center for ENERGYSTUDIES
Rice University's Baker Institute for Public Policy

ENERGY DIALOGUES

ENERGY DIALOGUES SUMMARY

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"Houston Energy Dialogues: Executive Summary"

Introduction

On August 31, 2021, Energy Dialogues and the Center for Energy Studies (CES) at Rice University's Baker Institute for Public Policy hosted the Houston Energy Dialogues (HED) for the fifth consecutive year. Co-sponsors of this event were Sempra LNG, Schlumberger and Validere. This year the HED was held in-person and once again provided a platform to for in-depth conversations about the energy industry involving representatives from the government, industry, academia, environmental groups, and regulatory bodies. Consisting of two panels and two roundtables, the 2021 HED focused on four topics, with resiliency as a central theme: (1) panel 1 – what Houston's future might hold in a post-COVID era of energy transition, (2) roundtable 1 – resilient ecosystems and the design of a reliable, resilient, and clean energy value chain, (3) panel 2 – the intersection of climate policy and resiliency, and (4) roundtable 2 – the role of policy in accelerating transitions while ensuring resilience in future energy value chains.

(1) Panel 1 discussed the role of Houston in energy transitions and centered mainly around the potential Houston has with its existing talent and experience to be a key player in energy transitions. The panelists agreed that Houston has the skills and expertise required, but a change of image is necessary to be a frontrunner. Indeed, Houston is already a critical part of energy transitions as investments in clean energy are already growing, creating a new wave of growth and opportunity for the city.

(2) Roundtable session 1 focused on resilient energy systems and the design of energy value chains that meet at the intersection of reliability, resiliency, and cleanliness. The participants recognized that policy consistency is needed to reduce transition risks and encourage participation by more than just large corporations. The conversations highlighted that policy is unlikely to be standardized across regions and markets, underlining the importance of making carbon a central element of any policy design that aims to facilitate a portfolio of solutions in a global marketplace.

(3) Panel 2 deliberated on the intersection of climate policy and resilience. The panelists compared the costs of non-resilient systems versus the costs of creating resilient energy systems. They also identified methane reduction as an available solution that is feasible and relatively easy to achieve. Finally, they agreed that policies and solutions would differ in every region as demands and needs vary.

(4) Roundtable session 2 centered on the role of policy to accelerate energy transitions while safeguarding resiliency. All participants concurred that policy must be stable and integrate resiliency requirements to be effective. They also reflected on the challenges and opportunities that arise from differing policies around the world to align their businesses to new value chains and develop new commercial opportunities across very different consumer and legislative environments.

Houston's role in a post-COVID era for energy transitions

Houston, a city traditionally recognized as the oil and gas (O&G) capital, can play a major role with its existing assets, talent, infrastructure, and expertise in energy transitions.[1] How the city and its industry reposition themselves to attract capital and talent to remain relevant as energy transitions advance was the main focus for the first panel.

Houston is very international and attracts talent from different regions with different interests. This diversity reflects Houston's various industries, interests, and markets that will create the necessary environment for all parties to work together, versus against each other, to ensure a successful future for the region.

It was commented that the narrative must reflect the realities on the ground when it comes to building new infrastructure and deploying new technoliges, and incorporate that into strategies that engage the variety and complexity of the various solutions that are needed. The next generation's talents are looking to solve challenges such as the role of hydrocarbons in the energy mix, how to measure objectively to reduce emissions, and how to deliver reliable, clean, and affordable energy. To that end, how can Houston reach beyond its O&G image to attract, educate, and retain talent that is focused on resilient energy systems?

For one, it was mentioned that it is imperative that the O&G industry's potential to solve the world's challenges, such as lifting people out of energy poverty, be recognized. Most consumers in the developed world are unaware of the fact that short-lived and sporadic access to power, and even no access, is a way of life for more than a billion of the world's population. To design and implement the solutions needed, the industry must ouline the scale and complexity of today's energy problems in ways that highlight opportunities. There are a vast number of interesting problems to solve, especially when it comes to energy, and given the scale of the solutions needed, energy transitions will need everything.

At the same time, the panelists raised the importance of training and education programs at traditional O&G companies for the labor force willing to shift from blue-collar professions to corporate careers. As skill requirements in the energy industry change as markets develop, what a company needs in year one may differ from what it will need in year three. Meanwhile, while a talent pool with younger people is necessary for innovation, more experienced industry veterans can provide perspective while bringing the next generation on board. In addition, O&G must expand the conversation to bring together more people with different points of view. The industry needs more outward-facing engagement with communities, and it can do so while providing opportunities for important skillsets that are transferrable across industries. O&G executives can, and many have, transition to other energy sectors, such as the renewable sector, with their strategy, planning, project management, and finance skills. This provides an opportunity for mentorship, not obsolescence.

[1] See Baker Institute report "The Future of Houston as Energy Transitions" for more. Available at (https://www.bakerinstitute.org/research/future-houston-energy-transitions/).

Panelists shared that another key aspect to attract young talent is to define the new role of hydrocarbons in the energy mix. Emissions reduction is an additional field that creates opportunities to attract talent and investors. Indeed, the Houston investment community is switching its focus to cleaning up the hydrocarbon industry while also investing in non-fossil fuel industries. There is a general sense that investments to clean up the macro energy portfolio will show a promising return in the long run. From a capital, expertise, and talent perspective, Houston could be the place for the next wave of growth.

Lastly, the speakers recognized the importance of data collection for correct measurement to determine efficient solutions across industries. They emphasized the potential for Houston to become a super-tracking center for global emissions. The city has immense supercomputer power that has been used for a long time in exploration and production activities, logistics, and supply chains more generally. Houston is well-positioned.

Creating resilient energy ecosystems during the energy transition

The question about resiliency in changing energy ecosystems and value chains raised many issues. For one, the group generally agreed that resiliency must go past responsiveness to singular natural events and be translated into stable, lasting policy that promotes sustainable, well-functioning energy systems. In other words, resiliency has to be part of a long-term strategy to satisfy consumer needs and facilitate planning for industry players. The struggle of investing productively with changing tax incentives and moving policy targets was addressed. For instance, if the 45Q tax credits equate to $50 in one administration and $80 in the next, it becomes very difficult to plan large-scale projects because no entity can afford to finance large-scale projects if the uncertainty about project finance parameters is very high.

Another topic at the center of the discussion on resiliency was the role of environmental, governance, and sustainability (ESG) strategies. Shareholders, investors, and consumers are the main drivers for companies seeking to implement various ESG strategies. For small and mid-sized companies, however, this can be an onerous task as they may lack the resources to address broad, sometimes inadequately defined, ESG concerns along their supply chain, or to drive their standards and adapt their growth strategy towards ESG goals. Reporting and analysis of all firm's own operations can be a challenge, especially so for resource constrained firms, which increases the challenge of understanding the ESG opportunities that align existing business models with new customer demands and emerging commodity market developments. Moreover, if smaller firms do not have access to ESG expertise available to partake in the transition, a large segment of the US and Houston energy industry could be left behind. This highlights a need for ESG-focused professional and clearly defined metrics.

Participants agreed that an ESG strategy must be tied to commercial gains to be effective, sustainable, and available to small and large industry players. Indeed, the case was made that companies that have made the most progress in reducing their emissions profile have implemented various measures that are explicitly tied to commercial interests. Some companies seek to diversify into low-carbon products, such as lower-emission gas, and market the low-carbon product at a price premium to utilities that have emissions

reduction goals. Others look at the option of trading carbon credits. In all cases that were raised, it was recognized that a price on carbon, for example through a carbon tax, would create a common baseline for companies act upon, both in financial reporting and developing long-term strategies. This led to a comment that better data collection and reporting on various ESG metrics, in general, is needed to continue progress. It was here that digitization was recognized as a technologuy-focused development that will play a key role in recording and understanding a company's baseline carbon footprint and in designing and implementing successful ESG strategies.

The development of a carbon market was heavily discussed, as was the importance of creating more transparency and certainty around the value of carbon to provide some measure of surety to ESG investments. Developing a market-based mechanism such as a carbon price would allow the industry to invest with an expected return. Standards for trade that can be applied globally or in larger regions are necessary to create reliable value for current and future investments. For example, the Baker Carbon Standard[2] is an interesting approach for a standardized nature-based solution. It is a pioneering way to address energy transitions with new value chain creation while increasing resiliency by combining local comparative advantages and collaborating with the industry. As the world undergoes energy transitions, different jurisdictions will create various policies, making standard consistency unlikely. Clarity on these differences, to the extent they are structural, will be vital for investment strategies in all industries across the global economy.

Concerns were shared about the resiliency of climate policies in light of national and energy security. For example, the existing US policies for electrification in both power generation and transport require materials that increase the country's reliance on third-party countries. It was stated that the minerals needed in the US to satisfy current and projected future demand cannot be covered with national production alone, nor does the US have the trained workforce required to respond to arising challenges. Mining is critical to this endeavor, yet it was claimed the US lacks sufficient university training of next generatiomn mining professionals. As a result, it was argued, ambitious climate goals that look far into the future also create critical supply chain risks given the weak to non-existent mineral extraction and processing facilities domestically. Since building these capacities at a national level will take a significant amount of time, the mineral needs are likely to cause heavy reliance on China and other countries to make broader scale electrification possible.

It was also argued that to achieve clean energy adoption and grid resilience, it is fundamental to avoid picking winners and losers. Rather, paradigms need to be established where the proverbial “cream” can rise to the top. Coordination between industry and policymakers to balance supply and demand and maintenance of long and intricate supply chains were recognized to be vital. It was also recognized that there is a need to improve the understanding that the timeline for solutions is not four years or one presidential term. Instead, it can take decades to bring promising solutions under development to commercialization.

[2] Definition: “The BCarbon standard treats soil carbon sequestration as a property right that enables farmers and ranchers to earn income off holistic land management.” Source: https://bcarbon.org/.

However, the gap between aspirations and realistic, economically viable solutions is wide and continues to exist. For example, the CEO of a company spoke at a Baker Institute annual energy summit briefly after announcing climate commitments for his firm and stated, "We know where we want to go, and I'll be blunt, we know how to do 70% of it. The other 30%, no idea." It was also observed that the pressure to make comparable climate commitments can generate “greenwashing” concerns, as the campaign for decarbonization becomes ubiquitous in PowerPoint presentations and new reporting templates with only marginal improvement in results. In sum, it was stated that forces are driving companies to base their future resiliency and business strategies on a future that lacks any clarity at all is scary. Ergo, the question became how to design a policy that is resilient and respects the timeframe from inception to commercialization of solutions.

It was also argued that at all levels of government, industry, and consumers there will inevitably be more realization that energy transitions are not facilitated by one simple solution nor a simple push to make clean commitments. Generalizing the solutions forces hydrocarbon companies to make commitments they are unsure how to meet and thus divest dirtier assets to other producers, amplifying the concerns about the overall greenhouse gas emission reductions or environmental benefits. A transition towards resiliency will be an iterative process. The energy industry is taking aggressive steps to move into new businesses. To that point, it was stated that it might look like the industry is moving two steps forward and one step backward, yet progress is occurring.

Intersection of climate policy and resiliency

It was expressed that energy transitions can be slowed by the unrealistic timelines of the current domestic climate policy, especially since neither industry nor consumers have adequate time to adapt given the tremendous infrastructure and technology requirements associated with meeting an ambitious *economy-wide* goal. In other words, energy transitions are not “moon-shots” and shouldn’t be characterized as such. Infrastructure requirements were a repeated example to showcase the challenges resulting from drastic climate policy that need to be addressed. For instance, the hurdles in local, state, and federal siting, permitting and construction present significant obstacles to building critical infrastructure, such as transmission lines, at the pace demanded. Changes in the energy ecosystem are lengthy processes, infrastructure being one of many, and there was a general frustration expressed that this is not reflected in the climate policies.

Another focus was the cost of energy system design. Participants discussed the costs caused by the disruptions in a non-resilient system – from events such as floods or freezes – versus the cost of building a resilient system in the first place. Participants weighted these expenses and discussed them in light of the costs of achieving climate goals and a transition to cleaner energy. It was epressed that finding the cost-benefit balance between financing increased resiliency versus rebuilding the losses of a non-resilient energy system is where the balance lies and is at the crux of energy transition challenges. Facilitating affordable, resilient, clean, and realistic solutions becomes intricate. Climate policy solutions should be for everyone in society to partake, yet consumer collaboration for sustainable alternatives has largely been expensive and thus affordable to only a small fraction of society.

It was argued that cleaner energy olutions must be affordable to lower income households for them to be broadly integrated. Here, the costs of electric vehicles (EVs) or solar panels on a new home matter, and statements that promote uptake presume both home ownership and access to sufficient financing, neither of which is a given for a household. This mindset is evident in policy design. For example, purchasing an EV for households that spend less than $20,000 on upfront cost for a vehicle raises questions about equity throughout electrification, considering the average price for a mid-range EV is at $55,600. It was pondered then whether various climate-related policies are necessarily consistent with social and environmental justice.

It was also stated that policies must increase transparency and accountability to trust "low-carbon" or "environmentally just" labels that offer a differentiated product based on claims about the product's supply chain. Certification and education will help customers understand the advantages of such a product so that they can determine its worth. At the same time, the policy cannot marginalize customers that are indifferent. It is essential to recognize that not every customer wants to know about the sustainability of their product, nor can every income group afford higher-priced, environmentally friendly products. Considering that some customers are willing to pay an additional $5,000 for responsibly-sourced plastic for their Tesla and others struggle with a relatively small, much less large, increase in fuel prices, finding solutions that fit a wide array of diverse customers is challenging.

It was also argued that things are made even more complicated because the definition of ESG continues to be subjective for policymakers, business leaders, consumers, and innovators. Each group of stakeholders has different inputs to develop solutions. Indeed, the understanding of sustainability and how to achieve it will differ across groups, and this consideration is integral to developing solutions. Is it water consumption and use, methane or CO_2 emissions, or access to electricity? The industry is in dire need of binding standardization to understand and measure the meaning of sustainability through critical scrutinization of each element along the supply chain. What are the elements of that footprint, and what areas can make the most significant impact reducing those elements? Transparent measurement and product certification will be necessary for commercializing sustainable products at a large scale, securing long-term offtake agreements for clean products, and bringing stakeholders' priorities together.

It was argued that absent agreement between government and industry on the vision and goals for energy transitions, progress will be hindered. The perception was shared that the government is enforcing strict but scattered regulations to eliminate the use of fossil fuel as it is seemingly the only viable response to energy transitions. Yet, the industry argues that there are multiple avenues to reduce CO_2 emissions. Such scattered and drastic policies make it difficult to create the marketplace necessary for innovation and organic growth for new industries. In other words, things do not have to be perfect to be effective or to be implemented.

Methane reduction in oil and natural gas production was repeatedly mentioned as an example where policy and industry can find common ground and use the opportunity to act. One suggestion was made that involved accelerating methane reduction while

combining institutional freedom and government participation with the US government financing all measurement and data collection and warehousing. The government could have advantageous contracts and the ability to standardize measurement with access to companies and non-profit organizations that would support the cause at a low cost. The idea that the government contracts with a company to measure a fugitive emission at the wellhead and publish the data would likely stop fugitive emissions immediately.

Participants recalled recent events, such as France denying natural gas produced in the U.S. because it claimed it was "dirty," indicating that the marketplace is pushing to reduce methane leakages and emissions from natural gas production by choosing the "cleaner" product. Unfortunately, most companies are not tracking methane emissions despite having the ability to measure them with incredible accuracy. Without an audit trail, they do not need to prove methane emission reduction throughout their supply chain. However, some do respond to the voluntary market, and the demand for certified low- to no-emission natural gas is growing. It was argued that certifying, proving, and gaining transparency to be audited will be decisive in the premium product market.

Another avenue that was explored is to set a standard for methane emissions throughout the supply chain and offers credits to those who emit below the threshold. The panelists also pointed to the proposed methane fee to penalize producers and processors for their methane leakage with apparent bilateral support in the Senate. While industry and consumer preferences might be more effective at accelerating methane emission reduction, government regulation might offer a more direct path. Reducing methane emissions is an opportunity to position US natural gas in the energy transition supply chain and is a feasible solution at the intersection of climate, policy, and resiliency.

Among the participants, hydrogen distinguished itself as a good example of the balance between building new infrastructure and reusing existing infrastructure. Given the sunk costs of existing systems and the costs to build new ones, it was argued that hydrogen use should be primarily focused on industry rather than transportation, at least initially. Hydrogen in transportation remains cost-prohibitive today as it requires a new infrastructure system such as fueling stations. At the same time, hydrogen raises a whole new set of issues and challenges, as it is a molecule with new properties for safety, transport, and processing. How, when, at what costs those challenges will be solved, and which technology will turn these challenges into commercial opportunities remain a wild guess at this point. For reference, General Motors said hydrogen would be the future for transportation in 1999, yet we are not living in that future yet. If the US is to build a robust hydrogen market, it can start by cleaning up existing hydrogen use in different industries. This way, cleaner hydrogen would become more attractive in new and growing markets.

An all-encompassing life-cycle analysis (LCA) was recognized as one central pillar to identify where policy, resilience, and carbon-free energy solutions meet. To facilitate new markets with more sustainable products, we need to be able to verify how “green” a product is. Without comparing all the factors throughout the supply chain for certified product differentiation, choices can quickly bring negative consequences such as supply chain disruption or unnecessarily higher-priced products. Using existing infrastructure, applying reusability, and retrofitting are key to lowering the costs and minimizing the use

of new resources, which should also be considered during LCAs. LCA data can be highly complementary to consumer, policy, and climate goals. Using local information and proactivity can help to benefit from all information available today to make better decisions tomorrow. A central struggle of energy transitions is that policies, governments, and industries are trying to predict what lies 10 or 20 years ahead, which argues for a divers, portfolio approach.

It was then argued that, contrary to a diversity approach, the EU is already picking winners by anticipating what markets, politicians, and technologies will do. Yet, the risk of putting "all eggs in one basket" is very high. Seemingly, the EU has put all its bets on a hydrogen plus renewables economy when cost, transportation, regulation, and markets remain uncertain. It was argued that Europe shows an example of strict government intervention, similar to US states like California, rather than a freer, more market-based approach. Businesses are likely to be run better in the US because markets rather than policies will figure out the best answer. It is crucial to find the middle ground between market self-regulation and policy-driven supply and demand. Again, energy transitions around the world will look different to meet different needs and priorities. Some regions demand a percentage of EVs in the total vehicle population, whereas others are concerned with access to electricity for the whole population.

It was generally agreed that restrictive and highly regulated industries make it difficult to innovate and utilize local advantages. A significant degree of innovation is required for ESG to address the challenges and become a guidepost for cleaner and more reliable energy. Participants were cognizant that ESG and climate policy are here to stay, but so is the reality that innovative solutions bear costs and must create value to be adopted in the industry. Overall, reliability and cost will pose challenges in the face of increasing ESG demands as all will continue to be demanded by regulators and financial bodies.

The role of policy in accelerating transitions and ensuring resiliency in value chains

There was no doubt that policy can play a major role in bringing actors together to accelerate energy transitions while creating new energy value chains. But can policy also ensure resiliency? Should policy have a resilience requirement for climate goals? How should one demand resilience if it is used as a politically rather than definitively? It was discussed that "resiliency" has many meanings and can become impossible to measure if the meaning changes with the audience.

It was stated that a lack of consstent definition is likely why policies continue to be fragmented at the federal, state, and local levels. For example, the destiny of infrastructure such as transmission lines to connect renewable energies to the grid usually ends up in the hands of the landowners to allow for the right of way. This means that certain federal goals, such as significantly greater renewable power generation, will be difficult to achieve because the path will be decided at a local, not federal, level. Even a carbon capture project that can benefit from the 45Q tax credit involves negotiating for new rights of way with landowners or local communities, turning a federally supported issue into one that faces local obstacles.

Historically, the O&G industry has successfully dealt with a lot of local issues. Although production and shipping of electrons are different than converting a crude oil molecule into the refined product, some of the challenges, such as managing complex supply chains or dealing with local communities, are similar. When thinking about energy transitions, goals will differ by industry. Yet, there are enough similarities among different players that they could deeply benefit from cross-pollination. How much cross-pollination will happen across sectors remains to be seen. It is thus crucial to create a platform for interaction and exchange of ideas to design policy that advances resiliency in future energy supply chains. In other words, high-level, rational dialogue is critical.

Participants shared that uncertainty about the vision for energy transitions is making the search for commonalities amongst all visions to achieve energy transition goals challenging. It was argued that for policy to accelerate anything, it must be multi-pronged. Policies often act as if one carrot can be put in front of everything, and that will make things work. Such a plan does not work for a system as complex and vital as energy.

It was argued that coordinating policies at different jurisdictional levels and collaborating with all stakeholders and communities are also crucial. Community intrusion, infrastructure, permits, and environmental justice are all key components to consider to avoid unwanted, negative consequences. Participants underscored the importance of collaborating with local communities to find better-suited solutions. Community leaders have a much greater understanding of how to navigate local issues and make use of local advantages. Energy transitions will take place at different paces in different regions, and it will mean something different to every community. Every region is choosing different options and finding what works best for each country, economy, and overall climate goals.

Another aspect that participants shared is for policy to communicate that energy transitions will require several steps rather than just one shift from one day to another for increased public acceptance, collaboration, and shared understanding. Politically, there is little space and middle ground to pass meaningful climate legislation, and allowing compromise is necessary to make progress. Focusing on what could be achieved now would help integrate new solutions while ensuring increased reliability.

The overall perception was that climate policy overlooks critical roadblocks. For renewable energy, storage is an ineludible bottleneck for a functioning power market with renewables, and climate goals will be difficult to achieve with such obstructions. Storage limits and transmission challenges raise questions about how to connect ever larger quantities of renewable energies to the grid. Other obstacles include the choice of baseload and what to use when the wind does not blow or the sun does not shine.

It was discussed that ideas to combine reliability and climate solutions exist. For example, research by Princeton studied capturing electricity from EV chargers when they are not operating, i.e., using it as energy storage. A suite of new technological advancements is likely to make new backup and net-metering options available for increased grid resiliency. Which solutions will take off will be strongly dictated by their price point in the market.

Concerns were also raised about policies triggering price increases on "essential" consumer goods such as energy or fuel and how they impact mid- and low-income families. The government must align with the public and understand the social injustice that comes with

higher-priced consumer goods, albeit clean. It was expressed by some that there is currently a disconnection. Markets and industries see a longer time horizon for changes, whereas governments are imposing policies with little consideration for consumer prices and the consequences for lower-income groups. Policies and decision-makers must design and include mechanisms to balance the social injustice arising from higher consumer prices to ensure that the quality of life is maintained.

Accordingly, some argued, solutions in general should seek "softer" transitions, not “hard” technology. Few legislators and consumers are fully aware of the complexity of the energy system. To avoid creating policies that bear a heavy weight from the law of unitended consequences, it is important to educate everyone on the full life cycle of energy to ensure equal scrutiny throughout the value chain of energy sources and new products. For example, what does it take to make wind turbines? What material requirements come with electrification? What happens with batteries or materials at their end-of-life?

The world shares the desire for reliable, resilient, clean, and affordable energy. Instead of focusing on one thing to scale, new opportunities to scale are varied. Whether spending money on greenhouse gas emissions abatement, new solutions, retrofitting, or workforce education will be decided by each region’s needs and demands.

In Closing

The 2021 HED built upon discussion of previous years to highlight the challenges and opportunities associated with energy transitions. Years 2022 and beyond are sure to unveil a host of new issues, and the need for continuous dialogue among stakeholders will remain vital for collective action. We look forward to continuing the conversation.