Nature of and Comparison Among Oil and Natural Gas Upstream Business Strategies by Major Companies

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Note

This paper is a report that appeared on the website of the Institute of Energy Economics, Japan on February 2, 2022. The information herein is therefore based on information obtained as of February 2. However, the business environment involving five major companies, namely Shell, BP, TotalEnergies, Exxon Mobil, and Chevron (hereinafter referred to as "Major Companies"), is currently changing as a result of Russia's launch of a military operation in Ukraine at the end of February. This operation prompted BP to announce its intention to exit its stake in Rosneft on February 27. Shell has also indicated that it will withdraw from business with Gazprom and multiple joint ventures with related entities. While at the time of this writing (early March) it is not yet clear how this situation will conclude, changes with respect to Russia, one of the world's largest oil and gas producers, could impact the Major Companies' upstream business strategies over the medium- to long-term.

Abstract

- A comparison of the oil and natural gas upstream business strategies by Major Companies has illuminated an across-the-board understanding of the importance of a purposeful pursuit of lower costs and a focus on natural gas.
- Trends differ among[1] Major Companies, however, with regard to future natural gas and liquid production volume.

[1] In general, liquids include things such as crude oil and NGL. However, liquids can refer to slightly different substances depending on the company. For more information, see the note concerning each company's production volume.

Comparison of upstream business strategies among major companies

Commonalities	Purposeful pursuit of lower costs (specific methods differ among the companies)	(Specific measures) - Regional consolidation of exploration operations ( ) - Business asset divestment - Improving operational efficiency through digitization, etc.
	Recognition of natural gas importance	- Natural gas will play an important role as a low carbon fossil fuel in the energy transition

Differences	Companies' liquid / natural gas production volume change trends (2020-2025)	N.A.	↓ Down	↑ Up	→ Flat	↑ Up

➢ While the purposeful pursuit of lower costs appears to be something shared among all upstream business operators, the nature of production volume changes (whether to increase, decrease, or maintain) is subject to change based on each company's situation and outlook on the future.

I. Introduction

Day by day, international public opinion is growing increasingly supportive of achieving net zero emissions. According to the United Nations[2], over 130 countries have set or are planning to set goals to achieve net zero emissions. In October 2021, major oil producer Saudi Arabia also announced a net zero target.

There is a global trend toward achieving net zero emissions, and upstream business strategies tailored to this trend will be needed by oil and natural gas upstream business operators, as well. Although low carbon and carbon removal technologies are attracting attention amid a movement to achieve net zero emissions, the global oil and natural gas demand will not dry up overnight. As such, there will continue to be a need for upstream business operators to supply a certain level of oil and natural gas. However, upstream business continuation will rely not only on traditional business strategy but also on strategy that takes this global trend into account.

Unfortunately, the need to address an opaque business environment will create

[2] https://www.un.org/en/climatechange/net-zero-coalition (Viewed on December 2021)

certain difficulties when it comes to strategy formulation among these businesses. Along with the aforementioned international sentiment, there are many unknown variables that could impact oil and natural gas demand, including the extent to which these countries achieve economic development and develop and proliferate low carbon technologies in the future. Various institutions, factoring in these unknown variables, have devised demand scenarios that have significant differences. Suppliers, on the other hand, will need to optimize their businesses to avoid stranded capital[3] while still achieving monetization amid considerable demand uncertainty.

This paper explores and compares strategies formulated by five Major Companies as illustrative examples of upstream business strategies. Major Companies have upstream operations around the world and face wide-ranging risks as the world shifts toward net zero emissions. The strategies of such companies at the top of their industry should provide useful hints for other upstream business operators.

A comparison of the oil and natural gas upstream business strategies by Major Companies has illuminated an understanding of the importance of a purposeful pursuit of lower costs and a focus on natural gas. Trends differ among Major Companies, however, with regard to future natural gas and liquid production volume. The methods employed by these companies to reduce costs by implementing state-of-the-art technologies and strict investing standards should prove instructive for other upstream business operators. There does not seem to be, however, any generally-accepted "right answer" on production volume changes (whether to increase, decrease, or maintain), and companies could take different paths in accordance with business strategies that are based on their individual situations and outlooks on the future.

Chapter II of this paper presents an overview of current production volume and reserves among individual companies, as well as their future strategy. Chapter III then provides a comparison of these companies' strategies.

II. Current Production Volume and Reserves among Major Companies,

[3] The IEA defines stranded capital as "capital investment in fossil fuel infrastructure that is not recovered over the operating lifetime of the asset because of reduced demand or reduced prices resulting from climate policies" (IEA, 2021 *Net Zero by 2050*, p.102 note).

and Their Future Strategies

This chapter presents an overview of current production volume and reserves, as well as future strategies, at Shell, BP, TotalEnergies, Exxon Mobil, and Chevron, in that order, with published data from these companies provided as reference.

(1) Shell

Shell has stated its intention to establish core business domains and regions, and to continue its upstream businesses while shifting production to gas and lowering costs. While the content of strategy announced by the company prior to May 2021 could be in the process of being reconsidered, this paper is primarily based on that original strategy.

<1> Current production volume and reserves

A look at natural gas and liquid production[4] in 2020 by region shows the key producers to be Asia and North and South America (Fig. 1). By type of resource, the U.S., Brazil, and Oman are the largest producers of liquid, while Australia, the U.S., and Malaysia produce the most natural gas. Shell is also continuously working to improve operations, including by reducing production costs. For example, the company reduced its unit development cost[5] (UDC) and unit operating cost[6] (UOC) by 51% and 26%, respectively, between 2015 and 2020.

As of the end of 2020, Asia and North and South America also have the largest proportions of proven reserves of liquid and natural gas[7] (about 9,124 Mboe) by region. The company's liquid to natural gas ratio is 51:49.

The amount that the company invests in its upstream segment as a proportion of its total

[4]Liquids include crude oil, NGL, and synthetic crude oil. Daily production by region is calculated by dividing annual production by region by days per year. Natural gas volume is converted to liquid volume using a coefficient utilized by Shell.

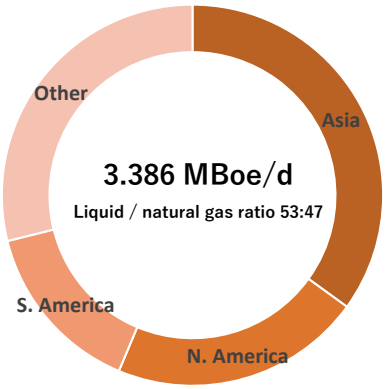
[5] Calculated by dividing the amount of Shell's concession share as a portion of its project capital costs by the production volume of its concession share.

[6] Calculated by dividing the amount of Shell's concession share as a portion of its operating costs by the production volume of its concession share.

[7] "Proved developed and undeveloped oil and gas reserves" from *ANNUAL REPORT AND ACCOUNTS 2020.*

cash capex[8] dropped from about 50% to 42% between 2018 and 2020. Total investment for both upstream and integrated gas[9] segments decreased from 66% (2018) to 65% (2020), a slighter change than for the upstream segment itself.

Fig. 1 | Liquid and natural gas production by region (Shell, 2020)



(Source) Prepared based on data from Shell, *ANNUAL REPORT AND ACCOUNTS 2020*

<2> Future strategy[10]

Shell sees cash flows from its upstream business as a means to fuel shareholder return and low carbon investment, and has indicated an intention to continue such business. It has indicated that it believes natural gas will play an important role in the energy transition. This is because natural gas is an energy source that could be used in the power production sector (to compensate for the intermittency of renewables) and sectors where electrification is problematic, as well as a possible means to reduce overall carbon emissions.

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[8] Definition from the company's publicized literature: "Cash capital expenditure comprises the following lines from the Consolidated Statement of Cash Flows: Capital expenditure, Investments in joint ventures and associates and Investments in equity securities."

[9] Included in integrated gas segment business is certain operations concerning liquid and natural gas production, exploration, development, and transport infrastructure, along with LNG operations, new energy business operations, and operations to conversion of natural gas to "gas to liquid fuel" and other products.

[10] The content of this paper is primarily based on upstream business strategies released through May, 2021. In May 2021, after the strategy was announced, the Hague Court ruled that Shell should establish additional carbon reduction targets as its current targets are inadequate and lack specificity. Shell CEO Ben van Beurden said that he interprets the ruling as Shell needing to accelerate, but not change, its strategy. The company has since sold its U.S. Permian assets, which were one of the company's core positions in September. Under the circumstances, the company may be rethinking the strategy it announced prior to the ruling. It has not made a proper strategy announcement since the ruling, however.

Although Shell's data does not state specific production volume target values, the company aims to make natural gas at least 55% of all liquid and natural gas production by 2030. Liquid production, meanwhile, peaked in 2019, and the company expects liquid to decrease 1-2% by 2030 due to natural decline and divestments. In materials released prior to May 2021, the company stated that it aimed to eliminate routine flaring at its operations by 2030. It has since moved this goal up to 2025[11].

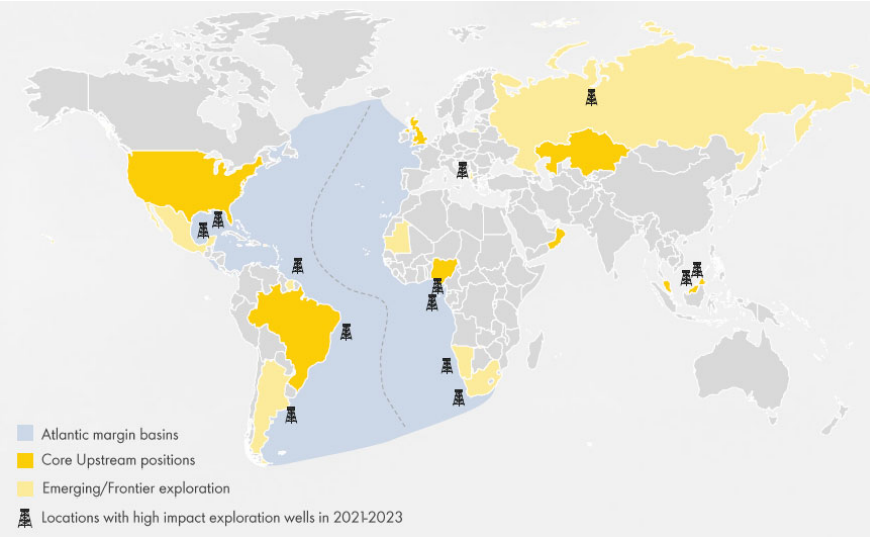
Shell will also continue reducing production costs through 2025. By 2025, Shell aims to reduce UDC by up to 10%, UOC by up to 20%, and total OPEX (operating expenses) by 20-30% compared to 2019 levels. Along with simplifying, standardizing, and replicating facility design aimed at reducing UDC, it will also promote digitalization in order to reduce UOC.

Shell has specified three areas of focus for the future, namely deep water, shale, and traditional crude oil and natural gas extraction, and has established regions (nine regions in total) that will serve as core business positions (Fig. 2). The specific core positions will be Brazil and the Gulf Coast for deep water extraction, U.S. Permian for shale drilling (but was sold after the announcement of its strategy), and the UK, Nigeria, Oman, Kazakhstan, Brunei, and Malaysia for conventional oil and gas production. Shell says it will concentrate 80% or more of all future cash capex into these core positions (with a particular emphasis on deep water business). It sees attractive opportunities for frontier exploration through 2025, after which it will cease frontier exploration in order to de-risk[12].

[11] https://www.shell.com/inside-energy/zero-routine-flaring-by-2025.html

[12]The company refers to these as under-explored basins in the same materials (*"Brazil Shareholder visit 2016"* p.15).

Fig. 2 | Upstream exploration program map



(Source) Shell, *"SHELL INSIGHTS: UPSTREAM STRATEGY"*

Shell has selected new business regions and aims to implement stricter investing standards. It assumes commodity prices post 2025 of $60/bbl for Brent crude and $3/MBtu for Henry Hub (HH). A hurdle rate (IRR) of at least 18% is a basic requirement for investment, with investment return before 2035. As far as this author was able to gather from published data, Shell is the only one among the Major Companies to disclose specific investment return dates. It also makes its own carbon cost projections and factors that in as potential cost in its business economic assessments.

The company's divestments suggest the possibility that investment targets could be selected from among lean positions (assets other than core positions).

For investing (cash capex) allocation in the future, it will gradually transition from upstream to growth segments (marketing, renewables, and energy solutions businesses). The company plans to establish three business pillars—"upstream," "transition," and "growth"—and increase its investment in the upstream pillar from about 42% in 2020 to 30-40% by 2025 and 25-30% thereafter. [13] It will also increase third party LNG business. Apparently this will contribute to increasing sales while minimizing upstream investment in and business risk from feed gas production.

[13]Transition pillar investment will change from around 43% in 2020 to 35-40% by 2025 and about 30-40% thereafter. For its growth pillar, Shell plans to gradually increase its investment allocation from roughly 16% in 2020 to 25-30% by 2025 and 35-40% afterwards.

(2) BP

BP has indicated that it intends to continue its upstream businesses while working to reduce production costs. However, it will only conduct new exploration operations in a limited number of regions and will reduce liquid production volume in stages until 2030. The company has a 19.75% stake in Rosneft but this portion is not included in BP's production and emissions targets.

<1> Current production volume and reserves

BP's liquid and natural gas production in 2020[14] was about 2.4 Mboe/d if excluding Rosneft and 3.473 Mboe/d if including Rosneft (Fig. 3). A look at BP's production volume by region inclusive of Rosneft shows places like Russia and North America to be key production regions. Broken down by country and resource, liquid production is largely from deep water drilling by Rosneft and in the Gulf Coast, while natural gas is mostly from Trinidad and Tobago, the onshore in the U.S. lower 48, and Rosneft.

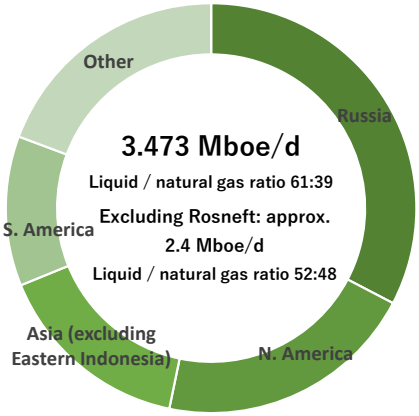
As of the end of 2020, Russia accounts for about 50% of proven reserves of liquid and natural gas[15] (about 17,982 Mboe) by region, followed by Asia (excluding eastern Indonesia) and the U.S. The company's liquid to natural gas ratio is 59:41.

The company's investment allocation in its upstream segment, which is a part of its organic capex (total capex minus outflows for acquisitions, etc.), stayed mostly flat at around 78-79% from 2018 through 2020.

[14]Liquids include crude oil, condensate, bitumen, and NGL. Natural gas volume is converted to liquid volume using a coefficient utilized by BP.

[15] Net estimated proved reserves as stated in *BP Annual Report and Form 20-F 2020.*

Fig. 3 | Liquid and natural gas production (BP, 2020)



(Source) Prepared based on data from BP, *BP Annual Report and Form 20-F 2020*

<2> Future strategy

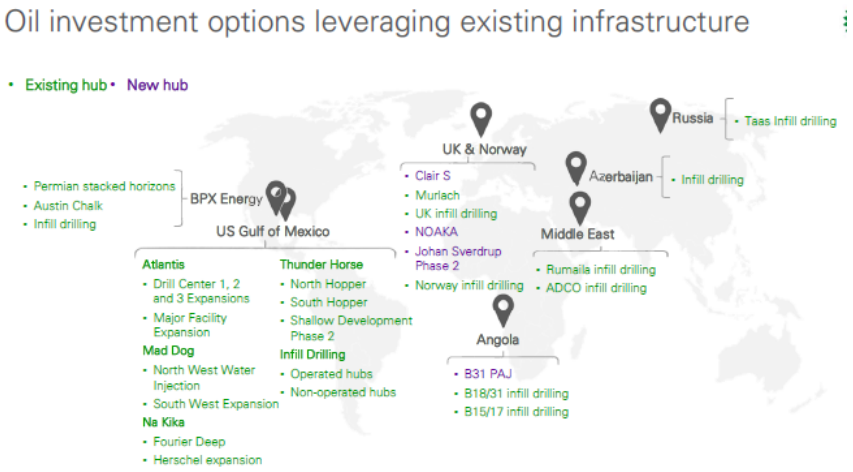
BP has said that it expects a certain measure of liquid and gas demand to remain over the intervening decades until 2050, and that it will continue its upstream business. The company sees upstream business as a necessary source of funding for transitioning into its two growth segments: low carbon energy, and improvement of customer convenience and mobility. It sees natural gas as playing an important role in the global energy transition.

However, it plans to reduce liquid and natural gas production (excluding Rosneft) up until 2030. It will gradually reduce production from around 2.4 Mboe/d in 2020 to under 2.0 Mboe/d by 2025 and around 1.5 Mboe/d by 2030. BP CEO Bernard Looney has given three reasons for reducing production by 2030. The first is to realize growth with cash flows and returns in good balance, in line with a policy of emphasizing quality over quantity, as part of a companywide effort to achieve business reform. The second is to decarbonize and diversify its businesses by reallocating capital to lower carbon business, thereby reducing risk. The third is to achieve alignment with the process to achieve net zero emissions by 2050. BP aims to be net zero on an absolute basis across all upstream oil and gas production operations by 2050. Milestones toward this goal are achieving emissions cuts of 20% and 35-40% by 2025 and 2030, respectively, compared to 2019. It says it will work to keep a liquid to natural gas production ratio of about 50:50 until 2025.

It will also reduce unit production costs from $6.84/boe in 2019 to under $6/boe in 2025. Some of the ways it will do this are digitizing operations management, improving maintenance and inspections, and shortening unscheduled operational downtime.

Regarding new investment, BP has announced that it will not embark on new exploration in countries it does not have a presence in, and will instead focus on exploration and development in hub-adjacent areas in existing core regions (Fig. 4, 5). The reasoning behind this is that directing upfront investment toward new business will help reduce production costs, while also reducing total production volume, as mentioned above. BP's liquids business will focus on tieback development and infill drilling, in particular[16]. Its exploration investment is already declining, a trend that the company expects will continue.

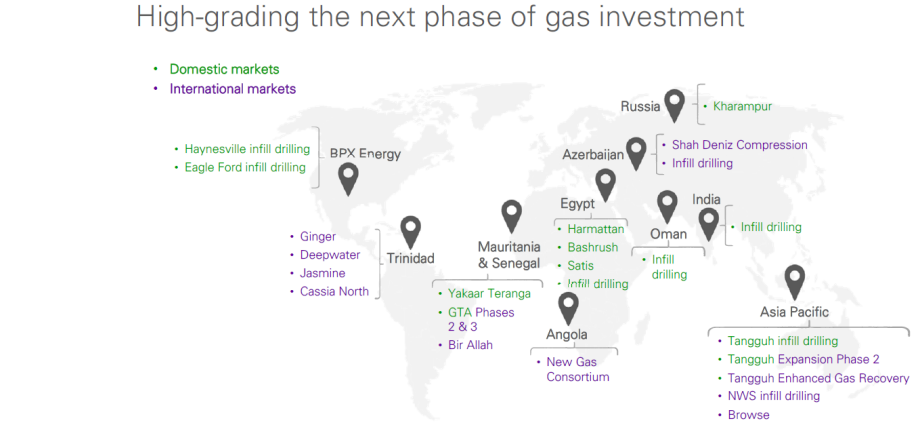
Fig. 4 | Liquids business investment options



（Source） BP, *Resilient and focused hydrocarbons*

[16] BP will drill new production wells in between existing production wells as a means to boost production capacity from existing oil reservoirs （https://oilgas-info.jogmec.go.jp/termlist/1000201/1000292.html）。

Fig. 5 | Natural gas business investment options



（Source） BP, *Resilient and focused hydrocarbons*

With a need for a resilient and competitive hydrocarbon business, BP is looking to implement strict investment standards. The company assumes average commodity prices up until 2050 of $55/bbl for Brent crude and $2.90/MBtu for HH, has set a hurdle rate particular to the business sector (about 10-15%), and forecasts an investment return period of less than 10 years for upstream liquids and less than 15 years for upstream natural gas. It has also made its own carbon cost projections and factors some of those costs into its business economic assessments. Cash flow volatility is among the other factors it considers in these assessments.

As for future investment allocation, it will gradually shift focus away from resilient hydrocarbons (including upstream business, refinement, and trading) and toward other growth segments. All BP business falls into four categories—resilient hydrocarbons, low carbon electricity and energy, convenience and mobility, and other—and total investment into low carbon electricity and energy and convenience and mobility, which were around 15% in 2019, will be increased to at least 40% by 2030. Some third-party LNG is expected to be included in LNG sales, presumably because it will contribute to feed gas development investment and de-risking.

Concerning divestment, the company will sell roughly 600 kboe/d in assets between 2019 and 2025. Among its liquid assets, low-margin assets will be sold more aggressively. About 200 kboe/d have been sold as of September 2020.

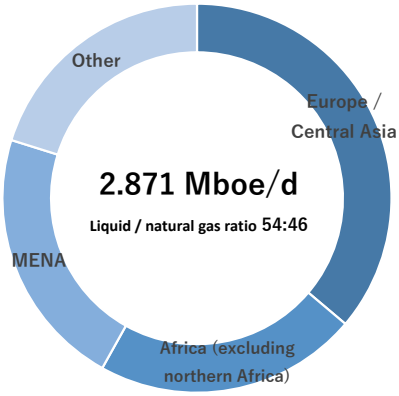
(3) TotalEnergies

TotalEnergies has indicated that it intends to increase overall production and continue its upstream businesses, while reducing production costs and producing more gas.

<1> Current production volume and reserves

Broken down by region, liquid and natural gas production in 2020 [17] was concentrated in Europe, Central Asia, Africa (excluding North Africa), and the Middle East and North African (MENA) (Fig. 6). By country and type of resource, countries such as UAE and Angola produce the most liquids while Russia and the UK are among the largest natural gas producers.

Fig. 6 | Liquid and natural gas production (TotalEnergies, 2020)



(Source) Prepared based on data from TotalEnergies, *Factbook 2020.*

MENA and Russia account for a relatively large proportion of proved liquid and natural gas[18] (about 12,328 Mboe) by region as of the end of 2020. The company's liquid to natural gas ratio is 47:53.

TotalEnergies' investment in the Exploration & Production segment as a proportion of total investment dropped from 62% in 2018 to 44% in 2020. Total investment for both the Exploration & Production and Integrated Gas and Renewables & Power segments

[17] Production volume in the Exploration & Production segment and Integrated Gas, Renewables & Power (iGRP) segment. Liquids include crude oil, bitumen, condensate, NGL.

[18] Proved developed and undeveloped reserves from *Factbook 2020.*

declined from 85% (2018) to 84% (2020), a slighter change than for the Exploration & Production segment itself.

<2> Future strategy

TotalEnergies will continue its upstream hydrocarbon business with the view that it is a source of cash flows for its energy transition and shareholder return. TotalEnergies sees natural gas as an important energy source that produces relatively little carbon emissions and compensates for the intermittency of renewables while contributing to the global energy transition. The company therefore anticipates LNG demand will see strong growth over the next several years in mainly Asian countries that are focused on increasing energy supply and reducing carbon emissions. It believes its formidable asset portfolio will allow it to supply sufficient LNG to meet this demand.

TotalEnergies will increase liquid and natural gas production by an average of 3% annually between 2021 and 2026, primarily through LNG production increases. An expected liquid and natural gas production volume of 2.85 Mboe/d for 2021 translates into a 3% average annual production increase, and 3.21 Mboe/d in 2025 (Fig. 7). The company is shifting production more toward gas, aiming to make it around 60% of total production by 2035. Liquid production, on the other hand, will peak over the next 10 years while following the overall market trend, and then gradually decline thereafter. As an emissions target for its upstream businesses, TotalEnergies has announced that it will achieve a 40% reduction in net emissions (Scope 1+2) from current liquid and natural gas operations by 2030 compared to 2015.

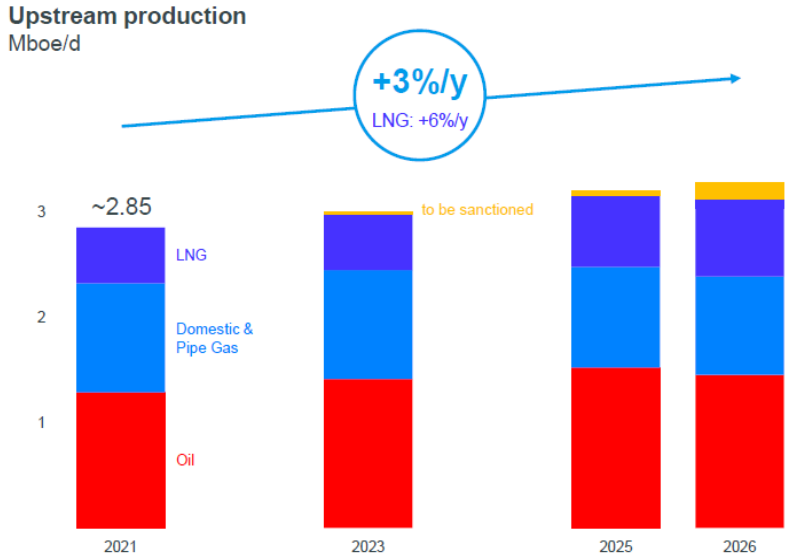
TotalEnergies will also cut unit production costs. As a near-term goal, the company will bring OPEX for its upstream business to around $5/boe in 2022. Digitizing operations will be among its measures for reducing costs.

New investment will prioritize low-cost and low-carbon projects, with "low-cost" defined as capex and opex of less than $20/boe and an after tax break-even price of less than $30/boe. It forecasts commodity prices of $50/bbl for Brent crude and $2.50/MBtu for HH, giving a return of over 15% for the company's liquids business. TotalEnergies has its own carbon cost projections and factors these in to its business economic assessments. The company's requires that GHG emission intensity for all new businesses be below the average intensity for its overall business portfolio.

For companywide investment between 2022 and 2025, roughly 50% will go toward maintaining the business base (mainly upstream and downstream liquids businesses), with the remaining 50% going to growth segments. In terms of allocation toward growth segments, the company plans to allocate about half to natural gas, and LNG in particular, while the other half will go toward new energy, primarily renewables and electricity. Some third-party LNG is expected to be included in LNG sales, presumably because it will contribute to feed gas development investment and de-risking.

Concerning divestment, the company has indicated that, as a near-term target, it will sell 12 assets equivalent to a total of about 65 kboe/d for 2020 to 2021 (Fig. 8). This selloff program is said to be in line with the company's strategy for assets that have high technical costs and emission intensity.

Fig. 7 | Liquid and natural gas production projections



(Source) TotalEnergies, *Strategy and Outlook*

Fig. 8 | 2020-2021 Divestment activities

(Source) TotalEnergies, *Strategy and Outlook*

(4) ExxonMobil

ExxonMobil has indicated that it intends to continue its upstream businesses while working to lower production costs. However, it will do this with an emphasis on improving asset quality rather than increasing production, and expects liquid and natural gas production in 2025 to be roughly on par with 2021 levels.

<1> Current production volume and reserves

In terms of natural gas and liquid production volume in 2020[19] by region, Asia[20] and North and South America are the key producers (Fig. 9). The U.S. is the largest producer by far among all the regions, both for liquids and gas.

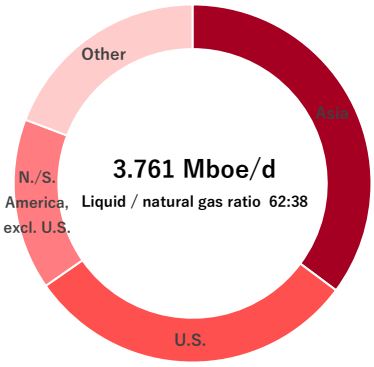
Asia and the U.S. account for roughly 80% of ExxonMobil's total proved liquid and natural gas reserves as of the end of 2020 (about 15,211 Mboe). The company's liquid to natural gas ratio is 58:42.

[19] Liquids include crude oil, NGL, bitumin, and synthetic crude oil.

[20] On page 16 of its *2020 Annual Report*, ExxonMobil lists Azerbaijan, Indonesia, Iraq, Kazakhstan, Malaysia, Qatar, Russia, Thailand, and the UAE as countries of "principal ongoing activities" in Asia.

ExxonMobil's investment in upstream segments[21] as a proportion of capex dropped from 78% to 68% from 2018 to 2020. Downstream segment investment increased from 13% to 20% during this period, while chemical segment investment grew from 9% to 13%. However, total capex shrank in 2022 due to adverse market conditions — the upstream decrease is not the result of reallocation to these segments.

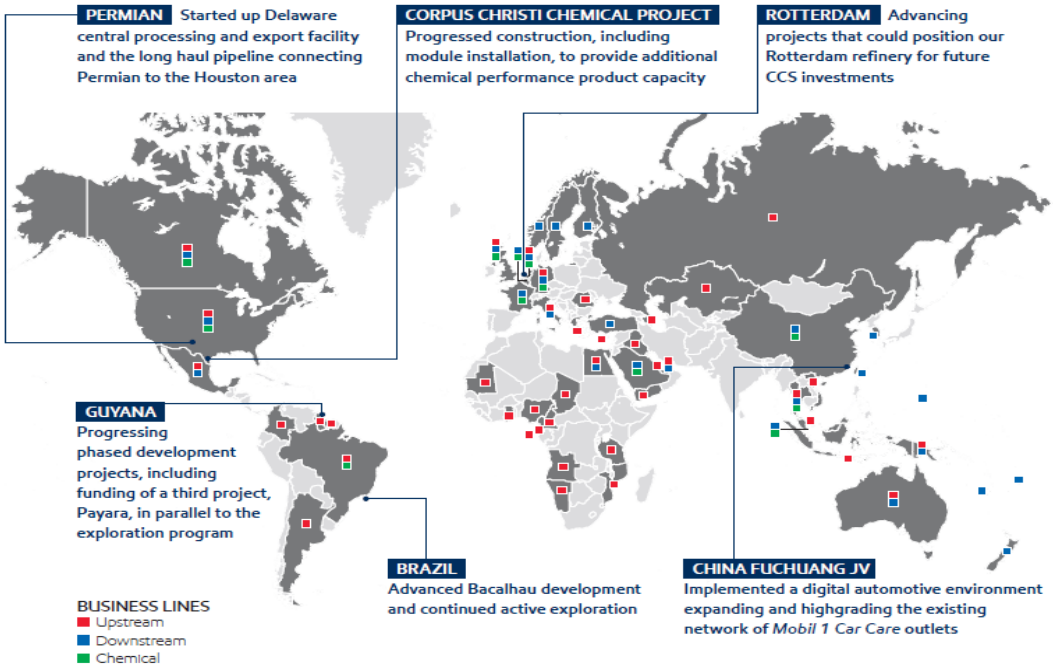
Fig. 9 | Liquid and natural gas production (ExxonMobil, 2020)



(Source) Prepared based on data from ExxonMobil, *2020 Annual Report*.

[21]Segments pertaining to exploration and production of crude oil and natural gas.

Fig. 10 | Core business regions



(Source) ExxonMobil, *2020 Annual Report*.

<2> Future strategy

ExxonMobil has indicated that it intends to continue its upstream businesses. The company's analysis points to oil and natural gas continuing to be an important energy source through 2040 based on IEA and IPCC projections, with a need for significant new investment in upstream businesses to satisfy demand. It says that natural gas will play an important role in transitioning away from coal that is being used in power production and industrial applications to low-emission fuels. It says it will also meet future demand with its extensive and diverse business asset portfolio.

However, ExxonMobil's liquid and natural gas production targets for 2025 are nearly identical to its expected production level for 2021 (about 3.7 Mboe/d). It says the reason for this lack of increase is because of a focus on strengthening its portfolio competitiveness, including by reducing costs, rather than increasing volume. The company did, however, release GHG emissions reduction targets in upstream businesses in December, 2020. Strengthening leak detection and restoration functions and improving facility design are some of the specific measures it will take to achieve these targets.

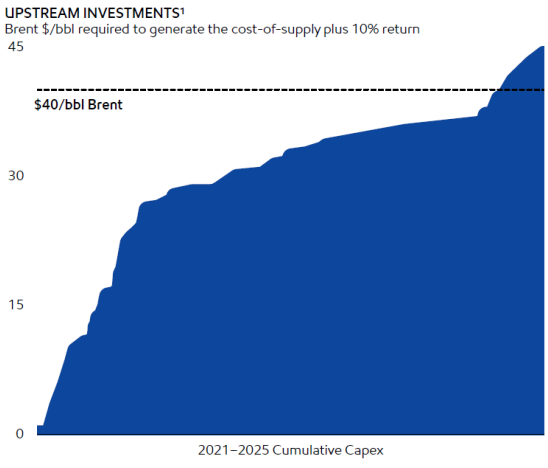
It will also reduce production costs. Digitizing operations will be one way it will

reduce costs. One example of this, according to its website[22], is the company's use of big data in the Permian Basin. Gathering production data using sensors installed in a broad range across the oil fields and using it to optimize performance and automate workflows will allow the company to reduce costs and boost production.

New investment will be concentrated on low-cost liquids and LNG. ExxonMobil is focusing on business that promises high returns and low GHG intensity, namely its liquids business in Guyana and Suriname, and its deep water drilling business in Brazil. As for new business, the company aims to keep cost of supply to below $40/bbl for Brent crude, while allocating about 90% of upstream investment toward generating returns of at least 10%, even with Brent crude at $35/bbl or below (Fig. 11). As a result, the company projects that about 40% of liquid and natural gas production in 2025 will be supplied by businesses that commenced operations in or after 2020. It also says that cash flows will increase by as much as 20%, even if production levels remain on par with 2021 (Fig. 12).

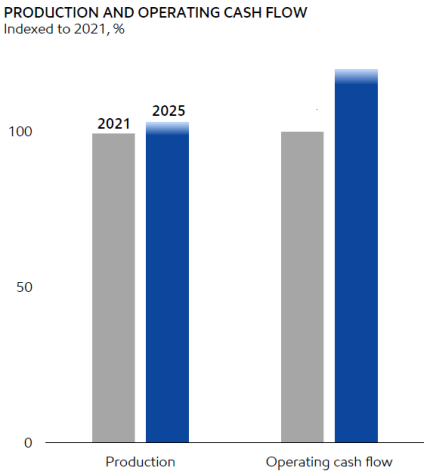
For divestments, the company will make an approximately 50% reduction in its dry gas assets in North America, which have relatively less value. Dry gas refers to natural gas that that has almost no added condensates or liquids at the time of production[23].

Fig. 11 | Total investment per Brent level that generates >10% return



(Source) ExxonMobil, *2021 Investor Day*

Fig. 12 | Ratio of 2025 production and operating cash flow to 2021 levels



(Source) ExxonMobil, *2021 Investor Day*

[22] https://corporate.exxonmobil.com/Energy-and-innovation/Digital-technologies
[23] https://glossary.oilfield.slb.com/en/Terms/d/dry_gas.aspx

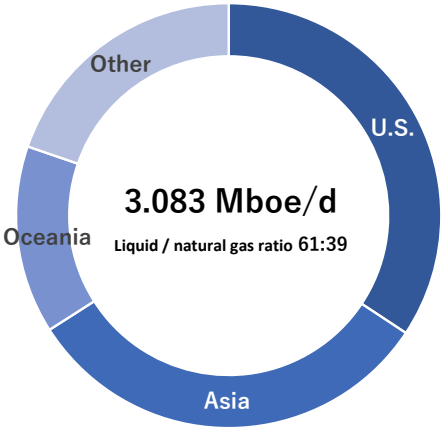
(5) Chevron

Chevron has indicated that it will continue its upstream businesses while working to reduce production costs and increase production.

<1> Current production volume and reserves

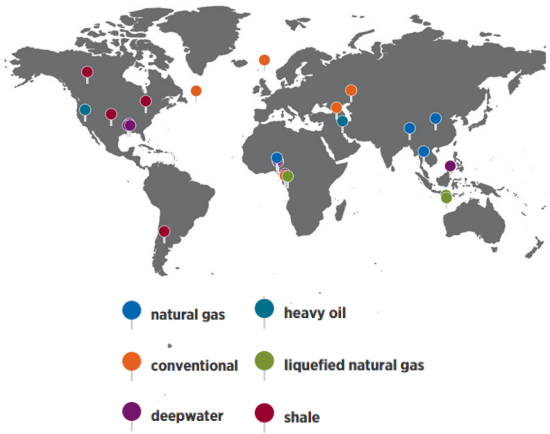
For liquid and natural gas production volume in 2020[24] by region, the U.S., Asia, and Oceania are Chevron's major regions of production (Fig. 13). By country and type of resource, countries such as the U.S. and Kazakhstan produce the most liquids while AUSTRALIA and the U.S. are among the largest natural gas producers (Fig. 14).

Fig. 13 | Liquid and natural gas production (Chevron, 2020)



(Source) Chevron, *2020 Supplement to the Annual Report*

Fig. 14 | Core business regions



(Source) Chevron's website

A breakdown of proved reserves as of the end of 2020 (about 11,134 Mboe) shows the U.S. and Asia to have the largest reserves. The company's liquid to natural gas ratio is 55:45.

Chevron's investment in upstream segments[25] as a proportion of capex dropped from

[24]Liquids include crude oil, condensate, NGL, and synthetic crude oil.

[25]Among the company's core businesses are the exploration, development, production, and transport of crude oil

88% to 81% from 2018 to 2020. This segment includes businesses that fall outside of LNG -related activities and other liquid and natural gas exploration and development business. However, downstream segment investment as a percentage of total investment increased by around 6% during this period. However, total capex declined in 2022 — the upstream decrease is not the result of reallocation to the downstream segment.

In 2020, Chevron acquired Noble Energy and strengthened its portfolio with the addition of proved reserves and undeveloped resources. With this acquisition, the company enhanced its unconventional position in the U.S. Denver-Julesburg Basin (DJ Basin) and the Permian, as well as its position in the Eastern Mediterranean Sea assets (Israel, etc.).

<2> Future strategy

Chevron will continue its upstream business with the view that its upstream portfolio will provide a foundation for future growth. In March 2021, CEO Michael Wirth stated that he expected global oil and natural gas demand over the next 10-20 years to exceed current demand. Consequently, the company is aiming to be a supplier of low carbon oil and natural gas. At an industry event that month, he also expressed the view that natural gas will play an important role in the coming low carbon economy. [26]

Chevron predicts that liquid and natural gas production will follow the current production increase trend through 2025. This author was unable to ascertain specific production targets for 2025 from published data (however, the production volume projections graph in Fig. 15 has been released that states $50/bbl or below, with conditions). A companywide production increase through 2025 will consist of increasing mainly U.S. Permian and other unconventional resource production, and will be facilitated by a ramping up of FGP-WPMP operations (a liquid development business in Kazakhstan). Chevron will concentrate two-thirds of upstream investment over the next four years into six assets (DJ Basin, Permian Basin, Gulf Coast, Eastern Mediterranean Sea, Kazakhstan, and Australian LNG). The company also released GHG reduction targets in October 2021 among which is an upstream carbon intensity[27] reduction target

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and natural gas; the liquification, transport, and vaporization of LNG; the transport of crude oil via international pipelines; the processing, transport, storage, and sale of natural gas; and the operation of a GTL plant.

[26] https://innovateenergynow.com/resources/ceraweek-recap

[27]UCI includes crude oil and natural gas production, as well as flaring and methane related emission intensity. The

for 2028 for its upstream business. As some of its measures to achieve its targets, Chevron will prioritize the development of low UCI businesses, modify how its drilling rigs are powered, and reduce routine flaring.

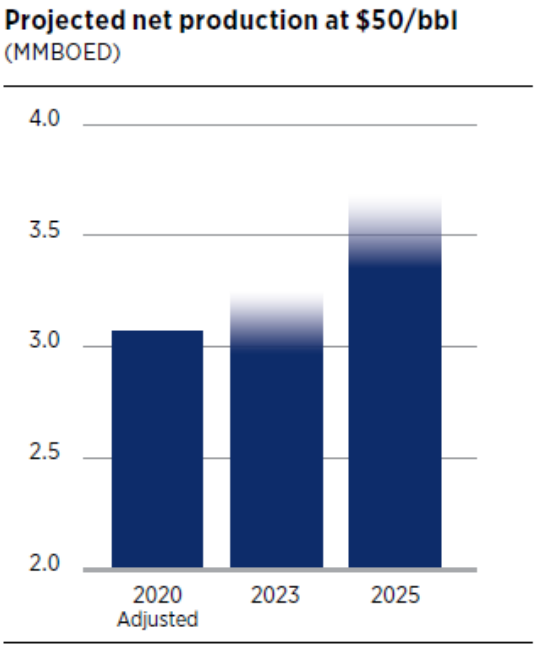
Chevron will also reduce production costs. Its specific measures include digitizing its operations management and improving on its drilling and production technologies.

For its investing standards, the company stands out for having expressed an intent to boost its short cycle business[28] investment ratio (Fig. 16). The focus on its short cycle business is aimed at achieving competitive and predictable returns in response to changing market conditions with less risk. About 60% of its upstream investment in 2021 has been allocated to its short cycle business. By raising its short cycle business investment ratio and carefully selecting major capital projects (MCP) for the long-term cycle, the company will bring its short cycle business investment ratio to around 75% by 2025. Although it has made long-term projections for crude oil, natural gas, and carbon prices, it has not disclosed these figures for competition-related reasons.

formulas for calculating each are given on page 61 of the company's Climate Change Resilience report. (https://www.chevron.com/-/media/chevron/sustainability/documents/2021-climate-change-resilience-report.pdf)

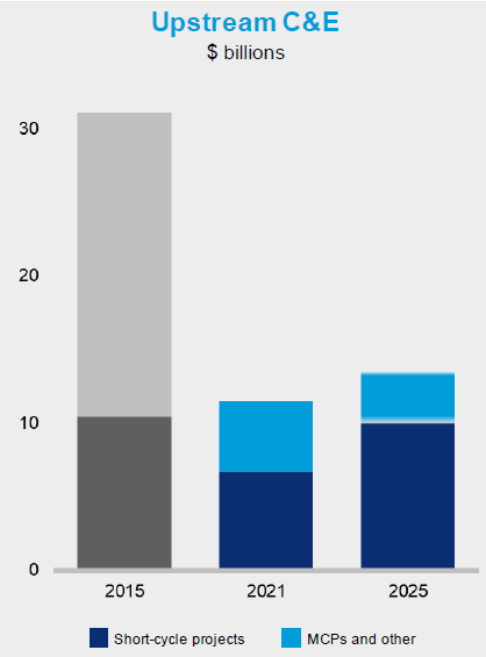
[28]This author was unable to find a definition in published materials for the company's specific investment return dates for its short cycle business.

Fig. 15 | Liquid and natural gas production projections ($50/bbl or below)



(Source) Chevron, *2020 Supplement to the Annual Report*

Fig. 16 | Upstream business segment investment



(Source) Chevron, *2021 Virtual Chevron Investor Day*
*Investment for 2016-2020 not shown in the graph trended downwards for total investment, and not just the upstream segment, due to low oil prices and measures to combat the COVID-19 crisis.

III. Comparison of the companies' strategies

This chapter will look at similarities and differences among the upstream business strategies of the five companies discussed in the previous chapter. Unfortunately, it was not possible to do an apples to apples comparison as not all companies use the same types of and definitions for the indicators in their published materials. Nevertheless, all companies stated a commitment to aggressively pursuing cost-cutting and acknowledged the importance of natural gas. However, there were differences among the companies in terms of future production volume trends.

(1) All companies will aggressively cost cut

As uncertainty grows with regard to the liquid and gas upstream business

environment, every company researched has indicated an intention to cut costs in its businesses. The general idea is to cut business costs and thereby generate relatively abundant cash inflows, even if commodity prices drop or carbon costs rise. With abundant cash flows, these companies will find it easier to prevent stranded capital and to acquire capital for reinvestment and dividends. Cutting costs in upstream businesses is not a new concept. However, amid growing uncertainty concerning the business environment due to society's interest in achieving net zero emissions, many companies see cash obtained from upstream businesses as a source of funding to bolster low carbon investment. Cutting business costs is therefore likely to emerge as a key issue.

Moreover, cost cutting will also play an important role in "limiting and shortening investment return periods," as multiple companies have laid out as one strategy for new investment. In general, achieving shorter investment return periods will require cutting costs while getting big revenues quickly. Good progress in cutting costs could therefore translate into shorter investment return periods. However, carbon costs are a cost category with an uncertain future. Carbon cost projections as obtained from published data tend to either trend upwards as time horizon lengthens, or to hold steady but be accompanied by sensitivity analyses based on higher costs as time goes on (Fig. 17). This overall expectation of future carbon cost increases could be an indirect cause of companies' focus on limiting or shortening investment return periods.

Fig. 17 | Carbon cost projections

		2021	2025	2030	2040	2050	Reference
	$/tCO2	N.A.	N.A.	5～110	N.A.	>100	Figures used within a range differ with the country
bp	$/tCO2	50	50	100	200	250	Central case figures
TotalEnergies	$/tCO2	40	40	40	40	40	Current price used when >$40/tCO2 For 2030 and beyond, $100/tCO2 sensitivity analysis, too

(Source) Prepared based on companies' published data.

* No projection data was found for ExxonMobil. Chevron does not disclose such projections.

While each company is going about it differently, all of them are cutting costs in various ways through business activities, new investment, and investment involving portfolio assets. One method that many companies cited for cutting costs in business activities involving portfolio assets is digitization. Methods outside of digitization include more simplified and efficient facility design, and the shortening of unplanned operational downtime.

The consolidation of new exploration in fewer regions by Shell and BP as part of their new investment strategy will also contribute to cost reduction. Consolidating new exploration in existing business regions could allow even new businesses to benefit from investment assets developed in the past (e.g., existing production and transport facilities and local back-office functions). Furthermore, as denoted by Shell's use of the term "de-risking," if the risk of exploration near existing business regions is smaller than that for regions that companies have little information about, it should be easier to curtail the necessary investment to achieve the same level of production.

Divestment, too, could help with cutting average costs across companies' business portfolios. Although the companies' published materials had only a limited amount of information on future divestments, there was a general tendency to consider asset profit margin as a factor in asset selection (mention was made about liquid assets by BP, for example, and North American dry gas assets by ExxonMobil). Low asset profit margin ratios seem to be affected by high unit production cost levels. Companies able to sell relatively low profit margin assets from their business portfolios stand to improve average profit margins.

(2) "Natural gas is key during the energy transition" is a refrain common to all companies

All Major Companies have indicated that they believe natural gas will play an important role in the energy transition. One factor fueling this belief is that natural gas, because of its low carbon emissions among fossil fuels, is a promising candidate for replacing coal and compensating for the intermittency of renewables as a fuel for power generation.

Although limited to companies' published data, this author was able to find future targets for natural gas as a percentage of total production for BP, TotalEnergies, and Shell's European operations. Shell and TotalEnergies have indicated that they will shift production to primarily natural gas (Fig. 18). However, as every company has different target achievement dates, it was not possible to compare how quickly the companies are each shifting to gas.

(3) A difference of liquid and natural gas production change rates (2020-2025)

among the companies

One difference in strategy among the companies lies in liquid and natural gas production change rates (2020-2025) (Fig. 19). Although Shell does not appear to have included targets in its published materials, liquid and natural gas production change rate data from the other four companies shows ExxonMobil will stay mostly flat, and TotalEnergies and Chevron will seek to boost production by more than 10% while BP will decrease production by over 15% from 2020 to 2025. However, it is unlikely that the main reason for BP's production decrease is due to its thinking that the global fossil fuels market is much smaller than the other companies think it is. In a comparison of initial fossil fuel consumption projections among BP, TotalEnergies, and the IEA (which cites ExxonMobil and Chevron's published data), BP's projection is not significantly lower.

Although it is difficult to accurately identify the differences of philosophy that inform these different production change rates, one factor could be that BP is more inclined than other companies to believe that liquid and natural gas demand, or business economy, could swing downward. As shown in Fig. 17 above, BP's carbon cost projection profile is higher than that of other companies'. This might be because BP sees a greater risk in businesses that produce carbon emissions. Also, while BP had the largest proved reserves among the five companies as of the end of 2020, BP CEO Looney says that "reallocating capital to low carbon businesses will lead to decarbonization and diversification of business, while reducing risk."

Fig. | 18 Actual and target values for natural gas as a percentage of total liquid and natural gas production

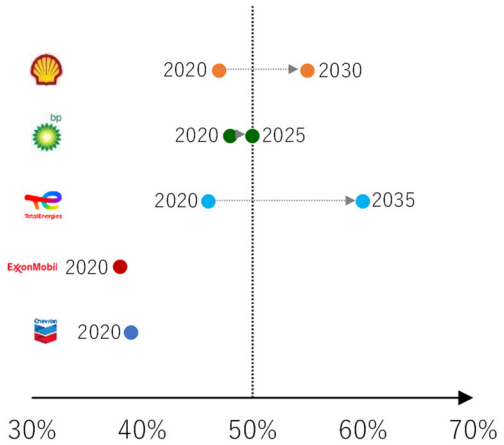
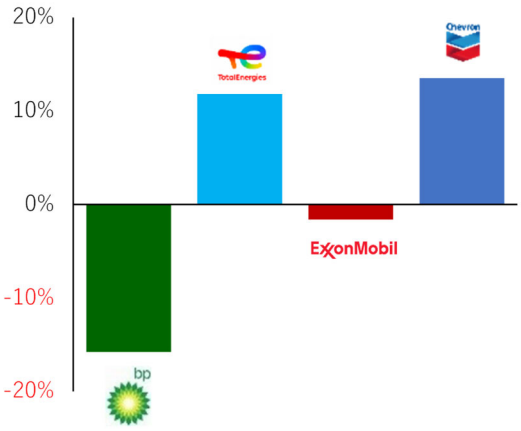


Fig. 19 | Liquid and natural gas production change rates (2020-2025)



(Source) Prepared based on companies' published data.
*Shell's figures for 2030 are the bottommost line of the target range (> 55%).
*BP's figures exclude Rosneft.
*Target percentages could not be found for ExxonMobil and Chevron.

(Source) Prepared based on companies' published data.
*For Chevron, change rates were calculated using an estimate of 3.5 Mboe/d for 2025 production volume, as shown in Fig. 15.

IV. **Conclusion**

This paper has looked at how all Major Companies' strategies recognize the importance of aggressively reducing costs and focusing on natural gas as a means to handle uncertainty surrounding the business environment as society transitions toward net zero emissions. However, the companies differed in how they view future production volume trends.

Aggressive cost cutting is likely to be a measure taken by even upstream businesses outside of the Major Companies. Reducing production costs appears to be one of the most probable measures businesses will take to boost resilience in the face of a business environment that is "worsening" due to factors such as declining demand and plummeting commodity prices. The stricter investment standards and measures to improve portfolio asset management that Major Companies are implementing are likely to be instructive for other upstream businesses.

There does not seem to be, however, any generally-accepted "right answer" on production volume changes (whether to increase, decrease, or maintain), and companies could take different paths based on their individual situations and outlooks on the future. As is clear from the company's different paths, businesses will need to make decisions based on their own business and asset structure, as well as the demand picture in key markets. Although every Major Company discussed above asserts the importance of natural gas going forward, it is not that liquid assets should be consolidated or sold off with high priority because they "have a higher carbon emission factor than natural gas"; focus deserves to be placed on the fact that companies are instead calmly considering the merits and demerits of individual business economy[29].

[29]For example, TotalEnergies, which is aiming to transition more into gas, is planning a low-cost, low-GHG emissions liquids project in Mero, Brazil and at Lake Albert in Uganda.

While it is difficult to imagine global oil or natural gas prices seeing a short-term crash, domestic and international conversations about, and the development of low carbon technologies toward, achieving net zero emissions will continue. Unforeseen external factors, such as the ruling against Shell, can also arise. What business strategies Major Companies and other upstream businesses will hammer out according to business environment changes, and how they will implement them, bears continued monitoring.

Referenced data published by Major Companies in this paper

Institution name	Document name
Shell	・ STRATEGY DAY 2021 PRESENTATION, TRANSCRIPT ・ SUSTAINABILITY REPORT 2020 ・ SHELL ENERGY TRANSITION STRATEGY ・ ANNUAL REPORT AND ACCOUNTS 2020 ・ SHELL INSIGHTS: UPSTREAM STRATEGY ・ Shell LNG Outlook 2021
bp	・ Second quarter 2020 financial results and strategy presentation ・ BP sets ambition for net zero by 2050, fundamentally changing organisation to deliver ・ From International Oil Company to Integrated Energy Company: bp sets out strategy for decade of delivery towards net zero ambition ・ Resilient and focused hydrocarbons ・ bp capital markets days ・ bp Annual Report and Form 20-F 2020 ・ BP plc 112th Annual General Meeting: Webcast Transcript ・ bp sustainability report 2020
TotalEnergies	・ Universal Registration Document 2020 including the Annual Financial Report ・ Factbook 2020 ・ Total Energies Energy Outlook 2021 ・ Strategy and Outlook, Transcript
ExxonMobil	・ 2021 INVESTOR DAY, webcast ・ Energy & Carbon Summary ・ 2020 Annual Report
Chevron	・ 2021 Virtual Chevron Investor Day ・ 2021 Virtual Chevron Investor Day Edited Transcript: Part I ・ 2021 Virtual Chevron Investor Day Edited Transcript: Part II ・ 2020 annual report ・ 2020 supplement to the annual report ・ Energy Transition Spotlight ・ Climate Change Resilience

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