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Petroleum Companies Need a Credible Climate Plan

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The Intergovernmental Panel on Climate Change (IPCC) is now stressing that a lower 1.5°C threshold is necessary to limit the rise in global temperature and ensure a more sustainable and equitable society. To achieve this critical target, the IPCC is urging policymakers to slash oil and gas use to reduce greenhouse gas (GHG) emissions—or suffer the consequences. This puts climate action squarely in the purview of petroleum companies that produce, refine, and sell oil, gas, and their byproducts.

To date, however, few petroleum companies have made durable climate commitments and none have backed them up with credible 2°C plans (the target set by the Paris Climate Accord), let alone 1.5°C plans. Those companies that are beginning to engage are focused more on reducing short-term, climate-related financial risks for their shareholders or are taking such a long view that it is hard to ascertain their precise plans.

New industry associations, such as the Oil and Gas Climate Initiative (OGCI), are exploring industry-wide voluntary climate actions—but these are not a replacement for specific, well-funded, company-level commitments and action. As shareholder petitions call for climate-risk disclosure, technological innovation stimulates renewable energy, consumer demand grows for electric vehicles, and international regulators clean up marine fuels, petroleum companies will need to openly update their inventories of GHG emissions, revise their mitigation actions, and share their climate plans. Such transparency will be required for policymakers to develop a petroleum transition strategy to safeguard the global environment.

ASSESSING INDUSTRY'S GHG EMISSIONS RESPONSIBILITIES

The United States recently broke its oil production record, set in 1970, of 10 million barrels a day. Yet conventional oil and gas resources are dwindling, while unconventional petroleum supplies—for example, shale gas, fracked tight oil, oil sands, condensates, and methane hydrates—are emerging. And technological advances in extraction, processing, and refining are making these alternatives increasingly viable. As such, the industry must account for the changing conditions that could significantly alter a company's historic GHG footprint. This will require

high-quality, consistent, comparable, accessible data that petroleum companies know best and can provide.

Scoping Emissions

GHG emissions occur throughout the oil and gas value chain, during production, processing, refining, transport, and end use. The emissions—typically identified by their scope—need to be comprehensively tracked. *Scope 1* emissions cover those a company has direct control over from its own operations, which, in the case of the petroleum sector, includes GHG emissions from oil and gas drilling, production, and surface processing; refining and petrochemical manufacturing; and product storage, transport, and marketing. *Scope 2* emissions occur indirectly when petroleum companies make purchases from others for use in their facilities, including the purchase of electricity, hydrogen, chemicals, and other processing inputs needed. *Scope 3* emissions include everything that occurs beyond facility boundaries and are sizeable for the petroleum sector. The consumption of transport fuels—gasoline, diesel, jet fuel, bunker fuels, and more—by both company employees and global consumers falls into this category. Opportunities for more accurately tracking, and ultimately certifying, the totality of each company's scope 1, 2, and 3 emissions are arising through the development of oil-climate models and the expansion of data digitalization in the oil and gas sector.

Enhancing Data Transparency

Detailed information about the climate impacts of new oil and gas resources will be increasingly critical as competition among industry actors increases amid market volatility. This effort will entail gathering basic resource quality and operational data to assess total emissions through oil and gas value chains. Using the Oil Climate Index (OCI)—an open-source, life-cycle GHG assessment tool—companies, investors, and policymakers can estimate and compare emissions. While data services are offered by Wood Mackenzie, Rystad Energy, and IHS Markit, the recent consolidation of energy data firms has made information even less transparent at a time when greater transparency is needed. Removing the obstacles to obtaining and verifying oil and gas data inputs can create an equal footing among companies and countries when it comes to climate mitigation in the petroleum sector.

Generating GHG Inventories

Each company is currently responsible for doing an accurate inventory of its GHG emissions. But various methods exist to do this: the IPCC's *Guidelines for National Greenhouse Gas Inventories,* the U.S. Environmental Protection Agency's Greenhouse Gas Reporting Program, the World Resources Institute's Greenhouse Gas Protocol, and IPIECA's *Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions*. In effect, there is no designated authority on inventorying GHG emissions. Instead, each company can pick and choose methods, in whole or in part, without being required to verify their GHG emissions.

Incomplete, inconsistent, and unverified GHG inventories make it difficult to create a credible climate plan. Inventories typically use generic operating assumptions about equipment, leakages, fuel quality, and fuel combustion efficiencies. Potential inaccuracies call for open-source accounting approaches like the OCI and its underlying engineering models that take resource-specific operating conditions into account. The OCI's assessment tools account not only for all of the products that are made and sold but also for the significant portions of these fuels that oil and gas companies consume on-site during resource extraction, processing, refining, and transport.

Focusing Anew on Methane and Black Carbon

In addition to carbon dioxide—a long-lived climate gas that has garnered the most interest to date—short-lived climate pollutants (SLCPs) are central to arresting the planetary warming underway. Of the many SLCPs, methane and black carbon are emitted by producing, refining, and consuming oil and gas. The petroleum

sector emits methane both unintentionally (leaks, or *fugitive emissions)* and purposely *(venting).* Black carbon is emitted throughout the oil and gas value chain by combustion equipment and engines that burn fossil fuels. Equipment that is poorly maintained or inefficiently operated releases larger amounts of black carbon. SLCPs persist for a shorter time in the atmosphere but are orders of magnitude more potent than carbon dioxide. It will be important for petroleum companies to consider short- and long-term time frames in the planning process. This entails providing emissions estimates that use the IPCC 20- and 100-year Global Warming Potentials with climate-carbon feedbacks, as currently specified and to be updated in the future.

Big Data Digitization

As information technology advances, the amount of oil and gas data that can be collected electronically will increase exponentially. A McKinsey Global Institute study, for example, found that only 1 percent of the 30,000 data points collected from remote sensors on oil and gas drilling rigs is currently available for operational decisionmaking. In response, block chain and distributed ledger technologies are being explored because they offer low costs and high speeds along with greater transparency and security. This method of near-instantaneous recordkeeping cuts out the middle man, replacing a central intermediary with a more tamperproof way to share sensitive intellectual property. Digitally recording and reporting pressures, temperatures, flow rates, compositions, system leakages, and other data can be used to model GHG emissions for a barrel of oil or a given volume of natural gas. For example, Equinor (formerly Statoil) is using block chain technology to create a granular "digital twin" of its Johan Sverdrup field to experiment with digital optimization before real-world interventions are applied. BP is also following suit. While not a silver bullet, there is a definite role for block chain technology in climate planning and policymaking. The ability to collect and analyze data and big data can spur new thinking on calibrated regulatory approaches and streamlined management practices.

ESSENTIAL STEPS IN CLIMATE PLANNING

The above efforts are fundamental inputs for a verifiable climate plan. And preparing one requires careful construction and includes six essential and four enhancing steps (see Figure 1). It is no longer enough for companies to merely claim to have a plan. Nor can companies continue to offer a rough sketch. New forums, like the Institutional Investors Group on Climate Change (IIGCC), are being created to "encourage public policies, investment practices, and corporate behavior that address long-term risks and opportunities associated with climate change." IIGCC, Vanguard, BlackRock, State Street, and others, worth together over $150 trillion in assets, have begun to use shareholder proxies to formally call for climate plans.

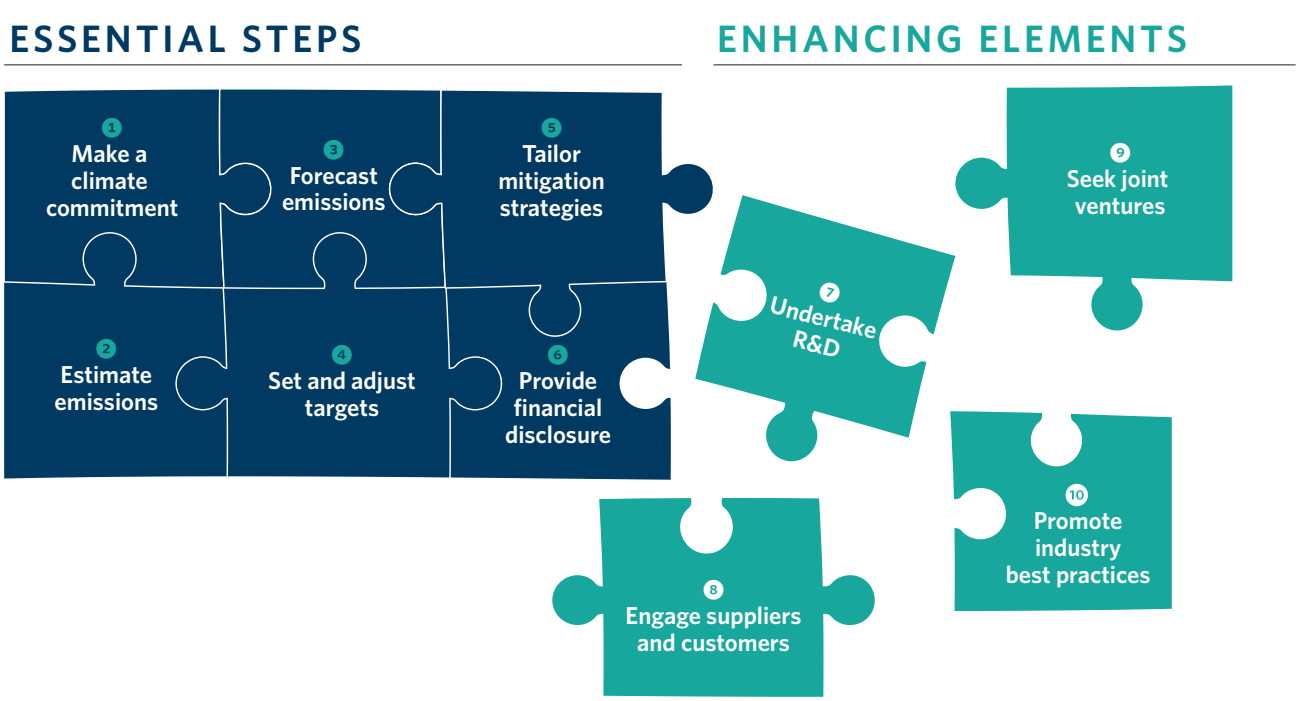
Make a Company Climate Commitment

Petroleum companies have a long history of avoiding responsibility for climate change. Some even have actively obscured facts around the impacts of their emissions. But as new oil and gas resources come to the fore through fracking and other means and it is becoming clear that supplies are not scarce, companies are experiencing renewed pressure to clearly lay out mitigation strategies to address man-made climate change. To do this, however, specific, quantifiable GHG emissions reductions need to form the backbone of each company's climate commitment. The purpose of this initial element in the climate plan is to align a company's commitments with its actions and intended outcomes. Commitments provide shareholders, decisionmakers, and the public with a clear understanding of the steps intended to be taken so that a company can operate responsibly and safely and the market can value adherence.

Estimate Emissions

Company GHG inventories (discussed above) are needed to establish baselines. This starts with selecting a baseline date that offers a real snapshot of GHG emissions from the entirety of a company's petroleum

Figure 1: Piecing Together a Climate Plan for the Petroleum Sector



operations and allows tracking of progress in their sustainability reports, which should be updated annually. Emissions baselines should include *absolute* and *normalized* (that are relative to operational data) metrics to assess both a company's overall GHG emissions and allow third parties to compare companies' emissions to one another. These reference data require monitoring, reporting, and verification to course correct and yield measurable results.

Forecast Emissions

Oil and gas companies are generally adept at planning ahead, especially on financial matters. Infrastructure can last for decades. Yet few companies publicly project their emissions, clearly conveying and accounting for their known and planned reserve compositions, acquisition and divestment plans, operational changes, and new project plans. Scenario planning, such as that performed by Shell, is a useful tool in projecting emissions. For example, in Shell's most recent Sky scenario, it promotes carbon capture and a transition to a hydrogen economy, which proposes to eliminate emissions of carbon dioxide and other GHGs. To be most useful, however, future forecasts need to be tied back to actions today. According to Equinor, there is an urgent need to stop talking about scenarios and start actually doing something. It is not useful for companies to assemble coalitions and set collective targets for which they cannot be held accountable. And it is not enough to cast about aspirations of long-term transformations that cannot be connected to concrete plans and investments.

Set and Adjust Targets

Companies routinely set targets for the future performance of key business indicators, such as the return on capital employed or the quartile performance of a key industry. When applied to climate action, specified

targets tend to be set at a low bar. Instead, it is vital that ambitious climate performance targets—absolute and normalized tons of GHG emissions and percentage reductions from the stated baseline GHG emissions—are established. These are as important to the long-term viability of a company as the traditionally targeted metrics. Targets should specifically cover all scope emissions for all GHGs. Given the low levels of climate action to date, especially compared to other sectors, emission targets should be more aggressive for the 2020–2025 timeframe. Companies that employ long-term targets and rely on breakthroughs that are years away might become free riders and use delay tactics. This is a major concern regarding recent heightened interests in U.S. regulatory rollbacks in methane emissions reductions. A feedback loop needs to be built in to adjust targets. If forecasts fall short, this loop would trigger the need for adjustments to come into alignment with the climate plan.

Tailor Mitigation Strategies

Each company—based on the particulars of its resource holdings, operational assets, workforce specialization, and market capitalization—can lay out the GHG emissions reductions uniquely suited to itself to address scope 1 and 2 emissions. There are numerous ways that a company can reduce its climate footprint. Tailoring its climate plan offers the best potential for targeted strategies for near-, mid-, and long-term actions that build on each other. For example, if a company has expertise in heavy oil operations, it should advance the use of renewables to generate heat and steam and update refining techniques to cleanly manage excess carbon. On the other hand, those companies with expertise in fracking light-tight oil should work toward tight gas management, including zero tolerance for venting, tight fugitive emission controls, and tight limits on flaring. Companies can also address their scope 3 emissions by encouraging other actors to collaborate, such as equipment manufacturers and automakers, through a range of plan-enhancing activities (discussed later).

Provide Financial Disclosure

Deciding whether to invest in an oil and gas project involves weighing risks. When it comes to global risks like climate change, standardized financial disclosure practices can be more effective. Establishing the social cost of carbon—a so-called shadow price—is one method used to internally assess GHG emissions to decide if a project should go forward. This offers a measurable way to price out effects from future climate policies in order to avoid stranding assets or misallocating capital. Without comparable reporting, however, climate-related financial decisions can be skewed. Efforts to require more transparent business disclosure are underway. For example, the Task Force on Climate-Related Financial Disclosures was launched to address the implications of climate issues on corporate profitability and long-term viability. That said, companies should not only focus on the climate-related financial risks to their shareholders but also to society at large. If conducted comprehensively, this offers a way to monetize companies' climate plans, making them more likely to meet their targets. The market's reaction to financial disclosure can also influence a company and encourage other firms to act.

ENHANCING ELEMENTS IN THE CLIMATE PLANNING PROCESS

Beyond the essential steps above, several enhancing elements can further a company's climate plan. While the essential steps are taken on directly by companies, many of the enhancing elements in the climate planning process involve other actors. When it comes to scope 3 emissions and indirect involvement in reducing scope 1 and 2 emissions, care should be taken to ensure that GHG emissions reductions are not double counted by oil and gas companies and others' actions.

Undertake Research and Development

There are many potential pathways to taking effective climate action, but no one company can endeavor to pursue all possible solutions. Companies can and should collaborate and share research while protecting

intellectual property—for example, through joint ventures with research labs and universities (this is how fracking came about). Technology advancements can affect scope 1, 2, and 3 emissions in different ways. Research and development (R&D) activities—those undertaken *directly* by petroleum companies and *indirectly* by all other actors—are an important source of fueling innovation. For example, ExxonMobil is researching a technological leap, using fuel cells in conjunction with carbon capture to generate on-site power from waste carbon dioxide. Other efforts to detect and reduce methane leaks (such as NASA's Carbon Monitoring System program or the Environmental Defense Fund's MethaneSAT, launching in 2021) and changes to engines and fuel quality (such as the International Maritime Organization's research into refining low-sulfur bunker fuel) are examples of how R&D can facilitate companies' efforts to meet climate targets. While breakthroughs can take decades, R&D opens the door to new operations, new products, and new markets that can spark ongoing climate progress throughout the oil value chain in the near term and long term.

Engage Suppliers and Customers

The true reach of the petroleum sector extends well beyond oil and gas companies to industrial suppliers, product traders, the investment community, and customers themselves who have the capacity to directly and indirectly influence the industry's GHG emissions. Involving these ancillary actors in the creation and implementation of a company's climate plan can have meaningful impacts on today's emissions and tomorrow's business practices. Examples of such strategies include specifying GHG emissions reductions in energy procurement contracts for electricity, hydrogen, and other inputs; developing low-carbon equipment specifications in purchase orders placed with vendors; and incorporating GHG labeling for consumer-facing petroleum products such as gasoline service stations.

Seek Joint Ventures

Petroleum companies routinely engage with automakers, truckers, shippers, airlines, construction companies, water companies, electric utilities, and others. Thus, there are ample opportunities to advance joint ventures to reduce GHG emissions, whereby each party takes credit for a portion of the GHG emissions reductions in their climate plan. For example, alliances with the auto industry could lead to a comprehensive analysis of vehicle electrification, automation, and new ridesharing arrangements and a modeling of their effects on gasoline demand. In collaboration with the renewables industry, concentrated solar technologies could be used instead of fossil fuels to provide heat and steam in oil field operations. In cooperation with the power sector, petroleum companies could reduce dependence on GHG-intensive residual fuels, such as petroleum coke. The petroleum industry could share its unique knowledge with electric utilities to advance carbon capture and storage, working to safely reinject carbon dioxide into oil fields and advance other carbon sequestration innovations. Such shifts not only have profound impacts on GHG emissions but they also influence the petroleum sector's business model and can lead to lucrative mergers.

Promote Industry Best Practices

The petroleum industry is large and diverse. On social issues like climate change, companies tend to collaborate when their interests and strategies overlap. As long as they are not resisting progress or silencing early adopters of climate innovations, industry groups can help develop and promote best practices, especially for those firms less willing or able to lead. In addition to large business-focused trade groups with thousands of members, such as the American Petroleum Institute, American Chemistry Council, and National Association of Manufacturers, there are smaller climate-focused industry collaborators that are working to advance climate planning. For example, these include IPIECA, along with newer organizations like the OGCI and Climate Leadership Council. Joining forces with other industry partners can help standardize common planning tasks and methods and allow shareholders to compare strategies and chart progress.

Engaging in the process discussed above will reduce the barriers to a wide array of climate actions. A range of

external influences—regulations, market forces, and technology developments—will need to be factored into the climate planning process.

IDENTIFYING CLIMATE ACTIONS

Climate solutions require a host of changes to business-as-usual practices. Laying out new options can help companies choose the best course that fits their capacity. In practice, GHG emission reduction opportunities exist for implementation sector-wide.

Research underpinning development of the OCI is useful in this regard, offering a methodology for comparing global oils' GHG emissions with global gases now being added. Assessing GHG emissions throughout the petroleum value chain helps to identify where—in production, refining, transport, and end use—the greatest emission reduction potential exists for a given resource.

Figure 2 identifies a wide array of approaches that can be included in petroleum sector climate plans by incorporating lessons learned in the OCI into climate strategies laid out by OGCI. Every company will not necessarily adopt every strategy. The specific strategies of a climate plan must correspond to the particular nature of a company's emissions and where they arise. However, the strategies below can serve as a checklist for companies to assess their climate mitigation potential and devise their plans.

Figure 2: Strategies to Reduce Scope 1, 2, and 3 Emissions

- Strategies that the Oil and Gas Climate Initiative (OGCI), an industry collaborative, has identified.
- Strategies that the authors have identified.

GHG Emissions Sources	Scope 1: On-Site Emissions Reductions	Scope 2: Off-Site Emissions Reductions	Scope 3: Indirect Emissions Reductions
Methane	Design and deploy methane management technologies	Purchase natural gas from suppliers that adopt MRV	Partner with transmission companies that monitor leakage
	Institute monitoring, reporting, and verification (MRV) for fugitive emissions	Purchase natural gas from suppliers that adopt MCU	Support industry standards to reduce methane emissions
	Build field equipment to same leakage specs as refinery equipment		
	Update methane emissions using satellites and fly-by and ground-level detection		
	Certify that methane venting has not occurred		
	Maintain flaring equipment		
	Minimize flaring operations		
	Conduct R&D on methane capture and utilization (MCU)		

GHG Emissions Sources	Scope 1: On-Site Emissions Reductions	Scope 2: Off-Site Emissions Reductions	Scope 3: Indirect Emissions Reductions
Heat, Steam, and Energy	Increase operating efficiencies systemwide	Purchase renewable electricity to meet power needs	Develop advanced fuel-engine technologies
	Produce and use efficient fuels and lubricants	Reduce energy requirements for liquefied natural gas	Support vehicle fuel efficiency standards
	Minimize the use of fossil fuels in all oil and gas supply chain operations	Permanently store petcoke in reclamation sites	LEED certify all company buildings
	Use renewable energy sources in oil and gas supply chain operations		Develop noncombustive alternative uses for petcoke
	Develop alternatives to coking refineries		Purchase and use only zero-GHG company vehicles
	Avoid using petcoke for on-site power		Maintain support for California Clean Air Act preemption
	Do not burn coke off catalyst; develop new cleaning methods		
	Use fuel cells for on-site power		
	Install cogeneration to minimize energy inputs		
	Develop production and refining decarbonization plans		
Hydrogen Demand	Develop technology to replace steam methane reforming (SMR)	Purchase renewable hydrogen	Invest in regional hydrogen distribution networks
	Produce and use renewable hydrogen	Purchase hydrogen from suppliers that do not use SMR	Support policies that advance hydrogen fuel utilization
			Collaborate with cities to install hydrogen refueling equipment
Water Handling	Reduce amount of produced water generated	Reduce purchasing of fresh water used in fracking and other oil operations	Investigate reclaiming of metals (e.g., lithium) from produced water
	Increase amount of produced water recycled, reused, and reclaimed		
	Reduce the amount of water used in oil and gas production		
	Use renewable energy to pump water		

GHG Emissions Sources	Scope 1: On-Site Emissions Reductions	Scope 2: Off-Site Emissions Reductions	Scope 3: Indirect Emissions Reductions
Other GHG Sources	Employ carbon capture and storage	Work with suppliers to provide warranties on low GHG equipment	Support "smart" carbon taxes that price lifecycle GHGs
	Certify that carbon dioxide venting has not occurred	Deal with firms that inventory GHGs and have climate plans	Determine pathways for low- and zero-carbon fuels
	Use only atmospheric carbon dioxide for enhanced oil recovery (EOR)	Encourage all suppliers to account for their lifecycle GHGs	Label product lifecycle GHGs to raise consumer awareness
	Avoid the use of carbon dioxide from natural sources that are sequestered		
	Inventory and reduce black carbon and nitrogen oxide GHGs		
	Inventory all GHG emissions according to the Oil Climate Index		
	Develop company climate plans that account for total lifecycle GHGs		

THE WISDOM OF PLANNING AHEAD

Greenhouse gas concentrations continue to rise, pushing up global temperatures. The past two decades have witnessed eighteen of the twenty warmest years since recordkeeping began in 1850. According to UN Secretary General António Guterres, "climate change is moving faster than we are."

In response, the IPCC is calling on the petroleum industry to find ways to meet its new 1.5°C climate goal. This will require reducing GHG emissions from the oil and gas they produce, process, refine, consume, and market.

As companies improve their environmental, social, and governance performance and disclose the financial risks that climate change poses to their bottom lines and shareholders' earnings, they must reduce the climate risks their overall operations pose for society. Such transparency and accountability lies at the heart of a credible climate plan. Even if companies are hesitant to voluntarily move forward on actions to reduce their GHG emissions, formulating a plan will both inform climate policymakers and prepare companies to act quickly in response to future carbon pricing and climate regulations. Early actors will have the benefit of signaling to institutional and other investors that they are better bets on climate grounds in highly competitive petroleum markets.

Petroleum companies have many operational and marketing opportunities to shrink their GHG footprints through increased efficiencies, ingenuity, and new capital flows. Given the long horizons in this sector, acting now would avoid locking in emissions for decades.

There will be increasing pressure on petroleum companies to hasten the transition to low-carbon energy pathways that make a meaningful contribution to cutting—and producing net-negative—GHG emissions. A credible

planning process that covers the entire petroleum value chain is important to success. This involves developing a plan that is publicly available, evidence-based, updated annually, standardized in methods used, verifiable by independent parties, and backed by the company's chairperson and board. As policymakers and the public become more aware and concerned about climate risks, companies will increasingly compete on the grounds to hand down a clean-energy legacy.

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