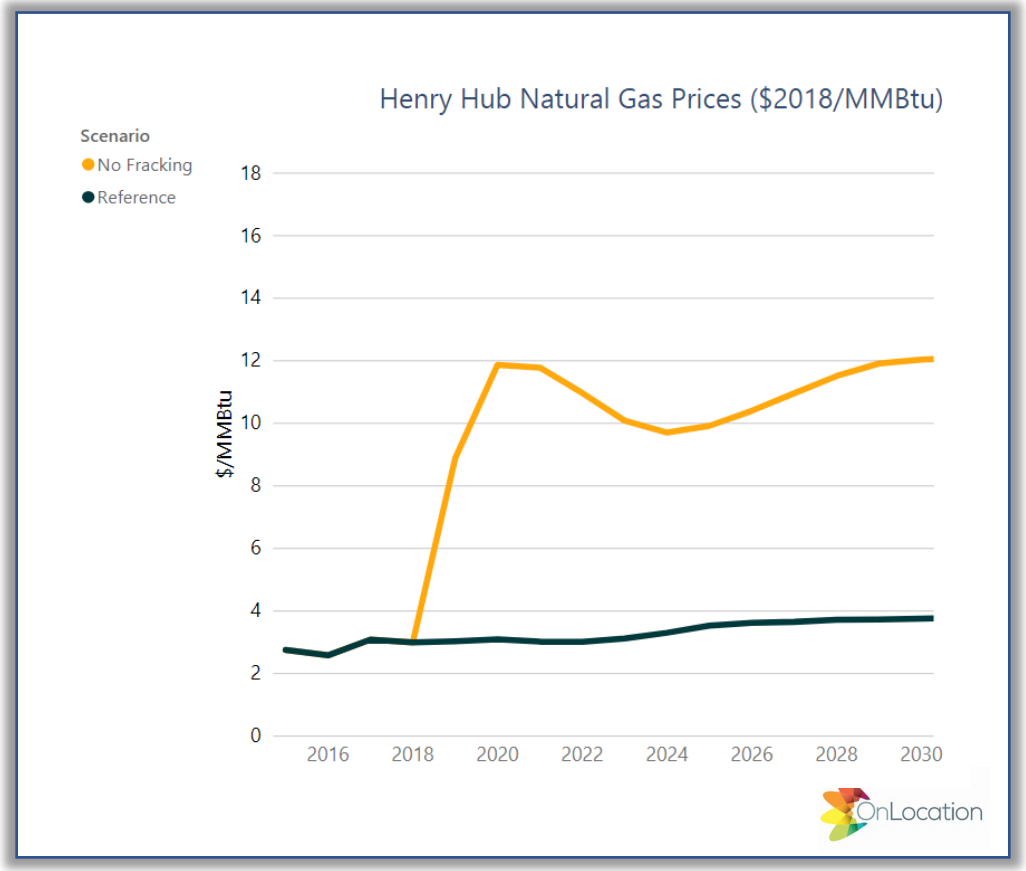
ECONOMIC IMPACTS OF A FRACKING and LEASING BAN
Over 3.6 Million Jobs Lost In 5 States In 2022





- ✓ **Texas alone could lose over 1.1 million jobs in 2022**
- ✓ **Six states could have over 15% of Jobs Lost**

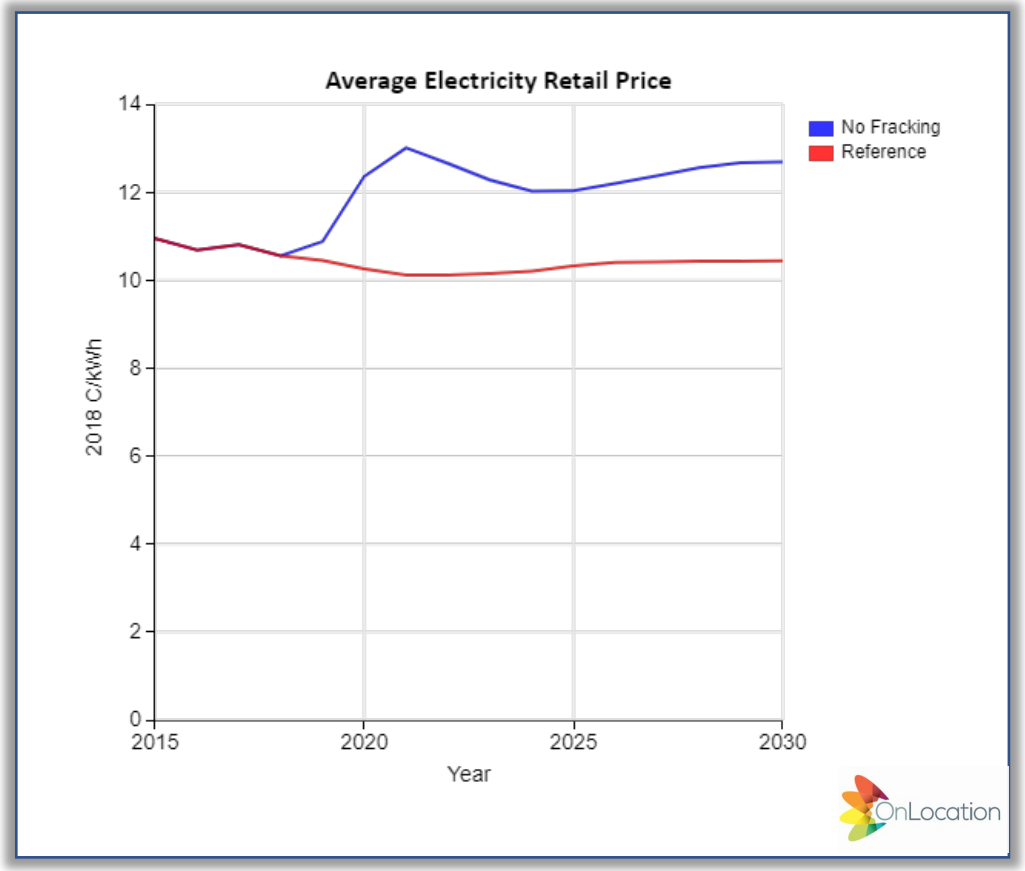


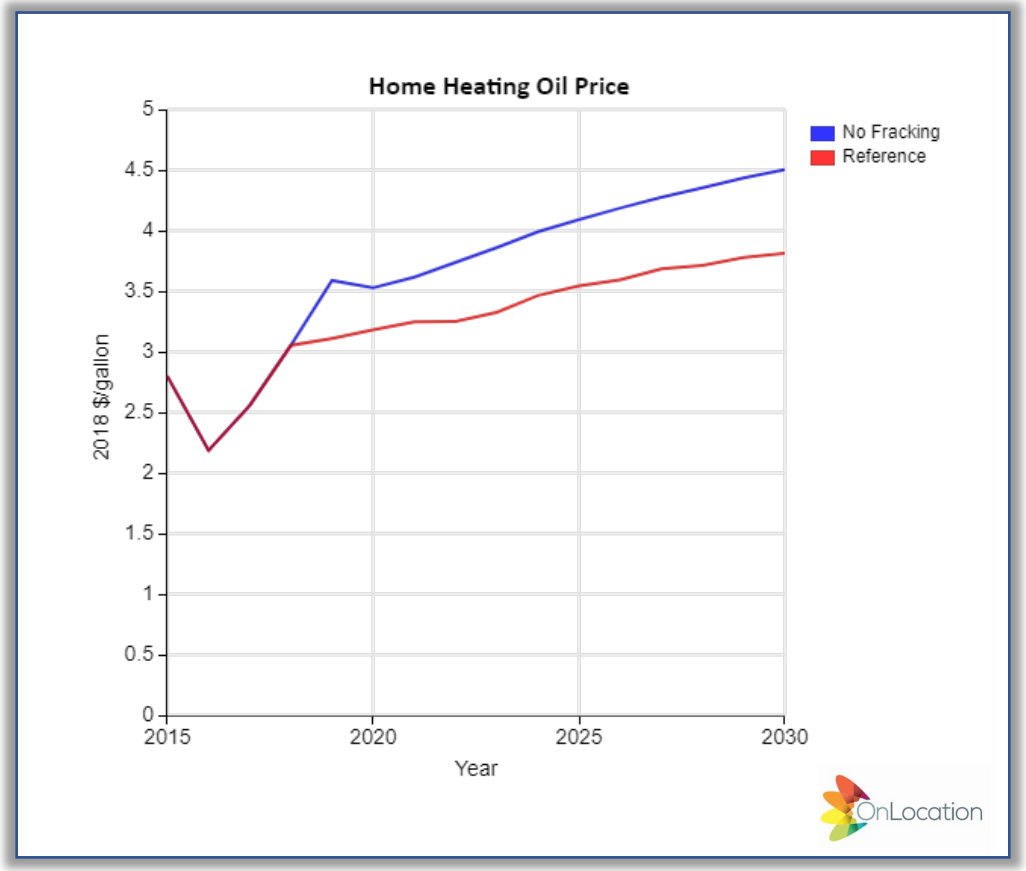


- **WTI oil prices jump and persist at a +30% premium over the Reference Case**
- **Under the Fracking Ban, Henry Hub natural gas prices jump 3 to 4 times that of the Reference Case**

ENERGY SECURITY IMPACTS OF A FRACKING and LEASING BAN

Energy Price Spike





- ✓ **Electricity prices average 20% higher under the No Fracking case**
- ✓ **Residential Heating Oil Prices average 15% higher under No Fracking Case**

ECONOMIC IMPACTS OF A FRACKING and LEASING BAN
Consumer Energy Prices Jump

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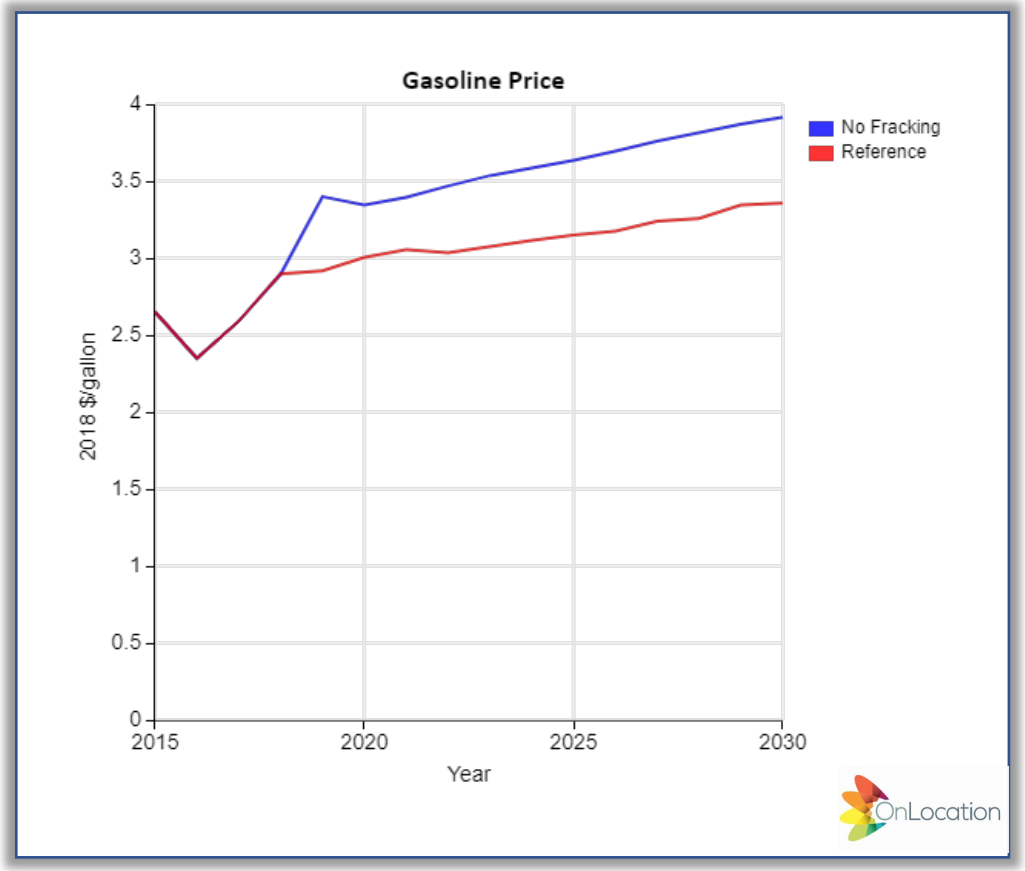

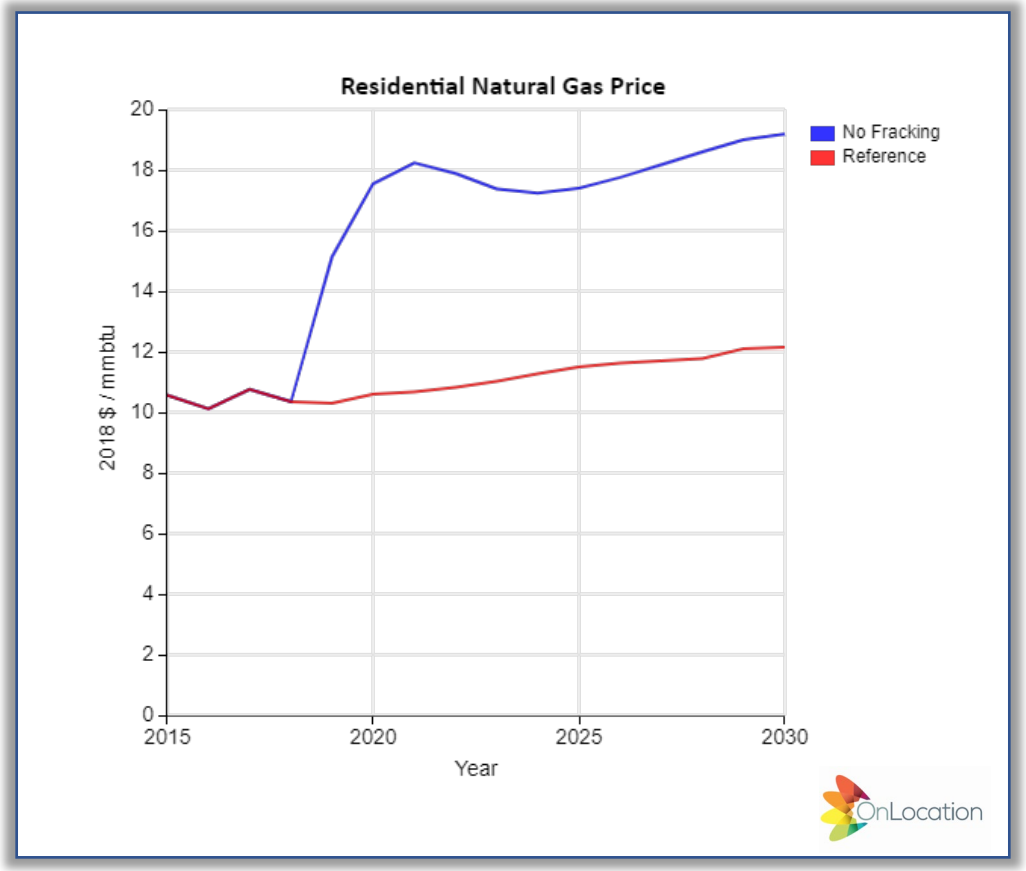

- ✓ **Gasoline prices average 15% higher under the No Fracking case**
- ✓ **Residential Natural Gas Prices average 58% higher under No Fracking Case**

ECONOMIC IMPACTS OF A FRACKING and LEASING BAN
Consumer Energy Prices Jump

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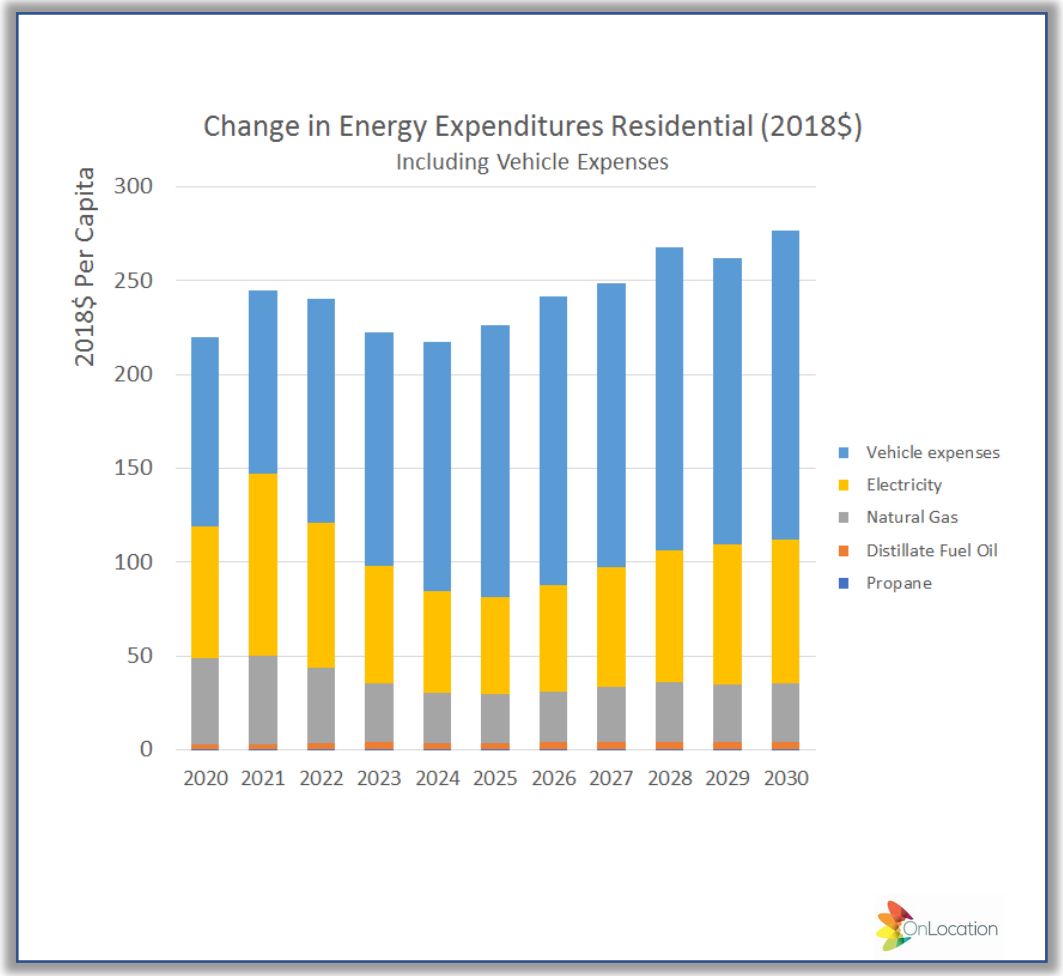
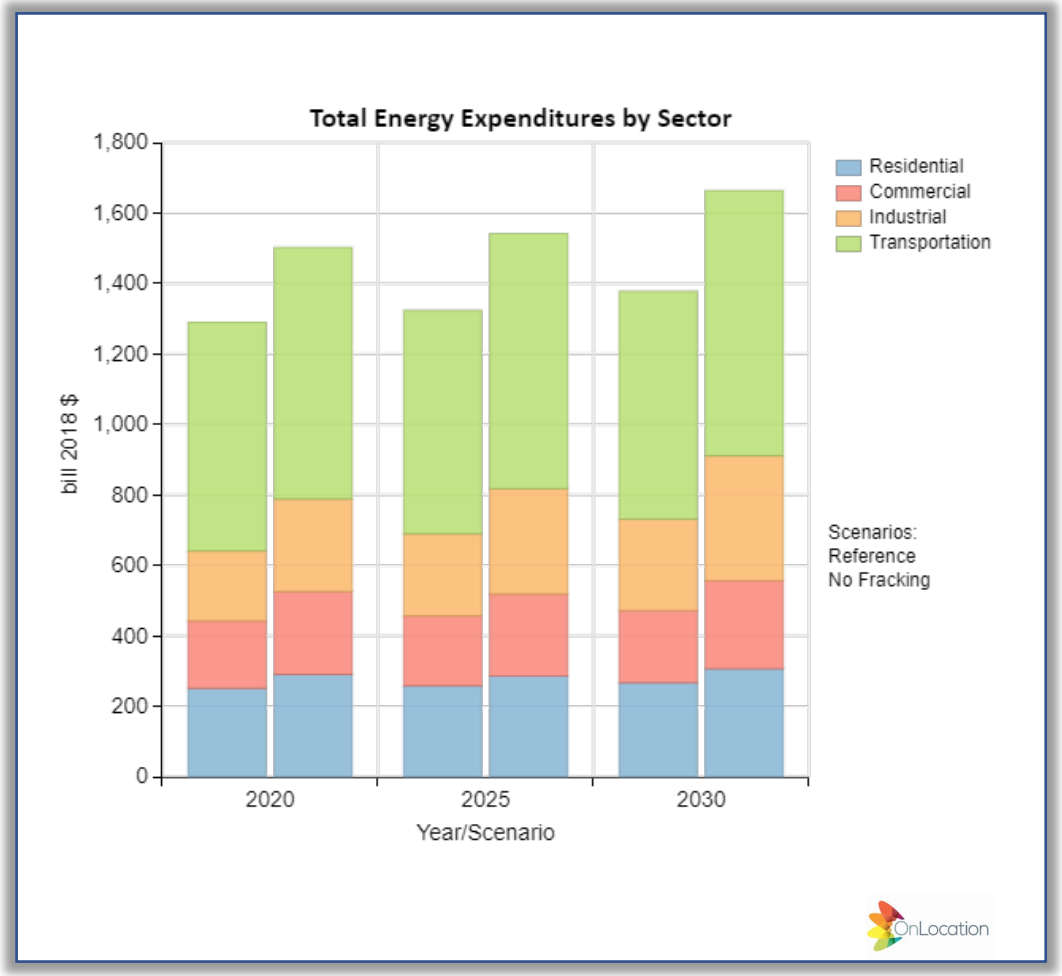
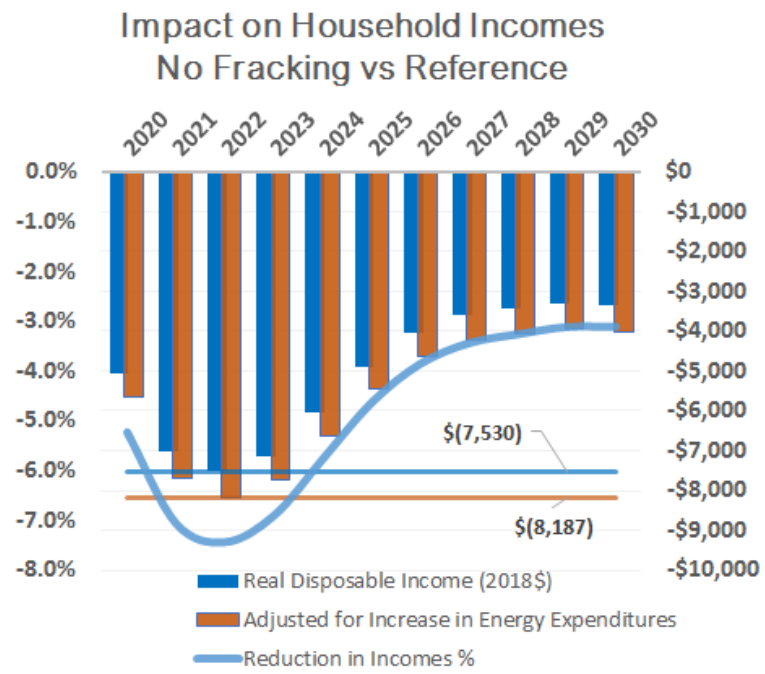




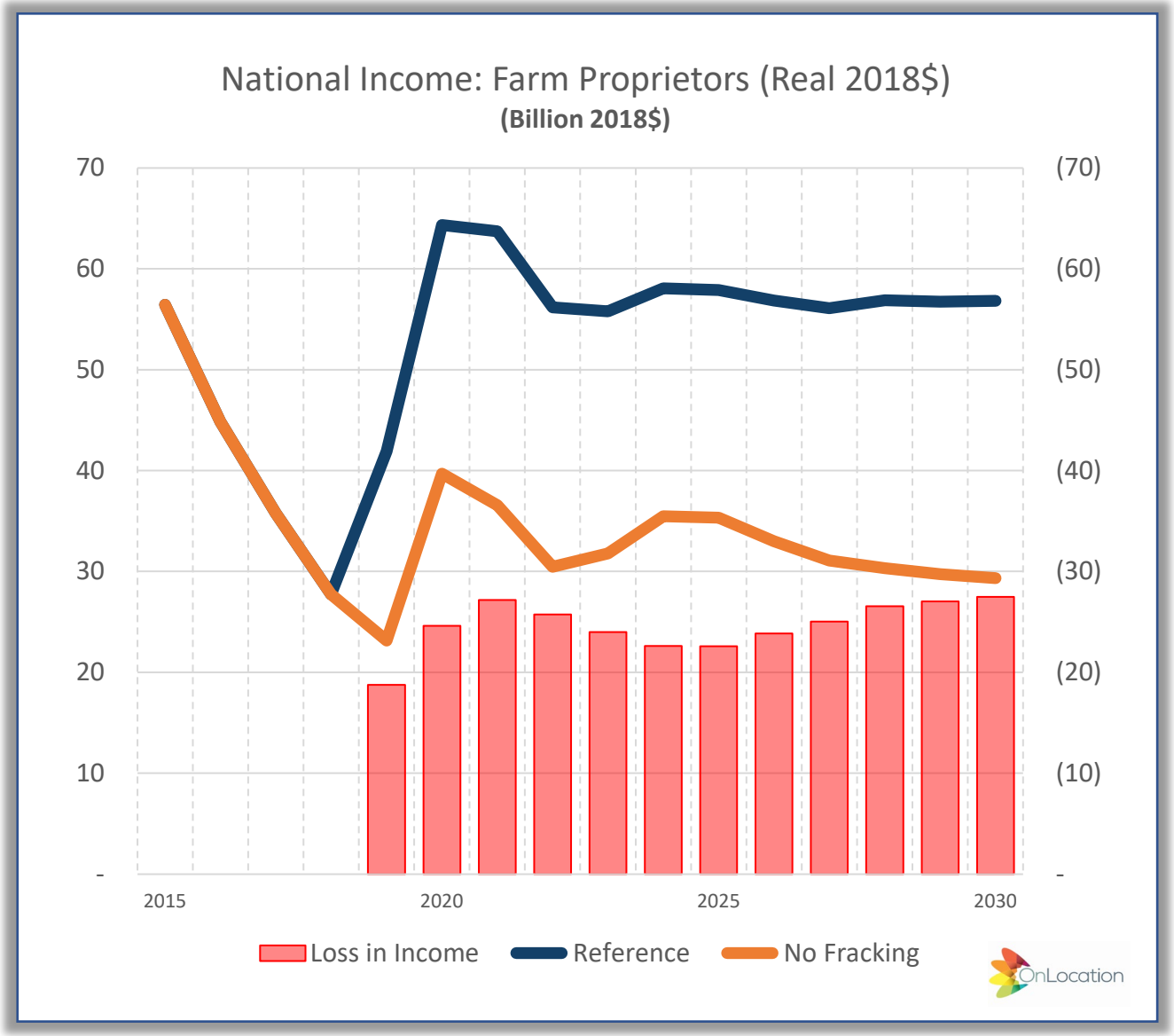
- Residential use is down 12 percent while energy costs are up on average 14 percent over 2020-2030
- Increases in energy expenditures in all sectors could result in increases in the costs of goods sold

ECONOMIC IMPACTS OF A FRACKING and LEASING BAN
Energy Expenditures

ECONOMIC IMPACTS OF A FRACKING and LEASING BAN
Decline in household income averages $5,700 (4.9%)



- Average decline in household incomes including increase in energy bills is $5,700 (4.9%) per year
  - Peak reduction in real disposable income is $7,500 in 2022
  - Peak reduction when energy bills are included is $8,187 in 2022, a 7.5% decline



FARM INCOMES

2020-2030

- Farm Incomes Decline 43 Percent
- Total Loss to Farm Income Exceeds $275 Billion
- Average Annual Loss is over $25 Billion

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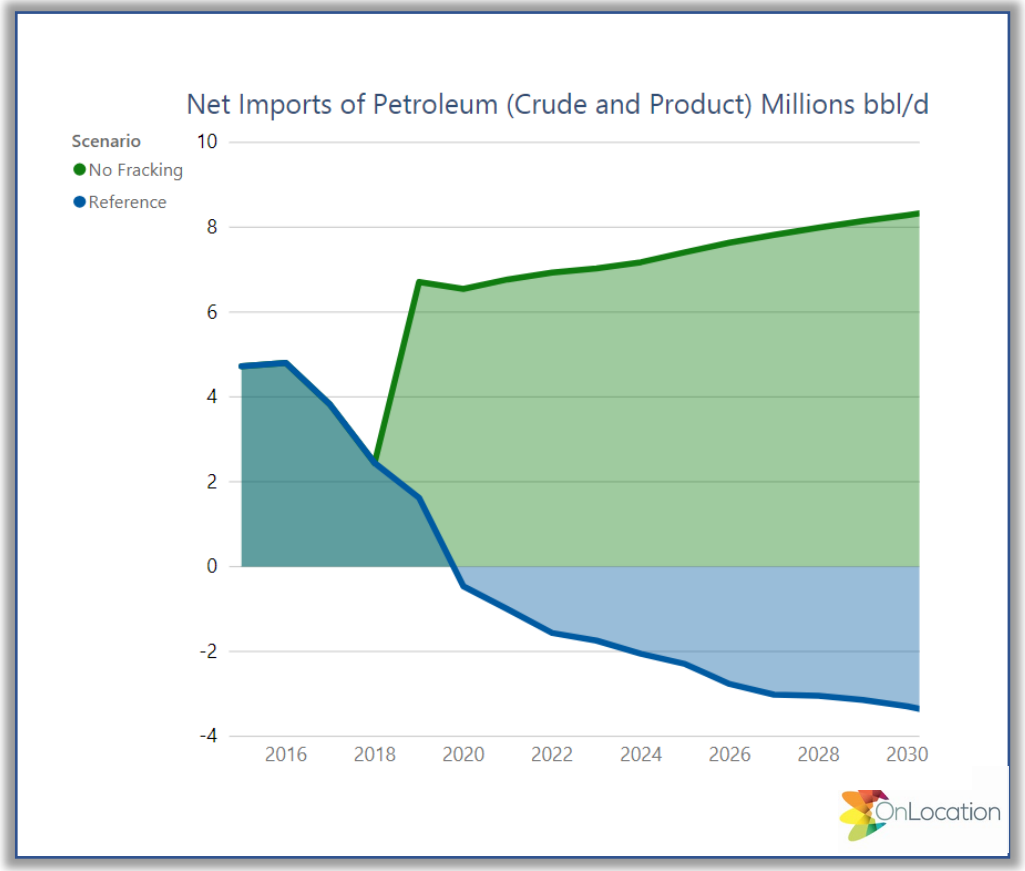
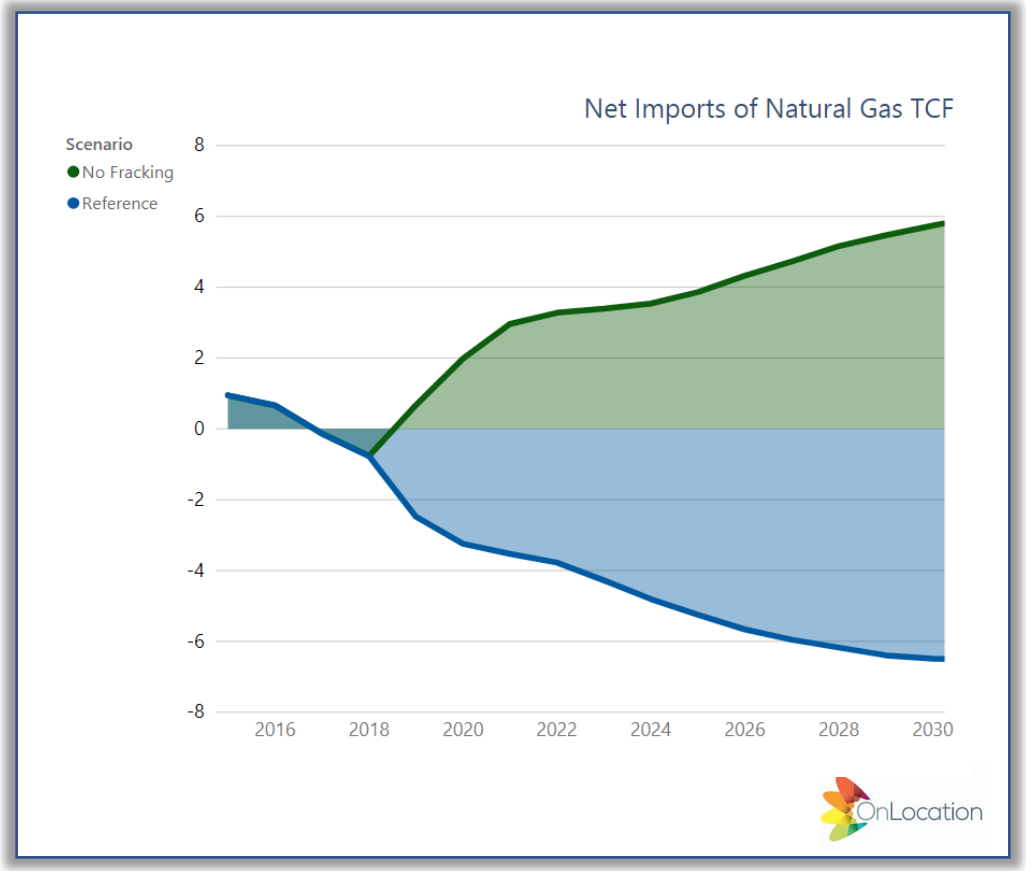
Energy Security Impacts

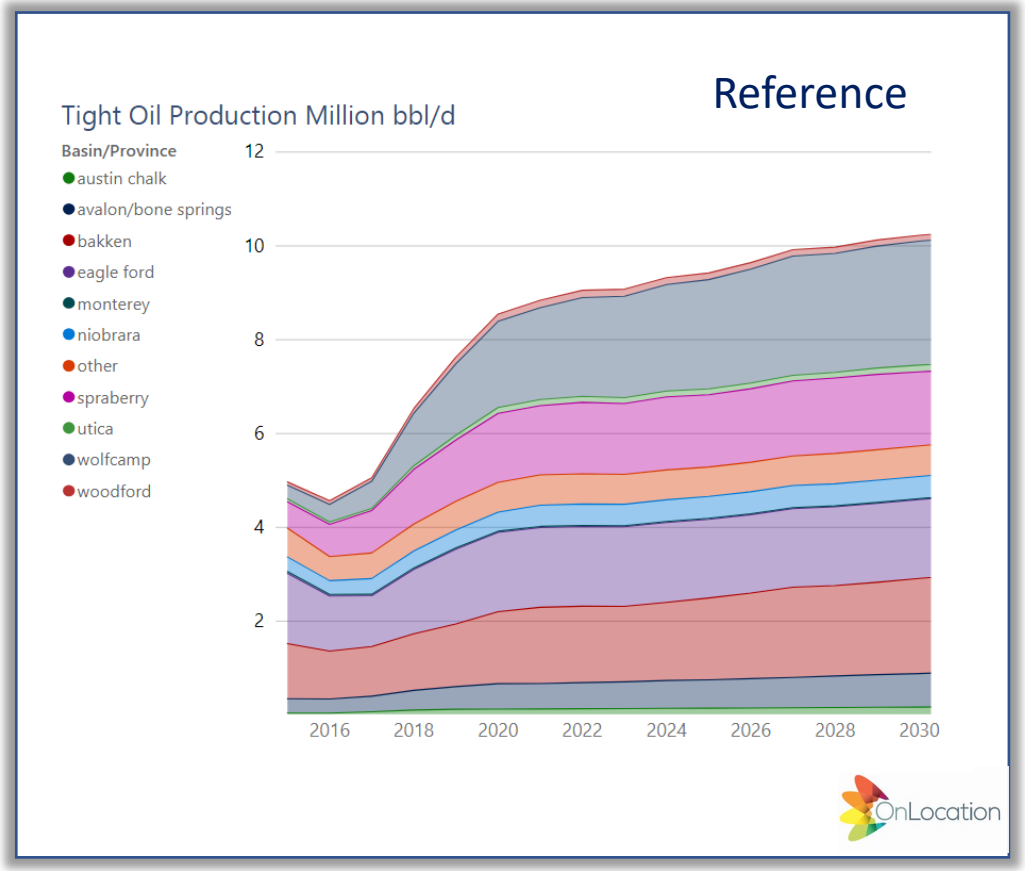


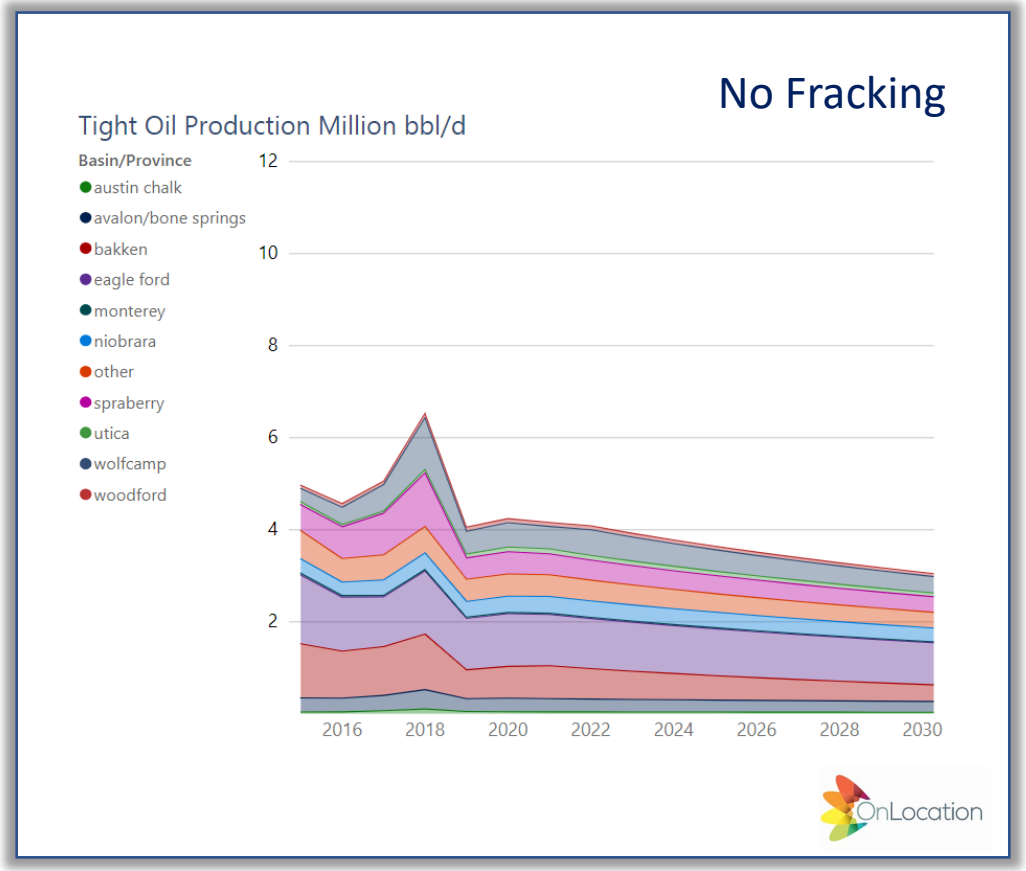


- **Having just become a net exporter of oil and petroleum products, US reverses direction and returns to heavy dependence on foreign sources for over 40% of our needs by 2030**
- **Reversing trend, instead of continuing to be a net exporter of natural gas, the US shifts to importing almost 30% of its natural gas needs by 2030**

ENERGY SECURITY IMPACTS OF A FRACKING and LEASING BAN

Return to Dependence on Foreign Energy Supplies

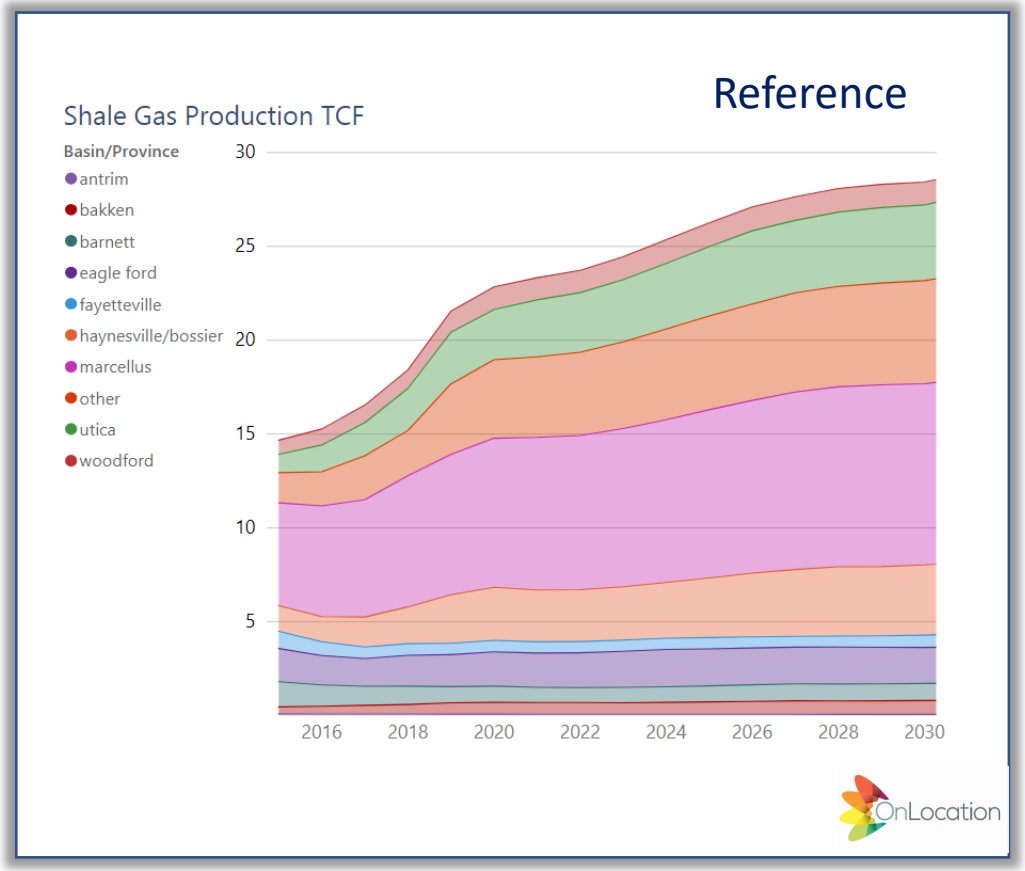


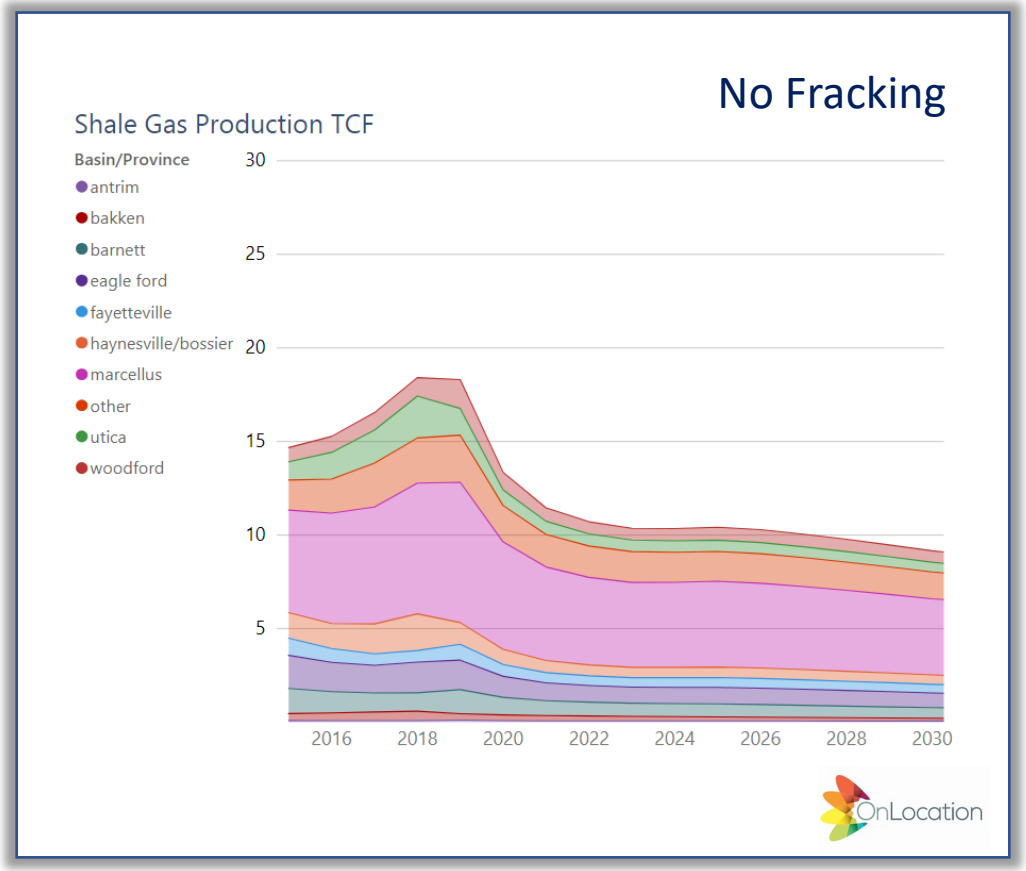


- **Under the Reference Case tight oil Is projected to exceed 11 million bbl/d by 2030**
- **Under the Fracking Ban Case, only existing production continues reducing the projection to 3 million bbl/d by 2030**

ENERGY SECURITY IMPACTS OF A FRACKING and LEASING BAN

Tight Oil Production Is Stymied

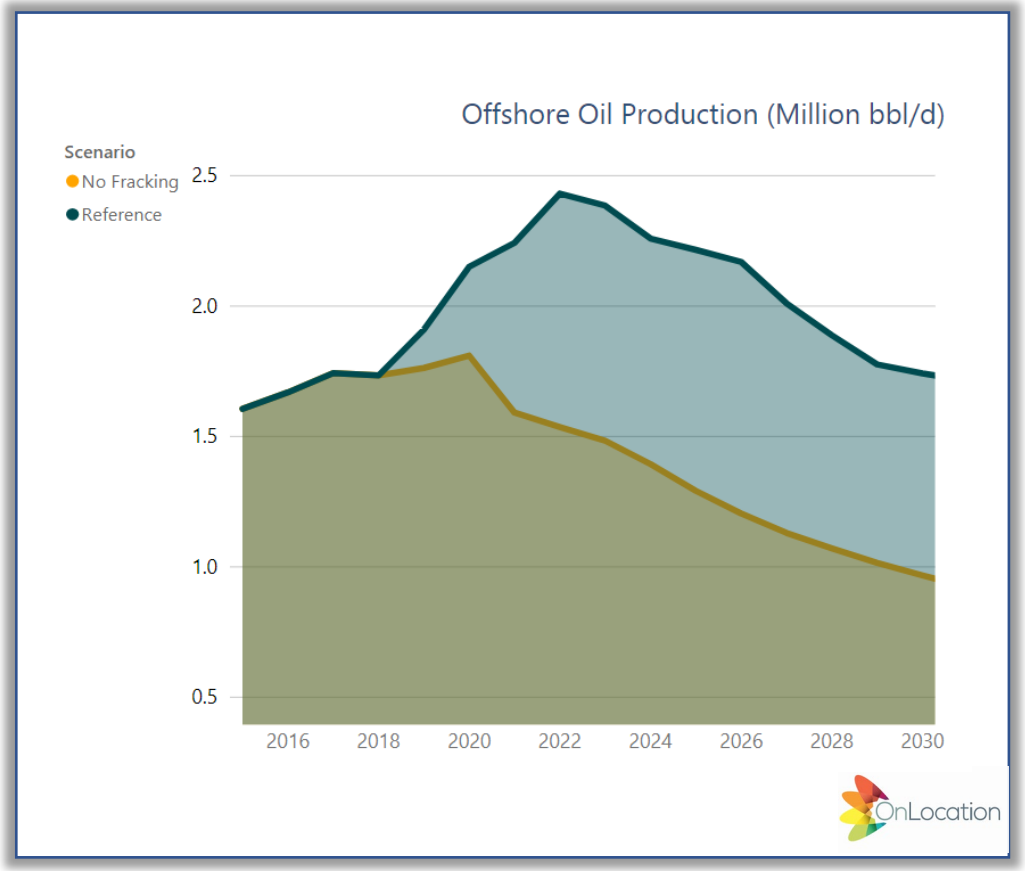


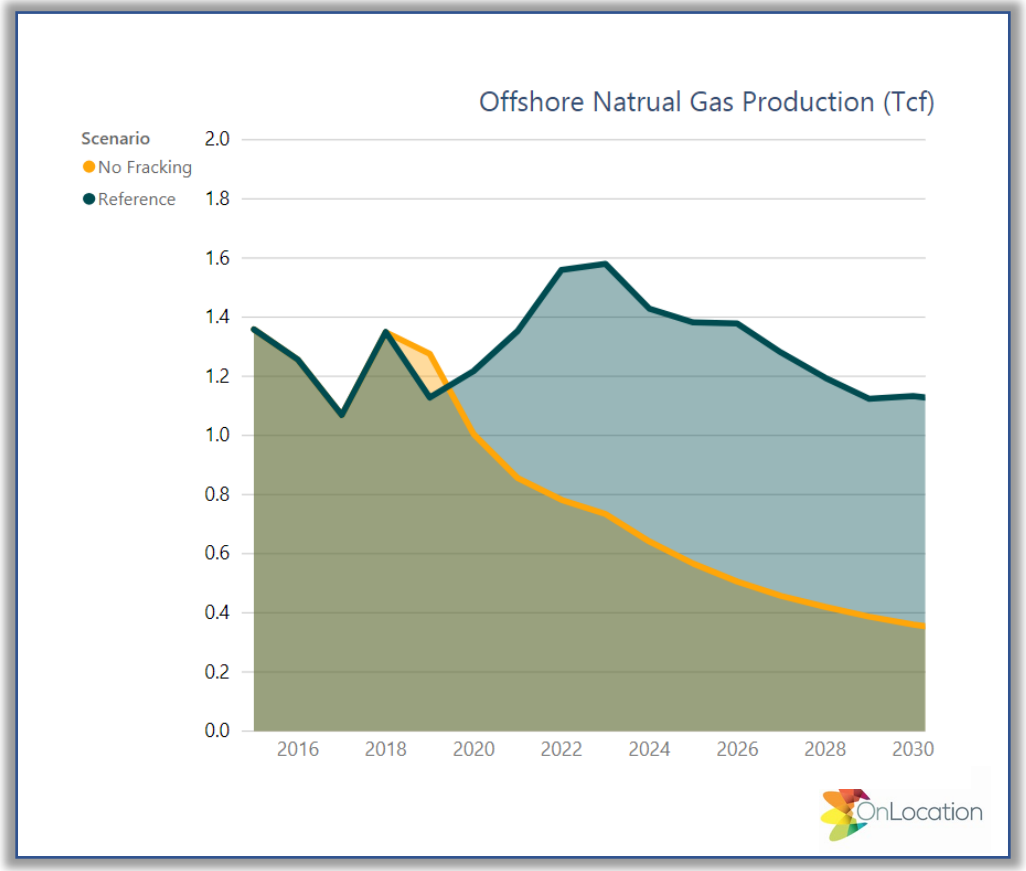


- **Under the Reference case shale gas Is projected to exceed 28 Tcf by 2030**
- **Under the Fracking Ban, only existing production continues reducing the projection to 9 Tcf, a 2/3^{rds} reduction in production**

ENERGY SECURITY IMPACTS OF A FRACKING and LEASING BAN

Shale Gas Production Is Stymied





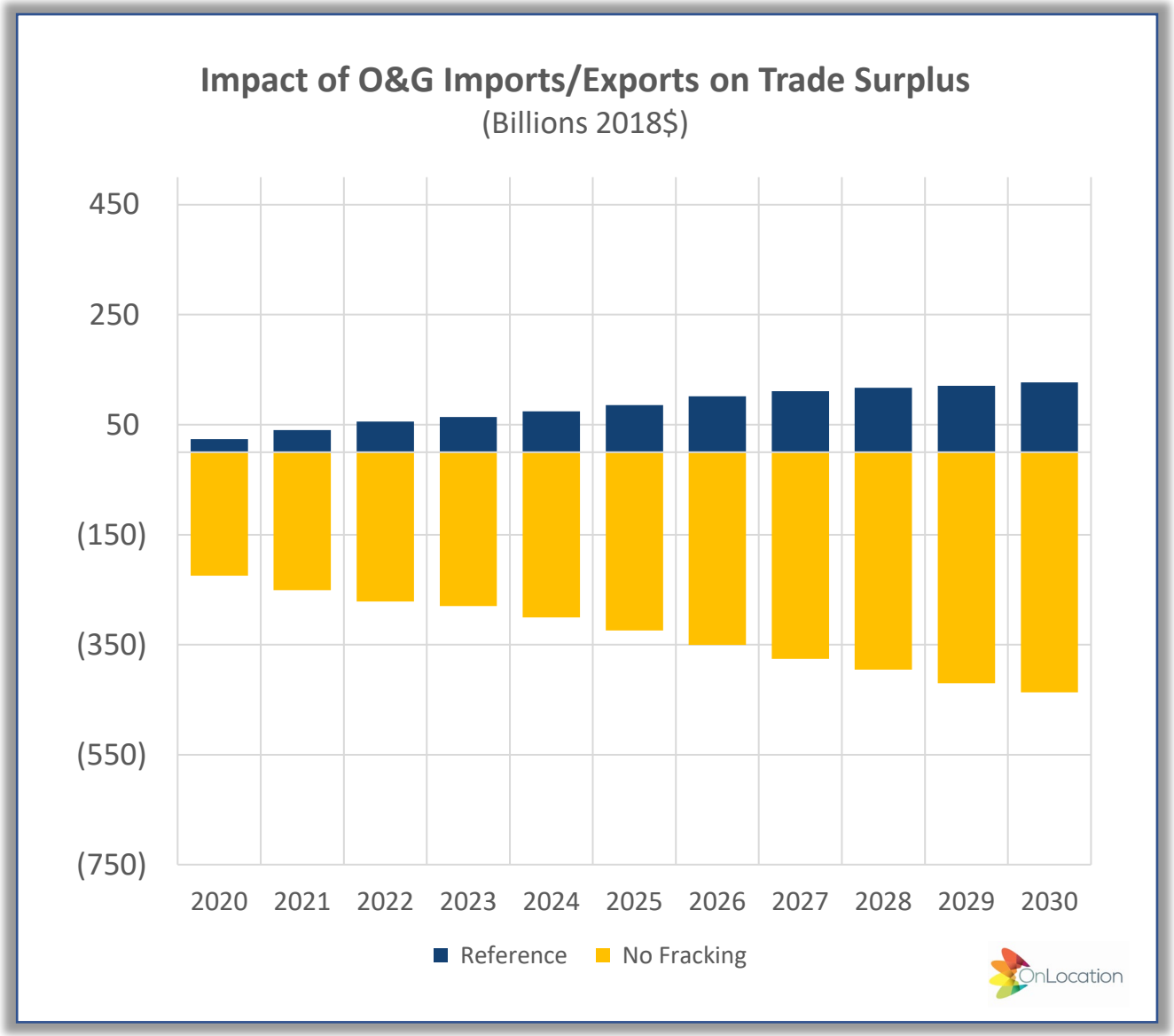
- **Elimination of new production on federal leases precipitates a significant reduction in the oil and gas supplies from the Gulf of Mexico**

ENERGY SECURITY IMPACTS OF A FRACKING and LEASING BAN

Offshore Oil and Gas Production Declines

Impact on Trade Surplus

- Cumulative Energy Trade Surplus Goes from $900 billion to -$3.6 Trillion
- Average Annual Swing of over $400 billion in Trade Surplus



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SUMMARY

- **$7.1 Trillion**
- **Cumulative total loss real 2018$ in GDP over 2020-2030**

- **3.8 Million**
- **Average annual job losses over 2020-2030, job losses peak at 7.5 Million within 3 years; Five states experience over 12-18% unemployment in 2025**

- **$5,700**
- **Household incomes including the cost of increased energy costs, decline by $5,700 on average per year over 2020-2030, a 4.9% decline**

- **40%**
- **U.S. Imports of crude and petroleum products rise to 40 percent of supplies reversing trend towards net exported and energy independence**

- **58%**
- **Residential natural gas prices rise 58 percent over 2020-2030; electricity, heating oil, gasoline energy prices rise 15-20 percent**

Caveats and Additional Assumptions

EIA Caveats on the NEMS integrated model

- Projections in the *Annual Energy Outlook 2019* (AEO2019) are not predictions of what will happen, but rather modeled projections of what may happen given certain assumptions and methodologies.
- The AEO is developed using the National Energy Modeling System (NEMS), an integrated model that captures interactions of economic changes and energy supply, demand, and prices.
- Energy market projections are subject to much uncertainty because many of the events that shape energy markets as well as future developments in technologies, demographics, and resources cannot be foreseen with certainty. To illustrate the importance of key assumptions, AEO2019 includes a Reference case and six side cases that systematically vary important underlying assumptions.
- More information about the assumptions used in developing these projections will be available shortly after the release of the AEO2019.
- The AEO is published to satisfy the Department of Energy Organization Act of 1977, which requires the Administrator of the U.S. Energy Information Administration to prepare annual reports on trends and projections for energy use and supply.

Slide 4, https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf

What is the EIA Reference Case?

- The AEO2019 Reference case represents EIA's best assessment of how U.S. and world energy markets will operate through 2050, based on many key assumptions. For instance, the Reference case assumes improvement in known energy production, delivery, and consumption technology trends.
- The economic and demographic trends reflected in the Reference case reflect current views of leading economic forecasters and demographers.
- The Reference case generally assumes that current laws and regulations that affect the energy sector, including laws that have end dates, are unchanged throughout the projection period. This assumption is important because it permits EIA to use the Reference case as a benchmark to compare policy-based modeling.
- The potential impacts of proposed legislation, regulations, or standards are not included in the AEO2019 cases.
- The Reference case should be interpreted as a reasonable baseline case that can be compared with the cases that include alternative assumptions.

Slide 5, https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf

Study Notes

This analysis uses the National Energy Modeling System (NEMS), the same modeling software that is used by the U.S. Energy Information Administration (EIA) for its Annual Energy Outlook (AEO). The 2019 AEO is the reference case used. As with all models, this analysis will generate results based on assumptions, laws and regulations that were in place in 2019. Within any model, the economic relationships here are a simplification of reality. Even with their limitations, models are essential to make quantitative projections about the future. Please note:

- The No Fracking (NF) scenario illustrated in this report extends the NEMS model outside its general operating range. This was done to show the potential impacts of a sudden end to fracking because this is being discussed publicly. Thus, the supply and demand responses are outside the usual output ranges. The impact of abrupt restrictions on new natural gas and oil supplies is particularly visible in the analysis' finding of an initial surge in natural gas and oil prices.
- Oil Supply: NEMS is a U.S. only model. The international element of oil supply and demand is not represented fully. All of the international interactions in terms of demand and supply may not be captured endogenously by the NEMS model, However, the total international demand and supply curves are accounted for in NEMS and so the import and export response to a fracking ban is captured.
- Natural Gas Supply: The 2019 AEO version of the NEMS model has future imports of liquefied natural gas (LNG) fixed at current levels. It does not allow for additional LNG imports. As a result of this constraint, in the NF scenario, the model leans on imports from Canada. Recoding this component of NEMS to allow more LNG imports was beyond the scope of the project. The resources and the time required to recode the model were not available. To the extent that LNG imports could substitute for Canadian imports may change some regional impacts.
- Coal Generation: In the NF scenario, as the power sector transitions away from more costly natural gas (due to declining domestic production), there is a move to generate more electricity using coal. This increase in coal use is assisted by the cancellation of planned retirements of approximately 35 GWe of coal-fired generating capacity in 2019-2030. (Note an additional 40 GWe of coal is economically retired in the Reference case.)
- As with all models, projections in this analysis can become more uncertain the farther out they go.

Appendix

NEMS Changes in addition to restricting fracking and stopping development on state and federal lands

- In several modules limits were set for natural gas prices when prices were otherwise driven outside of expectations
- Removed planned retirements of coal plants after 2018