



# ESF North America 2023

ENERGY & SUSTAINABILITY FORUM

Decarbonizing the Downstream Industry

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# ADVISORY MEETING REPORT

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## APOLOGIES

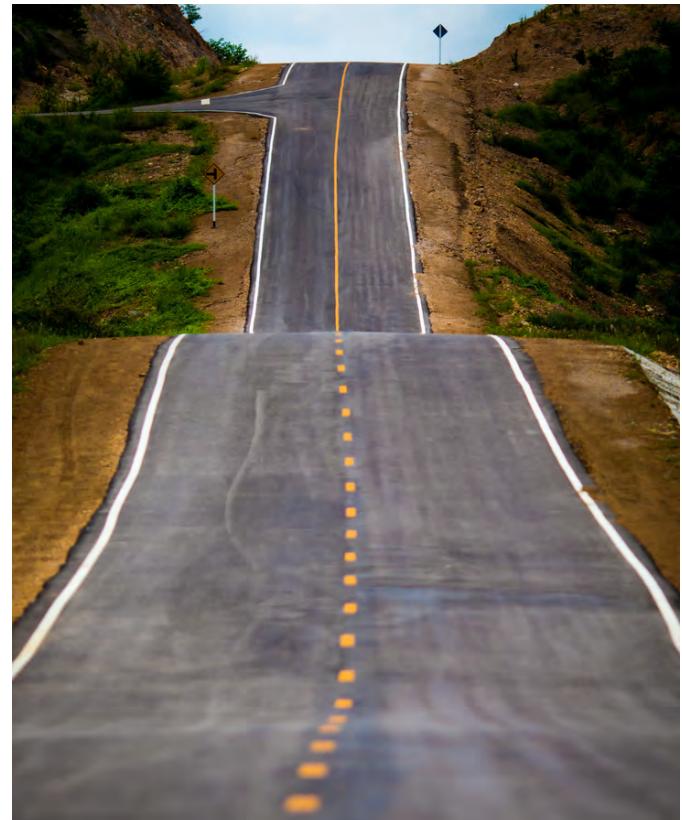
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# ENERGY TRANSITION HEADWINDS: MAINTAINING MOMENTUM

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Over the last six months especially, but since Russia's invasion of Ukraine and the COVID 19 pandemic, we have had an environment where the price of energy and the subsequent slowing global economy has taken centre stage, and against that backdrop, first up for discussion was the group's thoughts on how we keep the energy transition momentum going against these headwinds.

As shared by one advisor, today's high energy price presents a good opportunity to reinforce the role that energy efficiency plays in driving the longer-term energy transition. Echoed in our recent European meeting, the importance of energy efficiency is re-emerging as a way to ensure that we are always moving forward, whilst being cognizant of what's happening in the geopolitical and cost environment.



Despite these headwinds, for many, the 2030 timeline to deliver on the commitments is not slowing. Granted looking from 2030 to 2050, and at the bigger substantial asset changes, there are still open questions as to what the energy environment will look like. For example, the supply of renewable energy or capacity of carbon capture, and although these questions may impact the timelines of the broader implementation, they won't impact 2030 roadmaps.

As put by one advisor, the reality is, most companies have announced their ambitions for 2030, 2050 or somewhere in between, and in order to achieve those ambitions, we must continue to head

down that path regardless of the environment that we are in today. Of course, that does not mean going down that path with blinders on. You are always going to have to have some type of value proposition, which we would expect to change and continue to change by region, but nonetheless, we must continue to invest in the projects that provide returns, whether that's cost savings or commercial value. The announcements and ambitions matter.



# PERFECTION IS THE ENEMY OF PROGRESS

Moving the discussion on to policies, today we continue to see a tendency by the policymakers to focus on the “home run hitters” or the “golden goose” in the quest for net zero. Too often perfection is the enemy of progress and what could be achieved today with the multiple technologies already in the pipeline is being overlooked because they are not seen as going far enough. As an example, in the US everyone is looking at electric vehicles, but in the meantime low carbon fuels could actually accomplish more.

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Digging deeper, one advisor shared a personal example as an owner of both a Tesla Model 3 and a Toyota RAV4 Plug-in Hybrid. In the context of his home state, California, where the regulations are pushing heavily towards a pure EV solution, looking at the pragmatism of it, in five years' time, the reality will come striking home that there is not enough lithium or cobalt for everybody in California to have the luxury of driving a Tesla. The battery with roughly a 350-mile range vs. an average use of 50 miles means that 300 miles, 90% of the time is pure dead weight. Is that really the most efficient use of resources versus the hybrid, with a battery of about 1/5 the size that reduces his wife's emissions by upwards of 80% based on her driving habits? Ultimately, we have technology uncertainty, we have regulatory uncertainty and we have market uncertainty. How much more are people actually willing to pay than what the regulatory environment tees up?

Staying in the context of California, the high cost of energy has driven the West Coast to talk about a more diversified portfolio as it relates to the transition. With the state ground zero for high costs of gas, the current environment has enabled the west coast to bring in other technologies as part of a solution, and bring in conversations around hydrogen and CCS as ways to diversify the portfolio, while being mindful of costs.

Wrapping up the discussion around policy, whilst the DoE is in a completely new place than it was a decade ago in terms of the resources available for deep decarbonization projects, there is recognition that the policy framework is incomplete. Whilst challenges to making ambitious progress on some of the bigger decarbonization steps in the near term continue, there are opportunities for leaders to unlock the policies that do exist. DoE wide there is money available, whether it's the Office of Fossil Energy and Carbon Management (FECM), circa \$12 billion of grants available through the infrastructure law to write against Capex on carbon management projects from point source carbon capture, direct air capture, CO<sub>2</sub> conversion, and blue hydrogen, or the new Office of Clean Energy Demonstrations (OCED) circa \$6 billion for dedicated industrial decarbonization projects, available for not only full zero-emission demonstrations but also ways to incrementally reduce emissions. Furthermore, the biggest pot of money so far comes from the loan guarantee program, with hundreds of billions of dollars on order looking for high-quality deal flow to support projects over the finish line that might otherwise not make it in today's market environment.



Beyond that, the DoE is providing technical assistance to IRS as they implement 45Q. Whilst there is an appreciation that it's not sufficient in many first-of-a-kind contexts, the recent reforms will help in getting many projects across the finish line. Furthermore, the DoE is advising EPA and the interior in regards to permitting carbon sequestration, a current bottleneck for many cases.

Adding the financial perspective, the two and four year horizons in the US create a lack of certainty in the policies, especially when trying to secure finance for large projects and build assumptions into your business models that those policies are still going to be in place. Predicting what the landscape is going to look like 5, 10, or 20 years down the road makes it very difficult to get financial support for some projects, despite their strong potential in the long term, and today's challenging environment only exacerbates it.

Reflecting on the recent COP 27, one of our advisors was struck by the difference between Scotland and Egypt in terms of the presence of the financial sector and a sense that this is part of a broader dynamic that is starting to play out. Ultimately everything that everyone is trying to do has got to get financed and as such, finance must play a much more active role in the energy transition.

Certainly, all of the uncertainty and fluctuations, whether it's the policies or the incentives, are across a very long-time frame. The projects we are pursuing with regard to net zero are not quick turnaround catalyst changes that will bring immediate carbon footprint reduction, which in turn makes decision-making extremely challenging.



# TECHNOLOGIES TO MOVE THE NEEDLE

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In the downstream industry, 80%+ of emissions are heat-related, and so ultimately when it comes to it, as an industry we know what the technologies and solutions to meet the 2050 goals are, and there are only three of them, to electrify assets, carbon capture, and leverage hydrogen. The narrative can so often be esoteric that we don't know what the solutions are and that we'll be implementing projects in 2020-2030 to deliver on 2050 commitments. Granted the prices will come down as the technologies develop but as an industry, we are not waiting for the development of new technologies and so we need to stay focused on the actual project execution of those technologies. Certainly, we have uncertainties, such as the best carbon capture solution, and how to improve that but essentially, we know what needs to get done over this decade to deliver by 2050.

Having said that, we cannot only focus on the near term, and on finding those efficiencies, and the low-hanging fruit. We have to also try to pick up the top of the tree in pursuit of the next generation. Furthermore, we must guide the right use of renewable energy, hydrogen, and carbon capture. The most efficient way to leverage hydrogens value is as a chemical intermediate and use it in the chemical sector. The more we burn hydrogen for fuel value, the more we are actually sacrificing efficiency. When it comes to CO<sub>2</sub> conversion technologies, there is no scenario where it's an efficient use of energy and hydrogen to generate intermediates. We need to be very careful of where green hydrogen is applied.



Any scenario where we use electricity to generate hydrogen and then use the hydrogen to burn fuel sacrifices 30% to 40% efficiency. The view that blue and green hydrogen's first-place use in refining and chemical processes versus burning it for heat was echoed among our advisors.

Turning to Stope 3 emissions, and biofuels, there is more uncertainty with multiple technologies still playing out; gasification processes, catalytic processes, and biological processes which for the large part have not been commercialized at scale. The grants and debt available from the DoE will play a key role in helping to de-risk the second generation of biofuels that need to come to the market.



# IRA: LEVELING THE PLAYING FIELD

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Moving the conversation on to the IRA, and perspectives surrounding incentives. Which were the right steps but more importantly where are they still lacking or didn't go far enough and still require another layer to make some technologies economic and move beyond the pilot stage? On the positive, it has changed the conversation, bringing the concept of technology neutrality into play, and bringing forward the concept of rewarding continued focus on low carbon. Conversely, it has come up short regarding timelines, rewarding those technologies which are already in deployment as opposed to the nascent, first-of-a-kind technologies that need help to come to market.

In the context of hydrogen, the IRA has done well in addressing the primary concern around the cost of hydrogen production, but not in regards to the end use and completing the value chain. The fundamental nature of the element means that it's really energy-consuming to move the CO<sub>2</sub> or hydrogen beyond localized use, and so that still needs to be figured out. One perspective is that we're going to see a play for blue hydrogen generation and piping that into those areas that are site constrained and cannot easily put in carbon capture amine scrubbers.

Ultimately the solutions are going to be very location specific and defined almost at the plant level in terms of what may make sense. Expanding upon that point, a lot of the talk is on the federal level but is being driven at the state level. There is a big distinction around the country. In the context of California, there are still real struggles in the policy for hydrogen and carbon capture, as well as the credit programs (LCFS, Cap and trade), all of which are likely to become more expensive and more limiting. While there has been some progress on the federal level, it's potentially going to become more challenging on various state levels.

To conclude, thanks to the IRA, some headway has been made in levelling the playing field, especially for hydrogen but there is still some work to be done in pursuit of a true all-of-the-above approach.

# LOW-CARBON GASOLINE AND LIQUID TRANSPORTATION FUELS

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While we touched upon electric vehicles earlier, talk turned to low-carbon gasoline, and what role we see that playing in infiltrating some of the demand from electric vehicles or other low-carbon solutions of road transportation fuels vs the focus on hydrogen or electric-based diesel or mogas cars. The first perspective shared was that of the big opportunity being missed. First, we have to really define what low carbon gasoline is. Truly, if the objective is to reduce the carbon footprint of domestic transportation, there are big opportunities for refiners to find efficiencies, reduce the methane escape, and through hydrogen implement a lower-carbon gasoline product. The IEA recently did a study looking at the fuel cycle and comparing that to electric vehicles which revealed that a plug-in type hybrid utilizing low-carbon gasoline will have the same, if not a better carbon footprint than an electric vehicle. Included in the data which supports electric vehicles are plug-in and regular hybrids which make up almost two-thirds of the expected fleet of electric vehicles and use gasoline. In addition to talking about electric vehicles, we need to be talking about how to lower the carbon footprint of the liquid transportation fuel market for domestic transportation and bring other solutions to the forefront of the discussion and part of an “all of the above” approach.

Reflected back to the Tesla type 3, its battery could make another five or six other plug-in hybrid batteries, in turn reducing five or six other people's emissions by 80%. Furthermore, the plug-in hybrid is more efficient over the first 50 miles since the weight of that extra 300 miles worth of battery is a lot more than the weight of a gasoline engine in a gas tank, once again echoing the sentiment that sometimes perfection is the enemy of progress.

Importantly it was highlighted that the auto industry is not transitioning to electric vehicles for decarbonization, but rather to lower costs of production by focusing on one drivetrain. As such the expectation is that there will first be a big push to electric vehicles and then a realization that there is a gap that can be filled by hybrids. Added to that, there are not enough renewables to fulfil the electric vehicles promise and when it comes to the materials for the batteries, whilst the energy industry has always had a black eye because it operates in geographies that are messy, geopolitically mining is no better, in fact in some ways worse.

Clearly, there remains a long runway for liquid fuels and in the case of aviation, because of energy density, it's hard to see how it could ever really move off them entirely. Ultimately there is an educational gap, and we need to drive awareness of the options available in addition to pure electrification.

## COLLABORATION: THE WORLD'S APOLLO 13 MOMENT

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Great aspects of mankind were reflected in the Tom Hanks movie when everyone came together to figure out how to get those astronauts home so why can't we do the same? As an industry, we are not capable of solving this ourselves. Significant opportunities lie in open dialogues and cross-industry collaboration with other sectors such as, steel, cement, agriculture, forestry, etc for exchanging carbon, exchanging energy capacity, rationalization, capacity investments, and so on.



The transition will require partnerships. In the context of sequestration, it's the refiner who will bear most of the cost of getting the carbon dioxide to a 97 to 99% purity and compressed but then there is the transportation piece which is likely a different company to who is doing the sequestration. It's not clear how the incentives will be divided in a transparent, equitable manner. We need maturation of the value chain, particularly around the value chain of credits.

Beyond that to make the energy transition work we need a combination of concerted efforts from policy, industry, and consumers. No single element can make this happen on its own. For us that may mean accepting lower returns but when it comes to the consumer, how do we get customers to value a lower-carbon product more and be willing to pay more for it in a direct way?

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Ultimately, it's the consumer who bares the cost, whether that is through higher, direct cost or a market mechanism but who bears the volatility? Those who buy a gasoline-powered car bear the volatility of the oil and gas market, spread over the life of that asset whereas for an electric vehicle, who's bearing the price volatility of the lithium? Going forward how volatility gets handled in the market is going to be very interesting.

To conclude the discussion, we cannot underestimate the length of time that the energy transition will take. As an industry, we must strengthen our position to serve our consumers for as long as they need us and get ourselves into a position for longevity.



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Join us at #ESFNorthAmerica where we will be continuing the conversation and diving deeper into all of these topics and more. As the only event dedicated to downstream decarbonisation and sustainability, ESF North America 2023 is a truly unmissable event. Find out more here: [europetro.com/esfnorthamerica](http://europetro.com/esfnorthamerica)



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