Guidance for responding companies: sector module guidance

Oil & Gas Sector Module 2017

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Version Control

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0.2	January 2017	January 2017	Version 0.2 of the 2017 CDP oil and gas sector module guidance has been prepared for the disclosure period commencing in February 2017. It is a re-release of the advance version of this guidance (version 0.1, released in December 2016).

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Introduction to Oil & Gas Sector Module Guidance

General Guidance

These questions are designed to apply to organizations operating in the oil and gas (O&G) industry. They are based on a reporting framework devised by the Institutional Investors Group on Climate Change (IIGCC), Ceres, and the Investor Group on Climate Change Australia/New Zealand (IGCC). They have continually been reviewed and amended through extensive consultation with O&G industry representatives, investors and other stakeholders including NGOs. If you have feedback, please provide it here.

Please note that the oil and gas sector module is not scored as part of the general CDP 2017 climate change scoring methodology. In 2017, oil and gas companies will be scored publicly according to the general CDP climate change scoring methodology as in previous years, available here.

The O&G sector module is automatically presented to exploration, production, processing, storage, transportation, refining, distribution, marketing and integrated oil and gas companies. Companies with business activities additional to those should answer the 2017 core climate change questionnaire including emissions from other activities. The 2017 core climate change questionnaire contains a number of questions that are of particular relevance for O&G sector companies, including:

- Questions in section CC2 on climate change risk management approach, business strategy integration of climate change, internal price of carbon usage and engagement with policy makers
- Questions in section CC3 on emissions reduction targets
- Questions in section CC5 on climate change risks
- Questions CC8.2 and CC8.3a on gross global Scope 1 and 2 emissions, respectively, and CC8.4 on emissions exclusions
- Questions CC9.1a and CC9.2c on Scope 1 emissions breakdown by country/region and GHG type, respectively
- Questions in section CC12 on emissions history and performance
- Question CC14.1 on Scope 3 emissions, specifically from the ‘use of sold products’ category

The CDP climate change guidance document (available here) contains guidance on some of the above questions specifically for O&G companies, who are encouraged to respond to them fully, while making reference to the specific activities and topics that are covered in this O&G sector module where appropriate. The questions in the O&G sector module only require answers to be given for the oil and gas division(s) of the reporting entity. In answering the questions, the reporting boundary/consolidation approach used for the 2017 core climate change questionnaire should be adopted as far as possible for these supplementary questions. It is recognized that reporting organizations may in practice adopt a variety of approaches in view, for example, of joint ventures and complex operational arrangements. Confirmation of the consolidation basis is therefore requested for individual supplementary questions as it is important that cases are made clear for investors where information is reported on a different consolidation basis.

Some of the O&G sector module questions may not be relevant to every organization operating in the O&G industry. Please answer those that are and explain if a question is not relevant in the 'Further Information' field that appears at the end of every webpage within the Online Response System (ORS). Investors are particularly interested in forecast data and information, and to that end some of the questions have elements which are forward-looking. If you cannot provide this information, please explain why not in the 'Further Information' field within the ORS.

Pre-population and restatement of data

The facility to copy answers from last year's oil & gas module into this year's response is present for some questions, where stated. For details on which questions have pre-population available to them, please refer to the general guidance for each question page (section) of this module. The "Copy from last year" button must be clicked before you have completed any fields on the page in question.

If you wish to restate data previously supplied to the O&G sector module, you should do this by entering the reporting period for the restatement in question CC0.2 in the introduction of the 2017 core climate change questionnaire. When you arrive at the relevant pages in the O&G sector module (OG1, OG2, OG3, OG4, OG5 and OG6) for which you wish to restate data, please use the further information field that appears at the bottom of every page in the ORS to identify that this is a restatement and the reason for it.

References

The following sources were used in formulating the questions and guidance in this module:

- *Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry*, published by American Petroleum Institute (API), August 2009 (available by download from www.api.org).
- *Global Climate Disclosure Framework for Oil and Gas Companies*, published by Institutional Investors Group on Climate Change (IIGCC), Ceres and Investor Group on Climate Change (available by download from www.iigcc.org).
- *Greenhouse Gas Emissions Estimation and Inventories – Addressing Uncertainty and Accuracy*, published by International Petroleum Industry Environmental Conservation Association (IPIECA) and American Petroleum Institute (API), January 2007 (available by download from www.ipieca.org).
- *Carbon Capture and Storage from Fossil Fuel Use,* H Herzog and D Golomb, Encyclopedia of Energy, 2004.
- *Glossary of Terms used in Petroleum Reserves / Resources Definitions*, Society of Petroleum Engineers, 2005. Available from http://www.spe.org/).
- Intergovernmental Panel on Climate Change (IPCC). *IPCC Special Report on Carbon Dioxide Capture and Storage,* B Metz, *et al*. (eds.), Cambridge University Press, Cambridge, New York, NY, USA, 2005.
- *Part II, Carbon Capture and Geological Storage Emission Reduction Family*, published by International Petroleum Industry Environmental Conservation Association (IPIECA) and American Petroleum Institute (API), June 2007 (available by download from www.ipieca.org).
- *Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions*, published by International Petroleum Industry Environmental Conservation Association (IPIECA), International Association of Oil and Gas Producers (IOGP), and American Petroleum Institute (API), December 2003 (available by download from www.ipieca.org).
- Oil and gas industry guidance on sustainability reporting (3rd Edition), published by IPIECA, API and IOGP, 2015 (available for download from www.ipieca.org).
- *Fundamentals of Oil & Gas Accounting*, C.J. Wright and R.A. Gallun, PennWell Books; 5th revised edition, 2008.

OG0: Reference information

General Guidance

Question OG0.1 asks companies to identify the significant petroleum industry components of their business within their reporting boundary.

Pre-population

If you responded to CDP last year, question OG0.1 on this page is eligible for pre-population. To take advantage of this function, click “copy from last year” prior to entering any data on the page. Please make sure to select or deselect any options that may have changed since last year.

Specific Question Guidance

OG0.1: Please identify the significant petroleum industry components of your business within your reporting boundary (select all that apply)

Please respond to this question by ticking all segments that apply:

- Exploration, production & gas processing
- Storage, transportation & distribution
- Specialty operations
- Refining
- Retail & marketing

For definitions of the individual petroleum industry segments, which reflect those used in the *GHG Compendium* issued by the American Petroleum Institute, please see the general guidance for section OG2 below, under the heading ‘Segmentation of the petroleum industry’. If your organization uses a different segmentation, please explain this in the ‘Further Information’ field that appears at the bottom of this page within the ORS.

OG1: Production, reserves and sales by hydrocarbon type

General Guidance

Key Changes from 2016

A comment column has been added to question OG1.2 (hydrocarbon production) to allow the respondent to explain aspects of their hydrocarbon production figures or accounting, if needed.

Question OG5.1 (2016) on hydrocarbon sales has been moved to this section and renumbered as OG1.5. As a result, subsequent questions have been renumbered.

IEA 450 has been added to the list scenarios in question OG1.7 (low-carbon energy transition scenario analysis/portfolio stress-testing), and RCP 4.5 has been removed.

Pre-population and restatement of data

If you responded to CDP last year, questions OG1.1, OG1.2, OG1.3, OG1.4 and OG1.5 on this page are eligible for pre-population. To take advantage of this function, click “copy from last year” prior to entering any data on the page. There is no pre-population available on OG1.6 or OG1.7 request data for the current reporting year only. Please note that the hydrocarbon product structure you supplied last year in column 1 of OG1.2 and OG1.3 will be populated into column 1 of the corresponding table this year. In OG1.2 you will need to enter gross and net production figures for the current reporting year, and select a production consolidation boundary, in columns 2, 3 and 4, respectively. In OG1.3 the country breakdown you supplied last year will also be populated into column 2 (‘Country/region’) of the corresponding table this year, but you will need to manually enter this year’s reserves data into column 3 (‘Reserves (BOE)’), the date of assessment (column 4) and reserves definition/classification (column 5). ‘BOE’ is the symbol for ‘barrel of oil equivalent’ – see the appendix. Please note that for question OG1.5 (formerly OG5.1) the product structure you supplied last year in column 1 will be populated into column 1 of the corresponding table this year, but that you will need to enter sales figures for this reporting year in column 2.

If you wish to restate hydrocarbon production or sales data previously supplied in question OG1.2 and OG1.5, respectively, please follow the introduction guidance above on restatement of data, as well as the instructions provided in the guidance for CC0.2 in the introduction of the 2017 core climate change questionnaire.

Specific Question Guidance

OG1.1: Is your organization involved with oil & gas production or reserves?

Please respond to this question by selecting “Yes” or “No” from the drop-down menu. Companies should answer “Yes” if they have hydrocarbon production activities or reserves within their chosen consolidation boundary. Companies that answer “Yes” will be presented with questions OG1.2 through OG1.6, and should answer OG1.7 as well. Companies that answer “No” will be presented with question OG1.7 only.

OG1.2: Please provide values for annual gross and net production by hydrocarbon type (in units of BOE) for the reporting year in the following table. The values required are aggregate values for the reporting organization

Product	Gross production (BOE)	Net production (BOE)	Production consolidation boundary	Comment
Multi-select from: Conventional non-associated natural gas			Select from: Operational control	Free text field – use no more

Associated natural gas Natural gas condensate Natural gas liquids (NGL) Liquefied Natural Gas (LNG) Liquefied Petroleum Gas (LPG) Coalbed methane Shale gas Synthetic gas Tight gas Light oil Medium oil Heavy oil Extraheavy oil Bitumen (oil sands) Shale oil Synthetic oil Tight oil			Equity share Operational control and equity share	than 2,400 characters

Companies are requested to report the aggregated values of gross and net hydrocarbon production, separately, for the reporting year according to their preferred production consolidation boundary. Use the 'Comment' column to define and explain your hydrocarbon accounting and reported production figure(s), especially if your organizational boundary for emissions accounting and hydrocarbon accounting differ. The 'Product' column allows multiple hydrocarbon types to be selected for a given row of data, and respondents can use this functionality, where meaningful, to report production data for groups of hydrocarbon types rather than breaking down their production figures into individual hydrocarbon types. For example, a respondent could meaningfully multi-select 'Light oil', 'Medium oil', 'Natural gas liquids (NGL)' and 'Natural gas condensate' in one row and provide gross and net production figures for these grouped hydrocarbons. Companies are not requested to provide data disaggregated to all of the hydrocarbon types listed in the 'Product' column, nor are they requested to report both operated and equity production. However, further disaggregation is welcomed, in particular between conventional and nonconventional hydrocarbon types/sources. For example, a respondent could meaningfully provide their gross and net production figures for Bitumen (oil sands) in a separate row from liquids production. Columns 2 and 3 for gross and net production figures will accept numbers up to and including 1000000000000000; (10^{15})[1]. They will not accept decimal places. Enter the values without using any punctuation. Please indicate the relevant production consolidation boundary for the reported figures in column 4. Use the "Add Row" button to the bottom right of the table to make multiple entries.

OG1.3: Please provide values for reserves by hydrocarbon type (in units of BOE) for the reporting year. Please indicate if the figures are for reserves that are proved, probable or both proved and probable. The values required are aggregate values for the reporting organization

Product	Country/region	Reserves (BOE)	Date of assessment	Proved/ Probable/ Proved+Probable

[1] 10^{15} BOE or up to 1000000 billion BOE. CDP has not adopted the terminology of MBOE or MMBOE, as these terminologies are not used consistently around the globe (MBOE is sometimes used to denote one thousand BOE and sometimes one million BOE, while the latter is sometimes written as MMBOE). CDP preferably follows SI units, therefore any reference to MBOE should be interpreted as 10^6 BOE (M symbolizes the SI prefix 'mega', representing a factor of 1000000), i.e. one million BOE.

Multi-select from: Conventional non-associated natural gas Associated natural gas Natural gas condensate Natural gas liquids (NGL) Coalbed methane Shale gas Synthetic gas Tight gas Light oil Medium oil Heavy oil Extraheavy oil Bitumen (oil sands) Shale oil Synthetic oil Tight oil	Select from country/region drop-down		Calendar entry field. Enter dates in the following format: DD/MM/YYYY	Select from: Proved Probable Proved+Probable Other – please specify

The 'Product' column allows multiple hydrocarbon types to be selected for a given row of data, and respondents can use this functionality, where meaningful, to report reserves data for groups of hydrocarbon types rather than breaking down their reserves into individual hydrocarbon types – see guidance for question OG1.2, above. Column 3 will accept numbers up to and including 1000000000000000000; (10^{18}). It will not accept decimal places. Enter the value without using any punctuation. Use the "Add Row" button to the bottom right of the table to make multiple entries. Indicate in column 5 which reserves classification category the reported figures relate to. Where possible, please provide separate figures for proved and probable reserves. As noted below, there are different methodologies that can be used to estimate proved and probable reserves. Question OG1.4 requests that you note and explain your organization's approach.

The Oil and Gas Reserves Committee (OGRC) of the Society of Petroleum Engineers (SPE) found in their Comparison of Selected Reserves and Resource Classifications and Associated Definitions report from 2005 that "Most [reserves] classifications recognize three deterministic scenarios with decreasing technical certainty: a low estimate, best estimate and high estimate. While probabilistic assessments are not commonly applied, it is generally accepted that the equivalent estimates on a cumulative probability distribution would be greater than or equal to P90, P50 and P10 respectively. For discovered and commercial volume estimates, the discrete (incremental) volumes within these bounds are generally referred to as proved, probable and possible reserves. The Russian, UNFC and USGS recognize similar certainty classes but use alternative terminology." According to the SPE Petroleum Reserves Definitions: **Proved reserves** "… are those quantities of petroleum which, by analysis of geological and engineering data, can be estimated with reasonable certainty to be commercially recoverable, from a given date forward, from known reservoirs and under current economic conditions, operating methods, and government regulations. Proved reserves can be categorized as developed or undeveloped. If deterministic methods are used, the term 'reasonable certainty' is intended to express a high degree of confidence that the quantities will be recovered. If probabilistic methods are used, there should be at least a 90% probability that the quantities actually recovered will equal or exceed the estimate." Additionally, proved reserves are sometime referred to as 1P or P1, or as "proven". **Probable reserves** "…are those unproved reserves which analysis of geological and engineering data suggests are more likely than not to be recoverable. In this context, when probabilistic methods are used, there should be at least a 50% probability that the quantities actually recovered will equal or exceed the sum of estimated proved plus probable reserves." Probable reserves are often referred to as 2P or P2.

OG1.4: Please explain which listing requirements or other methodologies you have used to provide reserves data in OG1.3. If your organization cannot provide data due to legal restrictions on reporting reserves figures in certain countries, please explain this

The intention of this question is to highlight any limitations on the comparability of data that may be due to different methodologies being used. It is not the intention to seek any proprietary information on how to estimate reserves. Please respond to this question in the text box provided in the ORS using no more than 5,000 characters.

OG1.5: Please provide values for annual sales of hydrocarbon types (in units of BOE) for the reporting year in the following table. The values required are aggregate values for the reporting organization

Product	Sales (BOE)	Comment
Multi-select from: Conventional non-associated natural gas Associated natural gas Natural gas condensate Natural gas liquids (NGL) Liquefied Natural Gas (LNG) Liquefied Petroleum Gas (LPG) Compressed Natural Gas (CNG) Coalbed methane Shale gas Synthetic gas Tight gas Light oil Medium oil Heavy oil Extraheavy oil Bitumen (oil sands) Shale oil Synthetic oil Tight oil Refined products Diesel Gasoline/petroleum Other – please specify	The column will accept a number up to and including 1000000000000000. It will not accept decimal places. Enter the value without using any punctuation.	Free text field – use no more than 2,400 characters

Companies are requested to report hydrocarbon product sales for the current reporting year. Use the “Add Row” button to the bottom right of the table to make multiple entries. The ‘Product’ column allows multiple hydrocarbon types to be selected for a given row of data, and respondents can use this functionality, where meaningful, to provide sales data for groups of hydrocarbon types. The ‘Other, please specify’ option has been left in the ‘Product’ column to allow flexibility in the reporting of refined products. Emissions for the Scope 3 category “Use of sold products” is requested in the core questionnaire (CC14.1), and it is recommended that companies operating in the oil & gas industry refer to CDP’s guidance for estimating scope 3 category 11 (Use of sold products), available here. However, understanding the contribution that different hydrocarbon products and fuels make to this figure indicates the extent to which companies are focusing on lower-carbon fuels. Sales data is used as a proxy for the emissions from different fuels, and as such disaggregated sales data is useful. It is acknowledged that not all the hydrocarbons sold will be used as fuels; some may be used as inputs into manufacturing processes.

Companies are asked to provide any information that they have on non-fuel end-uses of the reported hydrocarbons by selecting 'Other' in the table and specifying the product in the text box that appears. Additional detail can be provided in the 'Further Information' field that appears at the bottom of this page within the ORS.

OG1.6: Please provide the average breakeven cost of current production used in estimation of proven reserves

Hydrocarbon/project	Breakeven cost/BOE	Comment
Free text field – use no more than 2,400 characters		Free text field – use no more than 2,400 characters

Breakeven is the point where sales (revenue) have covered total costs (fixed and variable), and profit is zero. At this point, no profit or loss has occurred, but opportunity costs have been covered and capital has received its risk-adjusted return. Breakeven costs, in this sense, depend of four fundamental aspects:

- Fixed costs – company structure costs (overheads) + capital costs;
- Variable costs – costs that vary with amount of production;
- Sale price – expected price at which the product can be sold; and
- Output - how much of the product can be produced considering the investment that needs to be made. For a project to be viable the output needs to be bigger than a certain minimum level.

  [Breakeven → Output * (sale price - variable costs) - Fixed costs = 0]

The intention of this question is to provide investors with the average breakeven cost(s) of your current production. Particularly because production costs have generally been rising in the sector, investors are interested in understanding the sensitivity of the profit margin of current production to changes in fossil fuel demand and prices, which could result from changes in fuel efficiency, fuel switching, efforts to reduce air pollution, policies to address climate change, and other factors. The volume of reserves is a ceiling for the maximum quantity of output and their estimation takes into account the economic viability of their production, i.e. the cost of producing and the output sale price. Thus prices, volume of reserves, breakeven costs, investments and profitability are interrelated and are important variables for investment analysis. Owing to the different existing oil and gas accounting practices and the way they treat incurred costs (see Box 1, below) it is important to use the 'Comment' column to explain which costs you have considered in calculating the figure(s). Describe in your answer which incurred costs are factored into your breakeven figure(s), and which accounting approach has been used e.g. 'Full Costs' or 'Successful Efforts'[2]. In projects producing multiple hydrocarbon types, assumptions may need to be made on the allocation of costs to one product or another. If you want to report breakeven costs by hydrocarbon type, please report these assumptions or any other information that can help contextualize the figure, in the 'Comment' column. There are multiple ways to report breakeven figures in OG1.5. Use column 1 (Hydrocarbon/project) to explain if the figure pertains to a specific hydrocarbon type or a project/development, or, for example, if it represents an average figure for all the different current developments in a particular region. It is also possible to report a range of breakeven costs by hydrocarbon type by using two rows and defining one as minimum and the other as maximum for that particular hydrocarbon type/project. This could be used to express a particular cost profile that your organization targets in its projects. Projects/development areas that can meaningfully represent the typical current breakeven average costs of production for the company can also be reported. The number entered in column 2 should relate to the currency selected in question CC0.4 in the core climate change questionnaire. Values can be entered up to 999999 with 2 decimal places. Please use a full stop "." and not a comma "," to indicate the decimal point. Please use the 'Comment' column to provide a description of the figure(s) provided, as well as any information relevant to understand/contextualize the figure(s). Use the "Add Row" button to the bottom right of the table to make multiple entries.

[2] In the United States, under Generally Accepted Accounting Principles (US GAAP), companies can follow either the successful efforts or full cost methods for accounting exploration and production activities. These two methods differ primarily in whether a cost is expensed or capitalized when incurred. The full details of the differences and similarities between the two methods are described in *US GAAP vs. IFRS The basics: Oil and Gas* - Ernst & Young (2009).

Box 1: Costs of exploration and production

Cost is a measure of the minimum amount that the producing organization must sell their product for the production to make a profit. According to the Fundamentals of Oil & Gas Accounting (5th Ed.) there are four basic costs that are incurred by companies during the course of oil and gas exploration and production:

- **Acquisition costs** are incurred during the acquisition of rights to explore, develop and produce oil and gas on a property;
- **Exploration costs** are incurred during the exploration and examination of a property and would generally include the costs of geological and geophysical work (G&G), licensing rounds and the costs of drilling exploration wells;
- **Development costs** are incurred during the preparation of proved reserves for production, i.e. improving or constructing infrastructure to the site, obtaining access to the proved reserves, and creating the infrastructure to extract, gather and store the resource from the reserve; and
- **Production costs**, also known as 'lifting costs', are incurred during the process of bringing the resource to the surface, including both operation and maintenance of wells, related equipment and facilities, as well as gathering, treating and storing the extracted resources.

Additionally, to these costs, there are other costs that can be considered, namely:

- **General and administrative expenses**, or structure costs, i.e. the costs of maintaining the administrative machine of the company which supports the rest of its activities;
- **Transportation costs** are the costs of transporting the product to market; and
- **Capital costs** are the cost of capital, including both debt and equity.

The breakeven costs can include any combination of the costs mentioned above, but considering the definition of "breakeven" CDP recommends that total cost is used or that the costs reported include at least: acquisition, exploration, development and production costs. However, if your company is already reporting only some components of cost, e.g. production (or lifting) costs, and does not want to calculate other categories, then please report these costs only, using the comment column to refer investors to the fact that the cost reported only includes the cost of production. Please add context to the figure(s) you provide and, if possible, comment on expected changes to the breakeven cost of future production based on your organization's development plans and reserves development.

OG1.7: In your economic assessment of hydrocarbon reserves, resources or assets, do you conduct scenario analysis and/or portfolio stress testing consistent with a low-carbon energy transition?

Please answer this question by selecting one or more of the following options:

- Yes, compatible with RCP 2.6
- Yes, compatible with IEA 450
- Yes, compatible with IEA 2DS
- Yes, compatible with IEA Bridge Scenario
- Yes, other
- No

If you select one or more "Yes" options, you will be directed to OG1.7a; if you select "No" you will be directed to OG1.7b. Please do not select "No" if you have selected any of the five preceding "Yes" options.

The driver for this question is for investors to understand whether oil and gas companies are considering and factoring in the risk of future scenarios where hydrocarbon demand and prices are lower than companies currently forecast, due to efforts to mitigate climate change, and if so, to enable them to make their views on this issue clear to investors. Investors are increasingly interested to understand companies' positions on this topic; please see The Investor Expectations: Oil and Gas Company Strategy, updated in November 2016 by the investor networks IIGCC, INCR, IGCC and AIGCC, which outlines the changing policy, technology and demand dynamics that are creating material risks in the oil and gas sector.

In 2010, at the 16th session of the Conference of the Parties (COP 16) to the United Nations Framework Convention on Climate Change (UNFCCC), the long-term goal to limit global warming to below 2°C (relative

to pre-industrial levels) was formally set by international governments. This goal was further strengthened in 2015 by the central aim of the COP 21 'Paris Agreement' to keep a global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. References on the issue of carbon budgets and the implications to the human use of fossil fuel reserves include:

- Meinshausen M, *et al*. (2009) Greenhouse-gas emission targets for limiting global warming to 2 °C *Nature* 458: doi:10.1038/nature08017
- Carbon Tracker Initiative (2011): Unburnable Carbon – Are the world's financial markets carrying a carbon bubble?
- Carbon Tracker Initiative and the Grantham Research Institute (2013): Unburnable carbon 2013: Wasted capital and stranded assets
- International Energy Agency (2012): World energy outlook 2012
- International Energy Agency (2013): Redrawing the energy-climate map
- International Energy Agency (2015): Energy Technology Perspectives
- International Energy Agency (2015): World Energy Outlook Special Report on Energy and Climate Change
- McGlade C and Ekins P (2015) The geographical distribution of fossil fuels unused when limiting global warming to 2 °C *Nature* 517, doi:10.1038/nature14016
- Oil Change International (2016): The Sky's Limit: Why the Paris Climate Goals Require a Managed Decline of Fossil Fuel Production

RCP2.6 is a GHG concentration trajectory, termed 'Representative Concentration Pathway' (RCPs) and adopted by the IPCC for its fifth Assessment Report (AR5) in 2014. RCP2.6 is highlighted in relation to question OG1.7 because it is representative of global warming increase projections consistent with efforts to limit global warming to 2°C (relative to pre-industrial levels). From the IPCC Summary for Policymakers (2013): "Global surface temperature change for the end of the 21st century is likely to exceed 1.5°C relative to 1850 to 1900 for all RCP scenarios except RCP2.6. It is likely to exceed 2°C for RCP6.0 and RCP8.5, and more likely than not to exceed 2°C for RCP4.5. Warming will continue beyond 2100 under all RCP scenarios except RCP2.6. Warming will continue to exhibit interannual-to-decadal variability and will not be regionally uniform." For an overview of the RCPs please see van Vuuren et.al. (2011) The representative concentration pathways: an overview.

The International Energy Agency's 450 Scenario "*sets out an energy pathway consistent with the goal of limiting the global increase in temperature to 2°C by limiting concentration of greenhouse gases in the atmosphere to around 450 parts per million of CO2*". (www.iea.org, scenarios and projections, 2016).

The International Energy Agency's 2°C Scenario (IEA 2DS) *"lays out an energy system deployment pathway and an emissions trajectory consistent with at least a 50% chance of limiting the average global temperature increase to 2°C. The 2DS limits the total remaining cumulative energy-related CO2 emissions between 2015 and 2100 to 1 000 GtCO2. The 2DS reduces CO2 emissions (including emissions from fuel combustion and process and feedstock emissions in industry) by almost 60% by 2050 (compared with 2013), with carbon emissions being projected to decline after 2050 until carbon neutrality is reached."* (www.iea.org, scenarios and projections, 2016).

The International Energy Agency's Bridge Scenario represents a peak in global energy-related emissions by 2020, "*achieved by relying solely on proven technologies and policies, without changing the economic and development prospects of any region*" and is dependent on five measures related to energy efficiency, coal-fired power plants, renewable energy technology, fossil fuel subsidies, and methane emissions (IEA World Energy Outlook Special Report on Energy and Climate Change, 2015).

OG1.7a: Please describe your scenario analysis and/or portfolio stress testing, the inputs used and the implications for your capital expenditure plans and investment decisions

This question only appears if you selected a "Yes" option in response to question OG1.7. Focus in particular on why current investments in new reserves and/or assets are not particularly exposed to the risk of lower demand and stranded assets, how current capital expenditure is affected by any considerations you make

with regards to future short-to-long term risk of stranded assets, and what probability/likelihood you assign to that risk. Please make reference to your organization's energy outlook, how it is reflected in your business strategy, and the flexibility of that strategy to adjust to significant changes in the demand for your products. Please respond to this question in the text box provided in the ORS using no more than 5,000 characters.

OG1.7b: Please explain why you have not conducted any scenario analysis and/or portfolio stress testing consistent with a low-carbon energy transition

This question only appears if you selected "No" in response to question OG1.7. What is your organization's outlook on energy and is it reflected in your business strategy? Please describe any scenario analysis that you carry out and how this supports your capital expenditure plans. How can your business strategy be adjusted for significant changes in the demand of your products? Please respond to this question in the text box provided in the ORS using no more than 5,000 characters.

OG2: Emissions by segment in the O&G value chain

General Guidance

Pre-population and restatement of data

If you responded to CDP last year, all questions on this page are eligible for pre-population. To take advantage of this function, click “copy from last year” prior to entering any data on the page. Please note that for OG2.3 and OG2.4 the value chain segment structure you supplied last year will be populated into column 1, but that you will need to manually enter the emissions data requested for the current reporting year.

If you wish to restate data previously supplied to OG2.3 or OG2.4, please follow the introduction guidance above on restatement of data, as well as the instructions provided in the guidance for CC0.2 in the introduction of the 2017 core climate change questionnaire.

Definitions

The definitions below have been provided to assist you in completing the questions in this section, as well as the questions in Section OG3. They are sourced from Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions, published by International Petroleum Industry Environmental Conservation Association (IPIECA), International Association of Oil and Gas Producers (OGP), and American Petroleum Institute (API), December 2003 (available by download from www.ipieca.org).

Scope 1 GHG emissions

Scope 1 GHG emissions are greenhouse gas emissions released into the atmosphere from GHG sources owned or controlled by the reporting company and which fall within the company’s reporting boundary. GHG emissions sources may include both stationary and mobile combustion sources, vented sources and fugitive emissions sources.

Combustion refers to combustion within the company’s boundary giving rise to emissions of CO_2, N_2O, and CH_4. Sources may include boilers, heaters, furnaces, incinerators, internal combustion engines, and turbines.

Flaring includes emissions of CO_2, CH_4, and N_2O from elevated flares, ground flares, emergency flares, well-testing and well work-over.

Process emissions include CH_4 and CO_2 emissions from processes involving chemical or physical transformations other than fuel combustion. Sources include glycol dehydrators, acid gas treatment, hydrogen plants, catalyst regeneration, fluid cokers and flexi-cokers.

Vented emissions or intentional processing venting, arise from process, maintenance, turnarounds, and non-routine and other activities, and include emissions of CH_4 and CO_2 occurring from such sources as inoperative flares, flashing of gas in crude oil or condensate storage tanks, pneumatic devices driven by natural gas, starters, pressure relief valves, blowdowns (vessels, pipelines, and compressors), compressor seals, pumps, loading operations, shipping operations, venting and purging, exploration and well testing, venting of casinghead gas from oil wells, maintenance and turnaround, and non-routine releases.

Fugitive emissions of CH_4 and CO_2-containing streams result from unintentional leaks (or system malfunctions) from such sources as valves, fittings, flanges, compressor seals, other compressor related leaks, heaters, dehydrators, and pipelines. Fugitive emissions can be individually found and fixed in order to make the emissions near zero. On-site waste treatment emissions of CH_4 occur from anaerobic wastewater treatment. Emissions from non-point sources, such as wastewater treatment and surface impoundments, should be accounted for under fugitive emissions. Fugitive and process vent emissions of

SF_6 may occur in the oil and natural gas industry, albeit on a small scale. Scope 1 GHG emissions excludes emissions of CO_2 arising from the combustion and fermentation of biomass and biofuels; these emissions are reported as a separate category.

Scope 2 GHG emissions

Scope 2 GHG emissions are greenhouse gas emissions released into the atmosphere and which are associated with the consumption of purchased or acquired electricity, heat, steam and/or cooling. These are indirect emissions that are a consequence of activities occurring inside the boundary of the reporting organization but which occur at sources outside the boundary, i.e. at sources that are neither owned nor controlled by the reporting organization.

Segmentation of the petroleum industry

The segments of the petroleum industry in the table reflect those used in the *GHG Compendium* issued by the American Petroleum Institute. The segments are:

- Exploration, production & gas processing (EPGP)
- Storage, transportation & distribution (STD)
- Specialty operations (SO)
- Refining (REF)
- Retail & marketing (RM)

The O&G industry involves a further sector (Service and Supply) consisting of companies providing equipment, services, supplies, and design and engineering support for exploration, drilling, refining and other operations. For the purposes of this questionnaire, the service and supply sector is not incorporated in the definition of the petroleum industry.

The **EPGP** segment includes the exploration for and extraction of petroleum and natural gas from underground reservoirs, located either onshore or offshore. Because oil and gas can be produced from the same well, the petroleum production segment may include gas handling equipment and processing operations, including oil/gas separation, gas treatment, oil/water separation and collection and storage. The segment also includes nonconventional extraction of heavy oil in the form of bitumen from sand deposits (also known as tar sands) and the subsequent conversion of the bitumen to synthetic crude oil as well as associated systems, such as tailings ponds. The segment also includes mining and coal bed methane production. Offshore operations may include combustion emissions from equipment and personnel transport to and from the platforms as well as floating production storage and offloading.

The **STD** segment includes natural gas storage, both above ground and underground, and liquefied natural gas (LNG) operations, liquid transportation and distribution, and natural gas transmission and distribution. Transportation and distribution consists of the movement of crude and associated gas from the EPGP segment to refineries as well as the movement of natural gas or petroleum products to market or distribution centers. As well as marine, road and rail operations, the segment includes pipelines that move crude oil from wells on land and platforms in the oceans to refineries, and then to terminals where fuels are transported to retail outlets. Storage facilities include above and below ground (e.g. spent gas production fields, aquifers, salt caverns) facilities. LNG operations include natural gas liquefaction, maritime operations, marine terminals, storage facilities, LNG re-gasification and LNG vehicle fueling operations. The segment includes maritime firefighting and oil spill response.

The **SO** segment includes carbon capture and sequestration (CCS), minerals and mining operations, petrochemical manufacturing, and energy generation (including electricity, heat/steam, and cooling). CCS is the chain of processes used to collect or capture, purify and compress a CO_2 stream to a critical phase fluid, transport the CO_2 to a storage location, and injection of the CO_2 into a geological formation for long-term isolation from the atmosphere. Ocean sequestration (e.g. via mid-depth and deep-lake injection and phytoplankton stimulation) although excluded in the API segmentation is included for purposes of full disclosure to investors. Enhanced hydrocarbon recovery operations are included in the segment. Minerals and mining operations includes the operation of mines and quarries primarily engaged in mining, mine site

development, and preparing metallic and nonmetallic minerals, including coal. The term 'mining' is used broadly to include extraction, quarrying, and beneficiating (e.g. crushing, grinding, screening, washing, and separating) customarily done at the mine site. Operations to produce or manufacture chemicals (e.g. carbon black, ethylene, ethylene dichloride, styrene, and methanol) derived from petroleum-based products are included in this segment. A petroleum company may own and operate energy generation facilities to provide electricity and often process heat, steam or cooling for other operations; these facilities are included in the SO segment.

The **REF** segment consists of all refinery sites that take in crude and produce finished products, such as gasoline/petrol. The refining process includes distillation steps to separate petroleum hydrocarbons and also refining processes such as cracking, coking, reforming, alkylation and isomerization. The segment also includes manufacturing (including blending) at refinery sites of lubricating oils, specialty oils and asphalt as well as hydrogen plant. Operations to produce or manufacture chemicals derived from petroleum-based products (petrochemical manufacturing) are included in the SO segment.

The **RM** segment includes company-owned retail operations and support to fueling operations.

Specific Question Guidance

OG2.1: Please indicate the consolidation basis (financial control, operational control, equity share) used to report the Scope 1 and Scope 2 emissions by segment in the O&G value chain. Further information can be provided in the text box in OG2.2

Segment	Consolidation basis for reporting Scope 1 emissions	Consolidation basis for reporting Scope 2 emissions
Select from: Exploration, production & gas processing Storage, transportation & distribution Specialty operations Refining Retail & marketing	Select from: Financial control Operational control Equity share	Select from: Financial control Operational control Equity share

Use the "Add Row" button to the bottom right of the table to make multiple entries.

OG2.2: Please provide clarification for cases in which different consolidation bases have been used and the level/focus of disclosure. For example, a reporting organization whose business is solely in storage, transportation and distribution (STD) may use the text box to explain why only the STD row has been completed

Respond to this question in the text box provided in the ORS using no more than 5,000 characters. If you do not have cases in which different consolation bases have been used, you should leave the question blank.

OG2.3: Please provide masses of gross Scope 1 carbon dioxide and methane emissions in units of metric tonnes CO_2 and CH_4, respectively, for the organization's owned/controlled operations broken down by value chain segment

Segment	Gross Scope 1 carbon dioxide emissions (metric tonnes CO_2)	Gross Scope 1 methane emissions (metric tonnes CH_4)
Select from: Exploration, production & gas processing		

Storage, transportation & distribution Specialty operations Refining Retail & marketing		

Companies are requested to report gross Scope 1 CO_2 and CH_4 emissions for the reporting year broken down by value chain segment. Columns 2 and 3 will accept numbers up to and including 1000000000000000. They will not accept decimal places. Enter the value without using any punctuation. Use the “Add Row” button to the bottom right of the table to make multiple entries.

OG2.4: Please provide masses of gross Scope 2 GHG emissions in units of metric tonnes CO_2e for the organization’s owned/controlled operations broken down by value chain segment

Segment	Gross Scope 2 emissions (metric tonnes CO_2e)	Comment
Select from: Exploration, production & gas processing Storage, transportation & distribution Specialty operations Refining Retail & marketing		

Companies are requested to report gross Scope 2 CO_2e emissions for the reporting year broken down by value chain segment. Column 2 will accept numbers up to and including 1000000000000000. It will not accept decimal places. Enter the value without using any punctuation. Please use the comment column to state whether your reported Scope 2 figures are location-based or market-based (please refer to the 2017 climate change guidance document for more information on location-based and market-based Scope 2 reporting). Use no more than 2,400 characters. Use the “Add Row” button to the bottom right of the table to make multiple entries.

OG3: Scope 1 emissions by emissions category

General Guidance

Questions OG3.2 and OG3.3 request data broken down by the following emissions categories: combustion, flaring, process emissions, vented emissions, fugitive emissions. These categories are defined in Section OG2 above, under the heading 'Scope 1 GHG emissions'.

Pre-population and restatement of data

If you responded to CDP last year, questions OG3.1, OG3.2 and OG3.4 on this page are eligible for pre-population. To take advantage of this function, click "copy from last year" prior to entering any data on the page. Please note that the "Copy from last year" function is not available on question OG3.3 as it is a fixed table relating to the current reporting year only.

If you wish to restate data previously supplied to OG3.3, please follow the introduction guidance above on restatement of data, as well as the instructions provided in the guidance for CC0.2 in the introduction of the 2017 core climate change questionnaire.

Specific Question Guidance

OG3.1: Please confirm the consolidation basis (financial control, operational control, equity share) used to report Scope 1 emissions by emissions category

Segment	Consolidation basis for reporting Scope 1 emissions by emissions category
Select from: Exploration, production & gas processing Storage, transportation & distribution Specialty operations Refining Retail & marketing	Select from: Financial control Operational control Equity share

Use the "Add Row" button to the bottom right of the table to make multiple entries.

OG3.2: Please provide clarification for cases in which different consolidation bases have been used to report by emissions categories (combustion, flaring, process emissions, vented emissions, fugitive emissions) in the various segments

Respond to this question in the text box provided in the ORS using no more than 5,000 characters. If you do not have cases in which different consolation bases have been used, you should leave the question blank.

OG3.3: Please provide masses of gross Scope 1 carbon dioxide and methane emissions released into the atmosphere in units of metric tonnes CO_2 and CH_4, respectively, for the whole organization broken down by emissions category

Emissions category	Gross Scope 1 carbon dioxide emissions (metric tonnes CO_2)	Gross Scope 1 methane emissions (metric tonnes CH_4)
Combustion		
Flaring		

Process emissions		
Vented emissions		
Fugitive emissions		

Companies are requested to report gross Scope 1 CO_2 and CH_4 emissions for the reporting year broken down by emissions category. Emissions categories are defined in Section OG2 above, under the heading 'Scope 1 GHG emissions'. Note that according to Petroleum Industry Guidelines for Reporting Greenhouse Gas Emissions, methane emissions can occur from all five emissions categories, though methane is likely to make a more significant contribution in the vented and fugitive emissions categories. Columns 2 and 3 will accept numbers up to and including 1000000000000000. They will not accept decimal places. Enter the value without using any punctuation.

OG3.4: Please describe your organization's efforts to reduce flaring, including any flaring reduction targets set and/or its involvement in voluntary flaring reduction programs, if flaring is relevant to your operations

Please describe your organization's efforts, if relevant, including examples of flaring reduction projects and details of any flaring reduction targets set, as well as any involvement in voluntary programs, for example the World Bank's Global Gas Flaring Reduction Partnership (GGFR) and "Zero Routine Flaring by 2030" initiative. Please respond to this question in the text box provided in the ORS using no more than 5,000 characters.

OG4: Transfers & sequestration of CO_2 emissions

General Guidance

Examples of transfers of CO_2 into an organization are:

- Transfer of CO_2 from a flue gas stream (e.g. power plant exhaust gas);
- Transfer of CO_2 from an industrial process (e.g. ammonia manufacturing, fermentation, hydrogen production); and
- CO_2 is purchased from a naturally-occurring underground source.

Examples of transfers of CO_2 out of the organization are:

- CO_2 is sold to the market for carbonated beverages, dry ice, fire extinguisher agents, refrigerant, laboratory gas, grain infestation treatment, solvents, feedstock to other chemical or industrial processes;
- CO_2 is transferred to another company for enhanced gas recovery (EGR) operations; and
- CO_2 is transferred to another company for enhanced coal bed methane (ECBM) operations.

Pre-population and restatement of data

If you responded to CDP last year, all questions on this page apart from OG4.4 are eligible for pre-population. To take advantage of this function, click “copy from last year” prior to entering any data on the page. Please note that the “Copy from last year” function is not available on question OG4.4 as it relates to the current reporting year only.

Please note that for question OG4.7 the options you selected last year in column 1 (Capture pathway in CCS) will be populated into column 1, but that you will need to manually enter the captured mass and percentage transfer data for this year into columns 2, 3 and 4. For question OG4.8 the injection and storage pathway structure you supplied last year will be populated into column 1, but you will need to manually enter the injected masses and related data for this year into columns 2, 3, 4 and 5.

If you wish to restate data previously supplied in OG4, please follow the introduction guidance above on restatement of data, as well as the instructions provided in the guidance for CC0.2 in the introduction of the 2017 core climate change questionnaire.

Specific Question Guidance

OG4.1: Is your organization involved in the transfer or sequestration of CO_2?

Please respond to this question by selecting “Yes” or “No” from the drop-down menu. Companies that answer “Yes” will be presented with the additional questions for this section. Companies that answer “No” will not be presented with the questions in OG4 and should move straight to OG5.

OG4.2: Please indicate the consolidation basis (financial control, operational control, equity share) used to report transfers and sequestration of CO_2 emissions

Activity	Consolidation basis
Transfers	Select from: Financial control Operational control Equity share

Sequestration of CO_2 emissions	Select from: Financial control Operational control Equity share

OG4.3: Please provide clarification for cases in which different consolidation bases have been used (e.g. for a given activity, capture, injection or storage pathway)

Respond to this question in the text box provided in the ORS using no more than 5,000 characters. If you do not have cases in which different consolation bases have been used, you should leave the question blank.

OG4.4: Using the units of metric tonnes of CO_2, please provide gross masses of CO_2 transferred in and out of the reporting organization (as defined by the consolidation basis). Please note that questions of ownership of the CO_2 are addressed in OG4.6

Transfer direction	CO_2 transferred – Reporting year
CO_2 transferred in	
CO_2 transferred out	

Column 2 will accept numbers up to and including 1000000000000000. It will not accept decimal places. Enter the value without using any punctuation. If you do not have any transfers, please enter zeros.

OG4.5: Please provide clarification on whether any oil reservoirs and/or sequestration system (geological or oceanic) have been included within the organizational boundary of the reporting organization. Provide details, including degrees to which reservoirs are shared with other entities

'Other entities' refers to third parties with whom the reporting organization may share a reservoir or sequestration system. Please respond to this question in the text box provided in the ORS using no more than 5,000 characters.

OG4.6: Please explain who (e.g. the reporting organization) owns the transferred emissions and what potential liabilities are attached. In the case of sequestered emissions, please clarify whether the reporting organization or one or more third parties owns the sequestered emissions and who has potential liability for them

Please describe the ownership status of emissions that are transferring into or out of the reporting organization's organizational boundary, as well as any attached liability for those emissions. Please respond to this question in the text box provided in the ORS using no more than 5,000 characters.

OG4.7: Please provide masses in metric tonnes of gross CO_2 captured for purposes of carbon capture and sequestration (CCS) during the reporting year according to capture pathway. For each pathway, please provide a breakdown of the percentage of the gross captured CO_2 that was transferred into the reporting organization and the percentage that was transferred out of the organization (to be stored)

Capture pathway in CCS	Captured CO_2 (metric tonnes CO_2)	Percentage transferred in	Percentage transferred out
Select from: Gas stream separation from natural gas purification Separation of CO_2 from industrial process gas streams	Enter values (without punctuation) up to 1000000000000000. This column will not accept decimal places.	Percentage-only field. Enter a value not greater than 100 and with no more than two decimal	Percentage-only field. Enter a value not greater than 100 and with no more than two decimal places.

Flue gas CO_2 separation Oxy-firing combustion Gasification (partial oxidation) or steam reforming to produce hydrogen Other – please specify		places. There is no need to enter the % symbol.	There is no need to enter the % symbol.

In column two, companies should enter the mass of carbon dioxide within its reporting boundary that has been originated via the method given in column one. In column three, companies should indicate what percentage of this mass was transferred into their reporting boundary and in column four what percentage was transferred out. This is illustrated by the following hypothetical examples in Box 2, below. Biologically sequestered carbon should be reported in question CC8.9 of the core climate change questionnaire. Use the "Add Row" button to the bottom right of the table to make multiple entries.

Box 2: Example answers to question OG4.7

Example 1: Company A has 30,000 tonnes of carbon dioxide arising from gas stream separation from natural gas purification, which solely originated within its reporting boundary i.e. no transfers in. It has not transferred any out. So, Company A completes the table like this:

Capture pathway in CCS	Captured CO_2 (metric tonnes CO_2)	Percentage transferred in	Percentage transferred out
Gas stream separation from natural gas purification	30000	0	0

Example 2: In this example, Company B is transferring 20% of the 30,000 tonnes of carbon dioxide from gas stream separation out to another unrelated company, outside of its reporting boundary.

Company B also has 35,000 tonnes of carbon dioxide that originated from the separation of carbon dioxide from industrial process gas streams. This carbon dioxide originated outside its reporting boundary but will be stored within the reporting boundary. None has been transferred out. Therefore, Company B fills in the table in the following way:

Capture pathway in CCS	Captured CO_2 (metric tonnes CO_2)	Percentage transferred in	Percentage transferred out
Gas stream separation from natural gas purification	30000	0	20
Separation of CO_2 from industrial process gas streams	35000	100	0

Example 3: In this case, Company C has 60,000 tonnes of carbon dioxide from gas stream separation. Half of this – 30,000 tonnes – originated within its reporting boundary. The rest originated from another unrelated company, outside of its reporting boundary. This example is more complex because 20% of the 60,000 tonnes within Company C's reporting boundary is going to be transferred out to another unrelated company outside of the reporting boundary.

Capture pathway in CCS	Captured CO_2 (metric tonnes CO_2)	Percentage transferred in	Percentage transferred out
Gas stream separation from natural gas purification	60000	50	20

OG4.8: Please provide masses in metric tonnes of gross CO_2 injected and stored for purposes of CCS during the reporting year according to injection and storage pathway

Injection and storage pathway	Injected CO_2 (metric tonnes CO_2)	Percentage of injected CO_2 intended for long-term (>100 year) storage	Year in which injection began	Cumulative CO_2 injected and stored (metric tonnes CO_2)
Select from: Acid gas injection (CO_2 and H_2S co-injected into a production reservoir) CO_2 used for enhanced oil recovery (EOR) or enhanced gas recovery (EGR) CO_2 injected into a geological formation or saline formation for long-term storage CO_2 used for enhanced coal bed methane (ECBM) operations Other – please specify		Percentage-only field. Enter a value not greater than 100 and with no more than two decimal places. There is no need to enter the % symbol.	Enter a year e.g. 1999. The value must be in the range 1900-2017.	

Column 5 (Cumulative CO2 injected and stored) is requesting the total figure of CO2 injected and stored over the lifetime of the project to date, since the year in which injection began. Columns 2 and 5 will accept numbers up to and including 1000000000000000. They will not accept decimal places. Enter the values without using any punctuation. Use the “Add Row” button to the bottom right of the table to make multiple entries.

OG4.9: Please provide details of risk management performed by the reporting organization and/or third party in relation to its CCS activities. This should cover pre-operational evaluation of the storage (e.g. site characterization), operational monitoring, closure monitoring, remediation for CO_2 leakage, and results of third party verification

Please respond to this question in the text box provided in the ORS using no more than 5,000 characters.

OG5: Emissions intensity

General Guidance

Key Changes from 2016

Question OG5.1 (2016) on hydrocarbon sales has been moved to section OG1 and renumbered as question OG1.5. Subsequent questions in this section have been renumbered.

Pre-population and restatement of data

If you responded to CDP last year, all questions on this page are eligible for pre-population. To take advantage of this function, click “copy from last year” prior to entering any data on the page. Please note that for question OG5.1 (formerly OG5.2) the range of years selectable in column 1 (‘Year ending’) has progressed one year and ‘2010’ no longer exists as an option in the drop-down menu and will not copy over from last year.

Specific Question Guidance

OG5.1: Please provide estimated emissions intensities (Scope 1 + Scope 2) associated with current production and operations

Year ending	Segment	Hydrocarbon/product	Emissions intensity (metric tonnes CO_2e per thousand BOE)	% change from previous year	Direction of change from previous year	Reason for change
Select from: 2011 2012 2013 2014 2015 2016 2017	Select from: Exploration, production & gas processing Storage, transportation & distribution Specialty operations Refining Retail & marketing	Multi-select from: Conventional non-associated natural gas Associated natural gas Natural gas condensate Natural gas liquids (NGL) Liquefied Natural Gas (LNG) Liquefied Petroleum Gas (LPG) Compressed Natural Gas (CNG) Coalbed methane Shale gas Synthetic gas Tight gas Light oil Medium oil Heavy oil			Select from: Increase Decrease No change N/A	

		Extraheavy oil Bitumen (oil sands) Shale oil Synthetic oil Tight oil Refined products Diesel Gasoline/petroleum				

Companies are requested to report emissions intensities for the current reporting year (select it in column 1); emissions intensities from previous reporting years are welcome and useful to show historical trends. Use the "Add Row" button to the bottom right of the table to make multiple entries.

In column 2 select the value chain segment to which your intensity figure relates. It is acknowledged that not all O&G companies are involved in each of the value chain segments; respondents should provide emissions intensities for those segments relevant to their organization. Column 3 (Hydrocarbon/product) allows multiple hydrocarbon types and products to be selected for a given row of data, and respondents can use this functionality, where meaningful, to report intensities for groups of hydrocarbon types and products – see guidance for question OG1.2. Report the emissions intensity in column 4 in units of metric tonnes CO_2e per thousand BOE. The values of emissions to be used are the combined gross Scope 1 and Scope 2 emissions determined for the given value chain segment. The values of BOE to be used for each value chain segment are those corresponding to the aggregated throughput of the particular value chain segment for the whole reporting organization. In those cases, in which the organization's hydrocarbon products are reliant on infrastructure of other entities (which implies Scope 3 emissions), the emissions used to estimate intensities should be those corresponding only to the reporting organization. Clarification should be provided in question OG5.2 on how each emissions intensity has been derived. Column 4 will accept numbers up to and including 1000000000000000 and up to 10 decimal places. Please use a full stop "." and not a comma "," to indicate the decimal point. Column 5 (% change from previous year) will accept a value of no more than 999 and up to two decimal places to describe the change in your emissions intensity figure. Do not use negative figures to identify a reduction as this will be covered in column 6 (direction of change). If you have experienced no change, please enter zero in column 5. In column 6 select the direction of change in intensity from the previous year. Select 'N/A' if you do not have sufficient data to calculate the change from the previous year. Use column 7 (Reason for change) to describe why your emissions intensity has changed. Companies should explain the primary reasons behind the change and the degree to which different factors have influenced the figures. This is a free text field and you can enter up to 2,400 characters.

OG5.2: Please clarify how each of the emissions intensities has been derived and supply information on the methodology used where this differs from information already given in answer to the methodology questions in the main information request

If you have provided multiple years of data, please clarify if there has been any change (e.g. relating to organization structure, process change, product mix, allocation variables) to the way in which the intensity has been determined. Please respond to this question in the text box provided in the ORS using no more than 5,000 characters.

OG6: Development strategy

General Guidance

Pre-population and restatement of data

If you responded to CDP last year, all questions on this page are eligible for pre-population. To take advantage of this function, click “copy from last year” prior to entering any data on the page. Please note that for question OG6.1 the strategic development areas and descriptions you supplied last year will be populated into columns 1 and 2, respectively, but that you will need to manually enter the financial information and comments for the current reporting year into the remaining columns. Please note that for question OG6.3, the strategic development areas, future planned R&D expenses and comments you supplied last year will be populated into column 1, 3 and 4, respectively, but that you will need to manually enter the R&D expenses for the current reporting year into column 2.

If you wish to restate data previously supplied to OG6.1 or OG6.3, please follow the introduction guidance above on restatement of data, as well as the instructions provided in the guidance for CC0.2 in the introduction of the 2016 core climate change questionnaire.

Specific Question Guidance

OG6.1: For each relevant strategic development area, please provide financial information for the reporting year

Strategic development area	Describe how this relates to your business strategy	Sales generated	EBITDA	Net assets	CAPEX	OPEX	Comment
Select from: Exploration and development of new hydrocarbon reserves Renewable energy, excluding Biomass and Biofuels[3] Biomass, excluding Biofuels Biofuels Carbon Capture and Storage (CCS) Energy efficiency Methane management Other (please specify)	Free text field – use no more than 2,400 characters						Free text field – use no more than 2,400 characters

Question OG6.1 captures key financial disclosures (sales generated, Earnings Before Interest, Taxation, Depreciation, Amortization (EBITDA), net assets, capital expenditure (CAPEX) and operational expenditure (OPEX)) for strategic development areas that are capital intensive within the industry, for the reporting year. Please select those that are relevant to your current business in column 1 and use column 2 to describe

[3] Renewable energy, excluding biomass and biofuels include: Solar - water heating; Solar - photovoltaic; Wind; Tidal; Wave; Hydro; and Geothermal

how they relate to your current business strategy. Please use this table to describe current developments both in E&P activities as well as developments in energy efficiency, methane management, alternative energy and low-carbon technology that are relevant to your business strategy.

The numbers entered in columns 3 to 7 should relate to the currency selected in question CC0.4 in the core climate change questionnaire. Columns 2 to 7 will accept numbers up to and including 1000000000000000. Column 4 will also accept negative numbers up to and including -1000000000000000. They will not accept decimals. Please do not use punctuation. Use the "Add Row" button to the bottom right of the table to make multiple entries.

OG6.2: Please describe your future capital expenditure plans for different strategic development areas

Strategic development area	CAPEX	Total return expected from CAPEX investments	Comment
Select from: Exploration and development of new hydrocarbon reserves Renewable energy, excluding Biomass and Biofuels Biomass, excluding Biofuels Biofuels Carbon Capture and Storage (CCS) Energy efficiency Methane management Other (please specify)			Free text field – use no more than 2,400 characters

Question OG6.2 captures current plans for future CAPEX and expected total return of CAPEX in strategic development areas that are capital intensive within the industry. Please use the table to provide financial information to support any statements you have made in other sections of the questionnaire about your current business strategy and its future direction in terms of the energy products and services your organization provides or will provide, considering also the flexibility of your hydrocarbon and energy product portfolio to adapt to climate change or low-carbon scenario developments.

If you took advantage of the pre-population function on this page by clicking "copy from last year" prior to entering any data on this page, you may want to adjust the data populated from last year into OG6.2, if appropriate. The numbers entered in columns 2 and 3 should relate to the currency selected in question CC0.4 in the core climate change questionnaire. Columns 2 and 3 will accept numbers up to and including 1000000000000000. They will not accept decimals. Please do not use punctuation. Use the "Add Row" button to the bottom right of the table to make multiple entries.

OG6.3: Please describe your current expenses in research and development (R&D) and future R&D expenditure plans for different strategic development areas

Strategic development area	R&D expenses – Reporting year	R&D expenses – Future plans	Comment
Select from: Exploration and development of new hydrocarbon reserves Renewable energy, excluding Biomass and Biofuels Biomass, excluding Biofuels Biofuels Carbon Capture and Storage (CCS) Energy efficiency Methane management Other (please specify)			Free text field – use no more than 2,400 characters

Question OG6.3 captures R&D expenses for the reporting year and future plans in relevant development areas that are capital intensive within the industry. If you are unable to provide financial information on current and future R&D expenses, consider providing a description of relevant strategic development area and indicating a percentage of total current and planned future R&D expenses, in the comment column.

If you took advantage of the pre-population function on this page by clicking “copy from last year” prior to entering any data on this page, you may want to adjust the data populated from last year into OG6.3, if appropriate, and enter a new figure for the reporting year R&D expenses in column 2 (which will not copy over). The numbers entered in columns 2 and 3 should relate to the currency selected in question CC0.4 in the core climate change questionnaire. Columns 2 and 3 will accept numbers up to and including 1000000000000000. They will not accept decimals. Please do not use punctuation. Use the “Add Row” button to the bottom right of the table to make multiple entries.

OG7: Methane from the natural gas value chain

General Guidance

There is investor interest specifically in methane emissions because of its high global warming potential, particularly over the 20-year time frame, which may lead to regulatory and reputational risk. A statement from the IIGCC, Ceres, and IGCC explains that these investor groups consider that methane emissions can be effectively reduced at low cost, and encourages companies to take action to implement effective methane emissions controls. A 2016 review by the Environmental Defense Fund, however, found that leading O&G companies are continuing to put themselves and their investors at financial and reputational risk by failing to adequately disclose meaningful information on methane emissions.

Key Changes from 2016

Question OG 7.7 has been amended to distinguish between methane-specific emissions reduction targets, and emissions reduction targets that incorporate methane as well as other GHGs.

Pre-population

If you responded to CDP last year questions OG7.1, OG7.2, OG7.3, OG7.3a, OG7.3b, OG7.4, OG7.5, OG7.6 and OG7.6a are eligible for pre-population. To take advantage of this function, click “copy from last year” prior to entering any data on the page. OG7.7 and its sub-questions will not copy over because they have changed significantly since last year or are new questions for 2017. Please note that for question OG7.5 the range of years selectable in column 1 (‘Year ending’) has progressed one year and ‘2010’ no longer exists as an option in the drop-down menu and will not copy over from last year.

Specific Question Guidance

OG7.1: Please indicate the consolidation basis (financial control, operational control, equity share) used to prepare data to answer the questions in OG7

Segment	Consolidation basis
Select from: Exploration, production & gas processing Storage, transportation & distribution Specialty operations Refining Retail & marketing	Select from: Financial control Operational control Equity share

CDP recognizes that some of these questions may be difficult to answer if you do not have operational control of the emission sources (in particular, question OG7.4), and so you may change the consolidation basis you use in order to answer these questions if you wish. Use the “Add Row” button to the bottom right of the tables to make multiple entries.

OG7.2: Please provide clarification for cases in which different consolidation bases have been used

Respond to this question in the text box provided in the ORS using no more than 5,000 characters. If you do not have cases in which different consolation bases have been used, you should leave the question blank.

OG7.3: Does your organization conduct leak detection and repair (LDAR), or use other methods to find and fix fugitive methane emissions?

Please answer this question by selecting “Yes” or “No” from the drop-down menu provided in the ORS. If you answer “Yes” you will be directed to OG7.3a; if you answer “No” you will be directed to OG7.3b.

OG7.3a: Please describe the protocol through which methane leak detection and repair, or other leak detection methods, are conducted, including predominant frequency of inspections, estimates of assets covered, and methodologies employed

Investors are interested to understand how companies approach methane leak detection and repair (LDAR), or other methane leak detection methods, in order to gauge how effectively methane emissions are being reduced. Please describe 1) the frequency, 2) the methodology, and 3) the scope of your LDAR programs or other methane leak detection methods you employ:

1) Frequency refers to how often a company observes its assets for leaks (e.g. monthly, quarterly, annually)
2) Methodology is the process that the company uses to detect methane leaks, for example:
    - Optimal gas imaging (OGI) cameras
    - Handheld "sniffer" gas detectors
    - Infrared thermal imaging (FLIR0 camera
    - Audio, Visual, Olfactory (AVO) inspections
    - US EPA's Method 21
    - Colorado Regulation 7
    - Canadian Council of Ministers of Environment (CCME) Environmental Code of Practice for Measurement and Control of Fugitive VOC Emissions from Equipment Leaks (Oct 1993)
    - Canadian Association of Petroleum Producers (CAPP) Best Management Practice: Management of Fugitive Emissions at Upstream Oil and Gas Facilities
    - EU Commission IPPC Directive (2008/1/EC) and Industrial Emissions Directive (IED, 2010/75/EU)
3) Scope is the percentage of the company's assets that are inspected under an LDAR or other methane leak detection program

This question only appears if you selected "Yes" in response to question OG7.3. The text box provided in the ORS will take no more than 5,000 characters.

OG7.3b: Please explain why not and whether you plan on conducting leak detection and repair, or other methods to find and fix fugitive methane emissions

This question only appears if you selected "No" in response to question OG7.3. The text box provided in the ORS will take no more than 5,000 characters.

OG7.4: Please indicate the proportion of your organization's methane emissions inventory estimated using the following methodologies (+/- 5%)

Methodology	Proportion of total methane emissions estimated with methodology	What area of your operations does this answer relate to?
Direct detection and measurement	Select from: 0% >0% to <5% 5% to <10% 10% to <25% 25% to <50% 50% to <75% >75%	Select from: All USA only Other – please specify
Engineering calculations	As above	As above
Source-specific emission factors (IPCC Tier 3)	As above	As above
IPCC Tier 1 and/or Tier 2 emission factors	As above	As above

Column 1 contains a list of methodologies for estimating methane emissions with a decreasing level of specificity to the company descending the list. Direct detection and measurement is the most specific methodology for estimating methane emissions. There are differing levels of certainty associated with each. Understanding the level of detail with which companies are accounting for their emissions can be indicative of their focus on methane emissions. Greater levels of detail will generally provide greater levels of accuracy in reporting, as well as allowing companies to understand specific reduction opportunities. In column 2, the question requests the percentage of methane emissions estimated with a range of methodologies, +/- 5%. To clarify, the percentage given should be the mean with the understanding that the actual figure could be 5% greater or 5% less than the figure given. The USA is featured specifically in the drop-downs in column 3 because companies may have data for US emission sources due to the mandatory Greenhouse Gas Reporting Program (40 CSR Part 98) that requires oil & gas companies covered by subpart W to report on methane emissions to the US Environmental Protection Agency from 2012. Note that if a methodology has been used in multiple geographies and not in "All" please select "Other" and explain in text box.

OG7.5: Please use the following table to report your methane emissions rate

Year ending	Segment	Estimate total methane emitted expressed as % of natural gas production or throughput at given segment	Estimate total methane emitted expressed as % of total hydrocarbon production or throughput at given segment
Select from: 2011 2012 2013 2014 2015 2016 2017	Select from: Exploration, production & gas processing Storage, transportation & distribution Specialty operations Refining Retail & marketing	Percentage-only field. Enter a value not greater than 100 and with no more than 2 decimal places. There is no need to enter the % symbol.	Percentage-only field. Enter a value not greater than 100 and with no more than 2 decimal places. There is no need to enter the % symbol.

Companies are requested to report their methane emissions rate for the current reporting year (please select it in column 1); methane emissions rates from previous reporting years are welcome and useful to show historical trends. Use the "Add Row" button to the bottom right of the table to make multiple entries. In column 2 select the value chain segment to which your intensity figures relate. It is acknowledged that not all O&G companies are involved in each of the value chain segments; respondents should provide methane emissions rates for those segments relevant to their organization. Please report your total methane emissions rate: (i) in column 2, as a % of natural gas production or throughput at the given value chain segment; and (ii) in column 3, as a % of total hydrocarbon production or throughput at the given value chain segment. The values to be reported are the total combined gross Scope 1 methane emissions determined for the given value chain segment (including vents, leaks, etc.), expressed as a percentage of the aggregated production or throughput of natural gas and total hydrocarbons, respectively, at the given value chain segment.

OG7.6: Does your organization participate in voluntary methane emissions reduction programs?

Please answer this question by selecting "Yes" or "No" from the drop-down menu provided in the ORS. If you answer "Yes" you will be directed to OG7.6a; if you answer "No" you will be directed to question OG7.7.

OG7.6a: Please describe your organization's participation in voluntary methane emissions reduction programs

This question only appears if you selected "Yes" in response to question OG7.6. Please name the methane emissions reduction program(s) your organization participates in, and describe any focus areas or objectives, as well as any outcomes and achievements of your organization's participation. Please also describe how the program relates to your organization's overall strategy for managing methane in the

natural gas value chain. Finally, please indicate where more information on your participation is available for interested parties to access, or attach any relevant information in the 'Further Information' field at the bottom of the page in the ORS. Examples of voluntary methane emissions reduction programs include:

- The CCAC Oil & Gas Methane Partnership
- The Global Methane Initiative (GMI)
- US EPA Natural Gas STAR Program
- US EPA Coalbed Methane Outreach Program
- Our Nation's Energy (One) Future Coalition

Respond to this question in the text box provided in the ORS using no more than 5,000 characters.

OG7.7: Did you have a methane-specific emissions reduction target that was active (ongoing or reached completion) in the reporting year and/or were methane emissions incorporated into targets reported in CC3?

Target setting is a basic and effective management tool for improving performance. Emission reduction goals and timelines provide actionable information about management commitment to reduce emissions. Please answer this question by selecting one of the following options from the drop-down menu provided in the ORS:

1) Yes, a methane-specific emissions reduction target
2) Yes, methane emissions were incorporated into targets reported in CC3
3) Yes, a methane-specific emissions reduction target and methane emissions were incorporated into targets reported in CC3
4) No

If you select option 1 you will be directed to question OG7.7a; if you select option 2 you will be directed to OG7.7b; if you select option 3 you will be directed to both question OG7.7a and question OG7.7b; if you select option 4 you will be directed to question OG7.7c.

OG7.7a: If you have a methane-specific emissions reduction target that is not detailed as a separate target in CC3, please provide those details here, addressing all of the metrics requested in table CC3.1a or CC3.1b (for an absolute or intensity target, respectively)

Companies are requested to provide details regarding any methane-specific emissions reduction targets that are not detailed as a separate target in CC3. For any methane-specific emissions reduction target companies should provide the following details:

- Scope
- % of emissions in scope
- % reduction from base year
- Metric (if it is an intensity target)
- Base year
- Base year emissions covered by absolute target (metric tonnes CO_2e) or normalized base year emissions covered by intensity target
- Target year
- Progress made against target in terms of time (% complete time)
- Progress made against target in terms of emissions (% complete emissions)

Please see the climate change questionnaire guidance for section CC3 for more information on reporting targets. This question only appears if you selected “Yes, a methane-specific emissions reduction target” or “Yes, a methane-specific emissions reduction target and methane emissions were incorporated into targets reported in CC3”, in response to question OG7.7. Respond to this question in the text box provided in the ORS using no more than 5,000 characters.

OG7.7b: If methane emissions were incorporated into targets reported in CC3 (but not detailed as a separate target), please indicate which target ID(s) incorporate methane emissions, and specify the portion of those targets that is comprised of methane

Companies are requested to provide details regarding the incorporation of methane emissions into emissions reduction targets reported in question CC3 of the climate change questionnaire. Please name the unique target ID(s) for the emissions reduction target(s) that incorporate methane emissions and the percentage or total metric tonnes CO2e that methane emissions comprise.

This question only appears if you selected “Yes, methane emissions were incorporated into targets reported in CC3” or “Yes, a methane-specific emissions reduction target and methane emissions were incorporated into targets reported in CC3” in response to question OG7.7. Respond to this question in the text box provided in the ORS using no more than 5,000 characters.

OG7.7c: Please explain: (i) why you do not have a methane-specific emissions reduction target or do not incorporate methane into your targets reported in CC3; and (ii) forecast how your methane emissions will change over the next five years

This question only appears if you selected “No” in response to question OG7.7. Respond to this question in the text box provided in the ORS using no more than 5,000 characters.

Appendix

The following table defines categories of various hydrocarbons. Information in the table has been gathered from a variety of sources in order to provide an overview of the diverse products, but it should be recognized that some overlap may exist between different products as definitions may vary according to the source used.

While oil density is important for evaluating resource value and estimating refining output and costs, the fluid property that most affects producibility and recovery is oil viscosity. The more viscous the oil, the more difficult it is to produce. There is no standard relationship between density and viscosity, but ‘heavy’ and ‘viscous’ tend to be used interchangeably to describe heavy oils, because heavy oils tend to be more viscous than conventional oils, being those oils extracted using conventional well technologies. When crude oil of different types and quality are mixed, or when different petroleum products are mixed, API gravity cannot be used meaningfully for anything other than a measure of the density of the fluid.

API Gravity is a measure developed by American Petroleum Institute (API) that expresses the specific gravity, density and specific weight of liquid petroleum products. API gravity is a measure inversely related to oil density. Crude oil is classified as light, medium or heavy, according to its measured API gravity. Calculation of API gravity uses surface measurement of specific gravity of degassed oil. The formula relating specific gravity (S.G.) at 60^{o}F to API gravity is API gravity = (141.5/S.G.) – 131.5.

Hydrocarbon/product drop-down menu option	Notes
Conventional non-associated natural gas	Natural gas produced using conventional gas well methods from reservoirs that contain gas and no liquid hydrocarbons. Excludes associated natural gas produced by conventional methods, i.e. 'wet gas' from crude oil wells, as well as natural gas produced by nonconventional methods e.g. 'tight gas'.
Associated natural gas	Natural gas produced in association with hydrocarbon liquids, typically crude oil. Note that no distinction of production conventionality is made under this category, as this can be inferred from any other hydrocarbon categories that are reported in conjunction with this category.
Natural gas condensate & Natural gas liquids (NGL)	Natural gas condensate and Natural gas liquids (NGL) are reported in a variety of ways. Sometimes they are listed as separate items; sometimes aggregated with oil or with gas. The definition of these categories is based on the following texts: The Oil and Gas Production Handbook (sections 3.1.2 and 3.1.3): "Ethane, propane, butane, iso-butane and natural gasoline are removed from natural gas to produce "pipeline quality" dry natural gas. These associated hydrocarbons, are known as 'natural gas liquids' or 'condensates'." American Petroleum Institute compendium 2009: "Components of natural gas that are liquid at surface in field facilities or in gas-processing plants. Natural gas liquids can be classified according to their vapor pressures as low (condensate), intermediate (natural gasoline) and high (liquefied petroleum gas) vapor pressure. Natural gas liquids include propane, butane, pentane, hexane and heptane, but not methane and ethane, since these hydrocarbons need refrigeration to be liquefied. The term is commonly abbreviated as NGL." This definition was sourced from Schlumberger's online oilfield glossary in 2009. API condensate definition: "Liquid formed by the condensation of a liquid or gas; specifically, the hydrocarbon liquid separated from natural gas because of changes in temperature and pressure when the gas from the reservoir was delivered to the surface separators. Such condensate remains liquid at atmospheric temperature and pressure." SEC definition of condensate: "Condensate is a mixture of hydrocarbons that exists in the gaseous phase at original reservoir temperature and pressure, but that, when produced, is in the liquid phase at surface pressure and temperature."
Liquefied Natural Gas (LNG)	Liquefied natural gas (LNG) is natural gas that has been liquefied for ease of storage or transportation.
Liquefied Petroleum Gas (LPG)	Usually propane and butane liquefied for storage and transportation.
Compressed Natural Gas (CNG)	Natural gas, mainly methane, stored at high pressure.
Coalbed methane	IEA's Golden Rules for A Golden Age of Gas (p.18, 2012): "Coalbed methane, also known as coal seam gas in Australia, is natural gas contained in coal beds. Although extraction of coalbed methane was initially undertaken

	to make mines safer, it is now typically produced from non-mineable coal seams."
Shale gas	International Energy Agency's (IEA) Golden Rules for A Golden Age of Gas (p.18, 2012): "Shale gas is natural gas contained within a commonly occurring rock classified as shale. Shale formations are characterized by low permeability, with more limited ability of gas to flow through the rock than is the case with a conventional reservoir. These formations are often rich in organic matter and, unlike most hydrocarbon reservoirs, are typically the original source of the gas, *i.e.* shale gas is gas that has remained trapped in, or close to, its source rock." The Oil and Gas Production Handbook by Håvard Devold, ABB Oil and Gas, (section 7.1.4, 2010) explains that shale gas is formed from the decomposition of shale oil. It distinguishes this gas, released by hydraulic fracturing, from oil shale gas, produced by pyrolysis of mined oil shale.
Synthetic gas	This category is included in SEC rules (document 33-8995) for oil and gas reporting which is based on the final product to reflect the difference in risk and reward in selling bitumen, for example, compared with bitumen self-processed to synthetic oil and synthetic gas (p24 & p59). This term is not included in the Canadian National Instrument 51-101. However, it is included here to give SEC-listed companies the flexibility to report as per their SEC filings. We suggest that companies use the same approach to assigning volumes to this category as they would their SEC filing.
Tight gas	IEA's Golden Rules for A Golden Age of Gas (p.18, 2012): "Tight gas is a general term for natural gas found in low permeability formations. Generally, we classify as tight gas those low permeability gas reservoirs that cannot produce economically without the use of technologies to stimulate flow of the gas towards the well, such as hydraulic fracturing." The IEA notes that "Tight gas is often a poorly defined category with no clear boundary between tight and conventional, nor between tight gas and shale gas." However, this category is included in order to complete the spectrum of more common nonconventional gases.
Light oil & Medium oil	**Viscosity** Viscosity in the range 1 cP (the viscosity of water) to about 10 cP [a]. **API gravity** Definitions vary. Light oil generally has density above 31.1°API and medium oil generally has density between 22.3° and 31.1°API [b-e]. **Examples** Brent and West Texas Intermediate crude oil have densities from 38° to 40°API. Dubai crude has density of 31°API. **Alternative names** Conventional oil

Heavy oil	**Viscosity** Viscosity ranging from less than 20 cP to about 10,000 cP. **API gravity** Heavy oil is defined as having density below 22.3°API [f]. **Examples** Orinoco heavy oil (density in the range 10° to 12°API).
Extraheavy oil	**Viscosity** Viscosity ranging up to about 10,000 cP. **API gravity** Extraheavy oil has density of 10°API or less. **Examples** Orinoco extraheavy oil (density in the range 6° to 10°API). **Alternative names** Ultraheavy oil Superheavy oil
Bitumen (oil sands)	Oil sands is placed in brackets to make it clear to data-users that this covers oil sands bitumen extraction. **Viscosity** Viscosity ranging above 10,000 cP to more than 1,000,000 cP [g]. **API gravity** Oil with an API of less than 10° is sometimes referred to as 'natural' bitumen [g]. **Alternative names** Bitumen is sometimes referred to as an extraheavy oil, even though it is a solid at room temperature.
Shale oil	The Oil and Gas Production Handbook describes shale oil as produced from oil shale by destructive distillation. Not to be confused with tight oil (see below).
Synthetic oil	This category is included in SEC rules (document 33-8995) which discusses bitumen self-processed to synthetic oil and synthetic gas (P24 & P59). This term is included in the Canadian National Instrument 51-101. It is included here to give companies registered in the USA or Canada the flexibility to report as per their filings. CDP suggests that companies use the same approach to assigning volumes to this category as they would with their filings.
Tight oil	Tight oil is also referred to as light tight oil (LTO) refers to crude oil that is derived from low-permeability formations of e.g. shale or tight sandstone. Not to be confused with shale oil (see above).
Refined products	This is an inclusive category of which diesel and gasoline/petroleum (below) are a part.

Diesel	A heavy petroleum fraction used as fuel in diesel engines.
Gasoline/petroleum	Refined petroleum used as fuel for internal combustion engines.

Footnotes:

[a] The Poise is a CGS unit of dynamic viscosity equal to one dyne-second per square centimeter; the viscosity of a fluid in which a force of one dyne per square centimeter maintains a velocity of 1 centimeter per second. The unit poise is equivalent to 0.1 Pa.s in SI units.

[b] The New York Mercantile Exchange (NYMEX) defines light crude oil for domestic U.S. oil as having an API gravity between 37°API and 42°API, while it defines light crude oil for non-U.S. oil as being between 32°API and 42°API.

[c] The National Energy Board of Canada defines light crude oil as having a density less than 30.1°API.

[d] The Mexican state oil company Pemex defines light crude oil as being between 27°API and 38°API.

[e] Grades and types of crudes from the Western Canadian Sedimentary basin available from www.crudemonitor.ca

[f] 'Highlighting Heavy Oil', Oilfield Review, pp 34-53, Summer 2006.

[g] USGS publication FS2006-3133_508 'Natural Bitumen resources of the United States'

The following information is provided to assist you in providing values for production and reserves:

BO (or bo) is the symbol for barrel of oil. The BO is the commercial unit of volume used to measure petroleum and by international agreement a barrel of petroleum equals 42 US gallons, which is about 158.9873 liters.

BOE (or boe) is the symbol for barrel of oil equivalent. The BOE is a unit of energy based on the approximate energy released by burning one barrel (42 US gallons or 158.9873 liters) of crude oil and is necessarily approximate as various grades of oil have different calorific values. The US Internal Revenue Service defines the BOE as 5.8×10^6 BTU, which is equivalent to 6.1178632×10^9 J (or 6.1 GJ for Higher Heating Value or 5.7 GJ for Lower Heating Value). The BOE volume equivalent of natural gas (pipeline quality) is 159.920 m^3, which is obtained by dividing 5.8×10^6 BTU by the heating value of natural gas (1,027 BTU/ft^3) and using the conversion 1 $ft^3 = 2.831685 \times 10^{-2}$ m^3. The BOE volume equivalent of natural gas liquids is 2.31327×10^{-1} m^3.