

# Fueling the Future

## A Strategic Roadmap to the Energy Trilemma for the Oil & Gas Industry

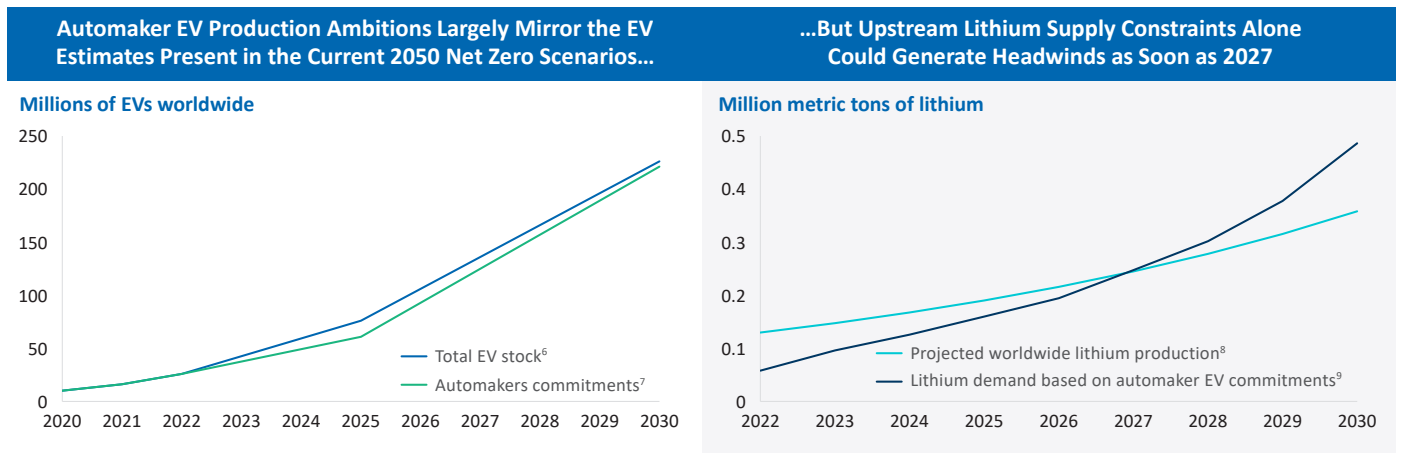
Governments, organizations, and regulators have grappled for years with the world's transition to clean energy. The complex path to decarbonization, including “net zero” targets, requires a staggering amount of planning to secure a reliable energy supply at a reasonable cost while mitigating environmental impact. Known as the “Energy Trilemma,”<sup>1</sup> this balance between energy reliability, affordability, and sustainability and its impact on everyday lives is at the forefront of the current debate regarding the future of our planet.

One key example of the challenges faced in the Energy Trilemma is the decarbonization of transportation. This can be accomplished by electrifying an entire vehicle fleet or decarbonizing the existing liquid fuels being used. Based on current manufacturer commitments, the electrification of transport is projected to spur significant growth for EV production.<sup>2,3</sup>

However, the industry is likely to face supply chain issues in the future, as demand for the rare earth metals required to produce these vehicles – e.g., copper and lithium – outstrips supply (see Exhibit 1).<sup>4</sup> Existing reserves will also likely face supply chain issues because of key minerals like cobalt, lithium and manganese facing export restrictions, further delaying their delivery to the market.<sup>5</sup>



Exhibit 1: The Ambition For Electrification Of Transport Is There, But Supply Chain Headwinds For Lithium May Be Limiting As Soon As 2027



At the same time, the decarbonization of traditional fuels currently relies on two dominant alternatives, namely, biofuels and e-fuels, each with their own distinct challenges. In the case of biofuels, there is clear evidence that there will not be sufficient feedstock to replace traditional fuels,<sup>10,11</sup> and when looking at e-fuels, even with significant technological advancement, there are significantly higher production costs relative to their fossil fuel alternative (see Exhibit 2).<sup>12</sup>

Exhibit 2A: Biofuel Production Is Expected To Reach Feedstock Saturation At > 65% Of Worldwide Supply, Well Below Required Supply Levels For Traditional Liquid Fuel Replacement

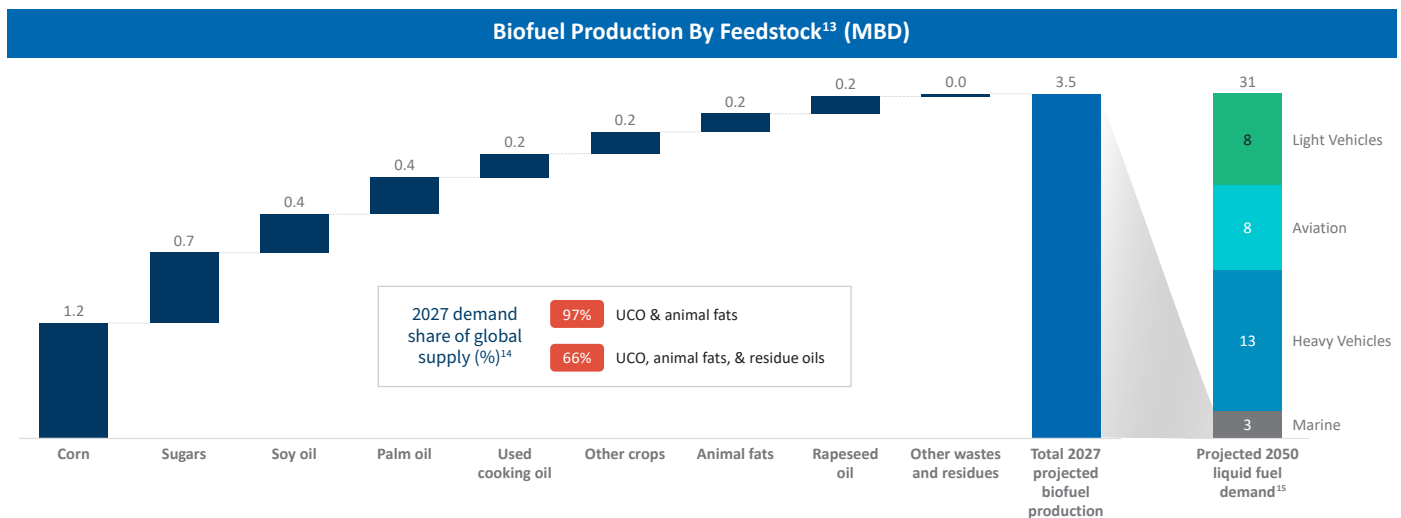
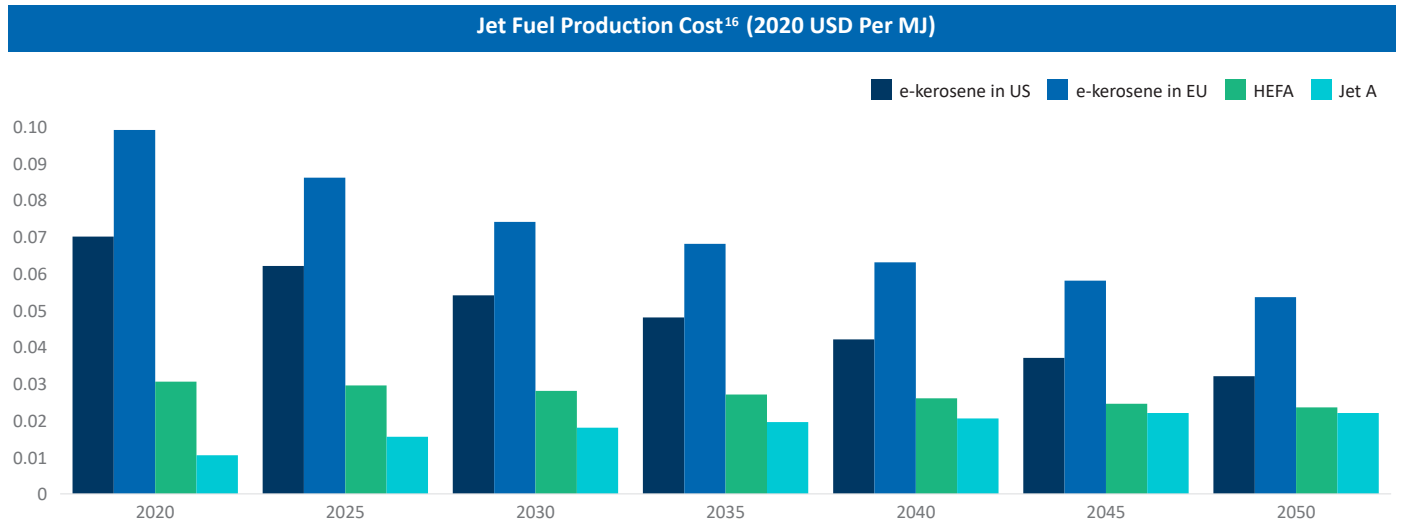
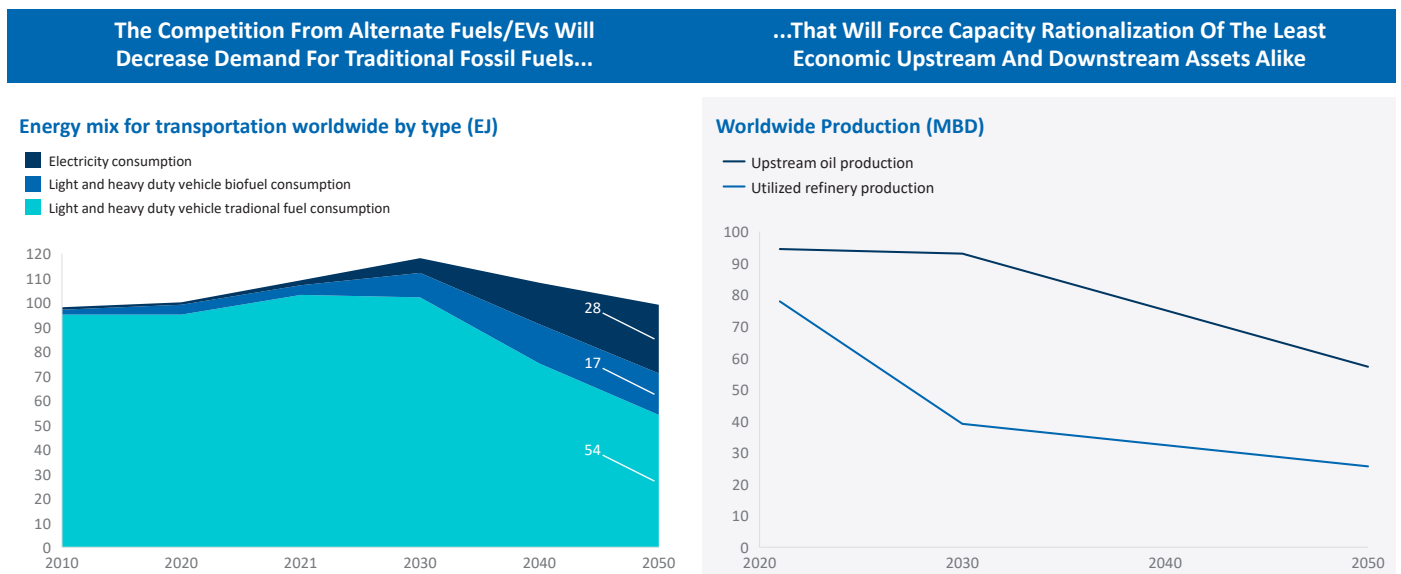


Exhibit 2B: E-fuels Are Expected to Retain Significant Cost Disadvantages Relative To Traditional Jet Fuel That Will Persist Into 2050



This leaves carbon capture and sequestration and offsetting as the last two remaining solutions to decarbonize the traditional fuel mix by 2050, even in a net zero scenario. If we combine these facts together, this means two things for Oil & Gas (O&G) players. First, there will be a mix of technologies, fuel production pathways, and emissions mitigation measures in the future, each requiring special care when deploying within the existing asset base. And second, the demand destruction from EVs and additional competition in the liquid fuel space (however significant either may turn out to be) will ultimately put pressure on overall oil and liquid fuel demand, especially for the highest cost producers, thus forcing rationalization of production in both the upstream and downstream segments (see Exhibit 3).<sup>17</sup>

Exhibit 3: Demand Destruction Expected to Force O&G Players to React, Despite Headwinds for EVs, Biofuels and e-Fuels<sup>18</sup>



As such, the O&G industry is at a crossroads. While the world cannot meet future energy demands without the help and expertise of the traditional O&G industry to provide affordable and available clean energy, there are also no guarantees for the success of individual players. As the decarbonization journey accelerates over time, only the strongest and most competitive O&G players will survive.

We already see significant momentum across many O&G players to address this transition and remain competitive in a net zero world. If we look at just the top five O&G players by market cap we see clear net zero pledges and significant capital expenditures devoted to sustainability (see Exhibit 4).<sup>19, 20, 21, 22, 23</sup> These investments are also taking place against the backdrop of several policy frameworks such as the Inflation Reduction Act in the U.S., Fit for 55 in the EU, and China’s Renewable Portfolio Standards, which all seek to drive the world toward net zero through either incentives or legal mandates.

*Exhibit 4: The top five O&G Majors by market cap have all established net zero pledges and are devoting meaningful amounts of their capital portfolio to sustainability*

Key Sustainability Metrics	SAUDI ARAMCO	EXXONMOBIL	CHEVRON	SHELL	TOTAL ENERGIES
Net Zero Target	2050 for Scope 1 & 2 emissions	2050 for Scope 1 & 2 emissions	2050 for Scope 1 & 2 emissions <sup>25</sup>	2050 for Scope 1 & 2 emissions	2050 for Scope 1, 2, & 3 emissions
Investment Disclosures	2.2 B\$ in 2022 <sup>24</sup>	17 B\$ by 2027	8 B\$ by 2028	8.2 B\$ in 2022	3.5 B\$/yr to 2025

Sources: Saudi Aramco Corporate Sustainability Report, <https://www.aramco.com/-/media/downloads/sustainability-report/report-2022/2022-sustainability-report-en.pdf>; ExxonMobil Press Release, <https://corporate.exxonmobil.com/news/reporting-and-publications/advancing-climate-solutions-progress-report#:~:text=Increased%20the%20amount%20we%20intend,2016%20levels>; Chevron Corporate Sustainability Report, <https://www.chevron.com/-/media/shared-media/documents/chevron-sustainability-report-2022.pdf>; Shell Energy Transition Progress Report, <https://reports.shell.com/energy-transition-progress-report/2022/financial-framework/investing-in-net-zero.html#:~:text=In%202022%2C%20we%20invested%20%248.2,compared%20with%20the%20previous%20year>; Total Energies Corporate Sustainability Report, [https://totalenergies.com/sites/g/files/nytnzq121/files/documents/2022-05/Sustainability\\_Climate\\_2022\\_Progress\\_Report\\_accessible\\_version\\_EN.pdf](https://totalenergies.com/sites/g/files/nytnzq121/files/documents/2022-05/Sustainability_Climate_2022_Progress_Report_accessible_version_EN.pdf)

The challenge that remains is to determine how best to deploy this capital against the existing and potential future asset bases that a player may have to maximize overall returns, while also achieving their net zero ambitions. Those O&G producers that best combine the strengths of their existing asset base while leveraging a nuanced global strategy based on local policy frameworks for the energy transition will be those poised to lead in a post-2050 world.

### Agility in the Organization’s Core Business

Despite what has been spent to date by governments and O&G players alike in low-carbon intensity fuel production pathways and carbon capture projects, the total capital investment required to tackle the Energy Trilemma will be significant. If we take the aviation industry as an example, the capital estimates vary between \$1.45-3.60 trillion to produce the Sustainable Aviation Fuel (SAF) needed for the industry to reach net zero.<sup>26</sup> What’s more, the burning of traditional jet fuel accounts for only 2% of total emissions.<sup>27</sup>

Given the magnitude of the capital expenditure involved in this transition, it is clear that those who best incorporate many of these new fuel production pathways into their existing business will be able to deliver superior returns on the capital they deploy over the business cycle. But strategic fit alone isn’t enough. The scope, scale, and number of



these projects will bring forward new cost challenges, be it in the form of portfolio and construction management or raw material procurement, placing an even greater emphasis on capital expenditure and project execution diligence.

While new fuel production pathways will have their place in the future, it is expected that large carbon abatement products will account for the majority of many low-carbon project portfolios, taking the form of anything from traditional Carbon Capture & Sequestration (CCS) to more novel technologies like Direct Air Capture (DAC), all of which are costly and have challenging project economics from the start. These projects will need to be conducted at the most competitive cost, using cutting-edge digital tools supported by world-class capital project management processes. Only in this way will players be able to meet their sustainability strategy at a competitive cost, while leaving space within their capital budgets to expand into higher return traditional and low-carbon projects.



Clearly, O&G companies that make capital project management a core competency will be best positioned to succeed in the energy transition. Those that keep a continued focus on asset management will also strengthen their organization's core business and fund the journey to net zero. Bolstering flexibility measures, particularly in refined product production, will ensure that organizations can react with more agility to inevitable market volatility in the next several decades. To this end, players without integration between the upstream and downstream businesses will likely face the biggest challenges in adapting to the price volatility we will all face in the transition to a net zero world.

### **Balancing Short-term & Long-term Strategies**

By balancing both short- and long-term strategies, O&G companies will be able to achieve a distinct right-to-win through 2050. To start, companies can identify and deploy adjacent decarbonization levers that have a positive return on investment in the near term. These can take the form of energy efficiency measures in their core operations across the value chain, emissions reduction measures for routine and non-routine flaring in upstream operations, co-processing bio-feedstocks in existing refineries, and using lower-carbon sources of fuel where there is access to waste. These higher-return measures pave the way for turning the decarbonization journey from a cost center into a source of competitive advantage.

Making shrewd, calculated investment decisions in these circumstances is key. Companies that expand their envelope of, and invest early in, low-carbon businesses that are firmly anchored to a clear net zero strategy will be best positioned to lead in the energy trilemma.

### **Keeping an Open Mind & Making Smaller-Scale Changes**

O&G companies should be bold in this transition, but not entirely abandon their risk management mindset that has served them well over the past 100+ years. The transition should start with smaller-scale changes that demonstrate a willingness to adapt and innovate, ideally generate positive returns and momentum, and ultimately fuel the broader transition. Oxford



University Professor Bent Flyvbjerg captures the mindset necessary to drive this type of organizational transformation in his book, *How Big Things Get Done*. He states, “A good plan is one that meticulously applies experimentation or experience. A great plan is one that rigorously applies both.”

The fusion of experience and experimentation is critical to the process of developing a thriving low-carbon business – especially as technology evolves. The continuous advancement and integration of technologies requires an ability to draw on past experiences, a willingness to innovate and make mistakes, and an open-mindedness to adopt new tools to plan and execute – whether that be in partnerships or scaling generative AI within your organization.

Staying in the know is a simple but important tactic that is an essential part of this leadership effort. Keeping abreast of new legislation, policies, supply chain developments, technological advancements, and other ever-evolving areas will enable leaders to make the best strategic decisions for their organization as they chart a course to net zero.

### Tying It All Together for Strategic Success

O&G companies are at a critical point in their journey and the significant decisions they make over the next few years will change the course of the industry. Successful transformation will require players to become more agile in operating their core business by embracing decarbonization technologies that meet short-term goals and align with clear longer-term objectives that incorporate an innovative mindset. Focusing on these goals will earn O&G companies a leadership role in a low-carbon future.

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