

# Arctic oil and gas





# Introduction

The region above the Arctic Circle accounts for only about 6% of the Earth's surface area, but it could account for as much as 20% of the world's undiscovered but recoverable oil and natural gas resources. The existence of hydrocarbon resources in the Arctic has been known for decades, but only in recent years has the opening to full-scale resource development and navigation – such as the fabled Northwest Passage that would connect the Atlantic and Pacific Oceans, or the Northern Sea Route that will connect Europe and western Russia with eastern Russia and Asian markets – become technically and economically feasible.

Only about one-third of the Arctic is covered by land; another third consists of the offshore continental shelf, with waters generally less than 500 meters deep and the remaining third comprises ocean waters, typically deeper than 500 meters. Much (if not most) of the Arctic waters are currently ice-covered for most of the year. However, the polar ice cap has been noticeably receding in recent years, quite possibly as a consequence of global climate change.

The Arctic region contains portions of eight countries – Canada, Denmark/Greenland, Finland, Iceland, Norway, Russia, Sweden and the United States. Finland and Sweden do not border on the Arctic Ocean and are the only Arctic countries without jurisdictional claims in the Arctic Ocean and adjacent seas.

Large oil and natural gas fields are particularly important in reducing the cost to develop Arctic resources because they help pay for the infrastructure required for smaller fields. Large Arctic oil and natural gas discoveries began in Russia in 1962, with the discovery of the Tazovskoye Field, followed in 1967 with the discovery of the US Alaskan Prudhoe Bay Field. Approximately 61 large oil and natural gas fields have been discovered so far within the Arctic Circle – 43 are in Russia, 11 in Canada, 6 in Alaska and 1 in Norway.<sup>1</sup>

In 2008, the United States Geological Survey (USGS) released the first-ever wide-ranging assessment of Arctic oil and gas resources, estimating the region's undiscovered and technically recoverable conventional oil and natural gas resources. Of the 33 Arctic sedimentary "provinces" that the USGS evaluated, 25 were found to have a greater than 10% probability of having oil or gas deposits larger than 50 million barrels of oil equivalent. The USGS assessment concluded that approximately 90 billion barrels of oil, 1,669 trillion cubic feet of gas, and 44 billion barrels of natural gas liquids (NGLs) may remain to be found in the Arctic. Of the total 412 billion barrels of oil equivalent (boe), approximately 84% is expected to be found offshore, and about two-thirds (67%) of the total was natural gas.<sup>2,3</sup>

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1. U.S. Department of Energy, Energy Information Administration, "Arctic Oil and Natural Gas Potential," October 2009.

2. U.S. Department of the Interior, U.S. Geological Survey, "Circum-Arctic Resource Appraisal: Estimates of Undiscovered Oil and Gas North of the Arctic Circle," May 2008.

3. The USGS study included those resources believed to be recoverable using existing technology but recoverable even with permanent sea-ice and water depths greater than 500 meters. No economic considerations were considered, and results were determined without reference to exploration and development costs. Importantly, non-conventional resources, such as coal bed methane, gas hydrates, shale gas and shale oil, along with oil sands, were explicitly excluded.



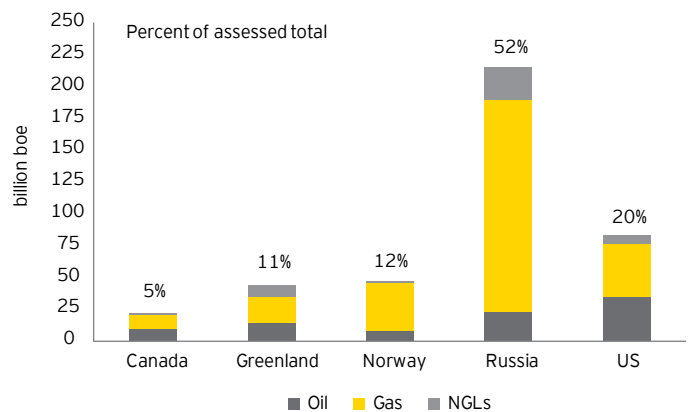
Source: U.S. Energy Information Administration and U.S. Geological Survey

The USGS study estimated that the Arctic could hold about 13% of the world's undiscovered oil reserves and as much as 30% of the world's undiscovered natural gas reserves. Allocating the estimated resources/provinces to the nearest country (with "shared" provinces allocated equally), Russia is estimated to hold more than half of the total Arctic resources. Russia also holds the largest amount of natural gas resources, while the largest oil resources are in the US portion of the Arctic (Alaska).<sup>4</sup>

Most critically, these high-cost and high-risk resources are increasingly commercially exploitable and affordable, given the current and expected prices of oil.

#### Potential Arctic oil and gas resources

(total assessed resources = 412 billion boe)



Source: Ernst & Young calculations from US DOE and US GS data

4. Notably this allocation exercise does not imply territorial and/or economic sovereignty by the countries over the petroleum provinces associated with them



# 1



## Challenges to Arctic resource recovery

The quest for Arctic oil and gas resources is not for the faint of heart, nor for those with less-than-deep pockets. Rather, Arctic resource development is both high-cost and high-risk. More specifically, the major challenges include:

- ▶ **Harsh climate:** The intense cold for much of the year, long periods of near-total darkness, the potential ice-pack damage to offshore facilities, the marshy tundra dictating seasonal activity in many areas and the limited biological activity all will take a huge toll on equipment and personnel.
- ▶ **Limited existing infrastructure:** New “greenfield” development will be very expensive and carry large environmental risks, and special equipment will be required (such as special tankers and ice-breakers), with long supply lines and with supply/logistical issues compounded by the harsh climate.
- ▶ **Gas-on-gas competition:** The booming global gas supply, both from conventional and unconventional sources, will challenge Arctic gas development, especially shale gas, but increasingly coal seam gas (CSG) and liquefied natural gas (LNG) as well. There are ever-increasing estimates of non-frontier resource potential, almost all of which could be developed at less cost and with lower environmental risk compared with Arctic natural gas. For example, offshore East Africa has seen tremendous recent gas discoveries, while US Arctic gas development costs may be as much as double those of comparable lower-48 developments.
- ▶ **Exceptionally long project lead times:** With the drawn-out time lines, the risk of cost overruns increases dramatically. The investment cycle will necessarily be long and gaining funding for these types of projects may prove challenging in the current economic climate.
- ▶ **Spill containment/spill recovery:** Both from a planning and an equipment perspective, containment/recovery contingencies will be both different and more difficult compared with “conventional” as well as other “frontier” develop projects, due to both climatic and logistical considerations.
- ▶ **Overlapping/competing economic sovereignty claims:** There are substantial political and jurisdictional issues with the 1982 United Nations Convention on the Law of the Sea (UNCLOS), which set seemingly conflicting rules for sovereignty claims, particularly for the Arctic seabed that may or may not be an extension of a continental shelf. Notably, the US has signed but not ratified UNCLOS. Under current international practice, countries have exclusive rights to seabed resources up to 200 miles beyond their coast, an area called an Exclusive Economic Zone (EEZ). Beyond the EEZ, countries must demonstrate that the seabed is a “natural prolongation” of the continental shelf in order to claim seabed rights. These practices have led to several overlapping claims between countries. For example, Russia has made a claim that its shelf extends all the way to the North Pole along the Lomonosov Ridge, a claim that the Canadians (as well as others) vigorously reject. Additionally, the long-running US/Canada dispute over the boundaries of the Beaufort Sea continues, while the other long-running dispute, between Russia and Norway in the Barents Sea, was resolved in late 2010.
- ▶ **Country-specific environmental laws/regulations:** Country-specific action may restrain or constrain Arctic development and/or further complicate the economic sovereignty issues (e.g., the US ban on Arctic National Wildlife Refuge (ANWR) development, or the environmental challenges to Arctic drilling plans). There are also increasing protests and objections from non-governmental organizations (NGOs), noting that the Arctic environment is a unique ecosystem and warning of potential irreversible ecological chain reactions.

# 2



## Recent area activity and perspectives

# Russia

Russian Arctic opportunities may in fact be the big prize. Over the last few years, Russia has intensified the development of the vast hydrocarbon resources of its continental shelf, through state incentives aimed at stimulating offshore oil and gas production. The area of Russia's shelf and continental slope totals 6.2 million square kilometers, with the vast majority in the Arctic area. The defined area of the continental shelf may be increased as Russia prepares an application to extend its borders over 1.2 million square kilometers of Arctic waters, an application expected to be finalized by the end of 2013.

The Government of Russia is also completing development of the state program on exploration and development of mineral resources of the Arctic continental shelf for 2012-30. Intensifying geological/exploration activity is one of the program's main priorities, to be supported primarily by investments from private Russian oil and gas companies.

Twenty major oil and gas provinces and basins have been discovered on the Russian shelf, 10 of which have proved oil and gas reserves. The largest Arctic sedimentary basins are the East Barents, South Kara, Laptev, East Siberian and Chukchi basins. The majority of local resources (around 94% of the total) have been found in the western part, while the hydrocarbon potential of the eastern part, along the slope and in the deep Arctic basin, is mostly regarded as inferred or contingent.

Gazprom and Rosneft are currently the only companies allowed to receive new licenses to explore Russia's continental shelf. The two companies hold the majority of licenses (29 for Rosneft and 16 for Gazprom), with the licenses mainly located in the Okhotsk, Kara and Barents seas. However, according to Russia's Arctic shelf development program, more companies may gain the right to explore and produce oil and gas in the offshore strip, including some smaller, private companies or subsidiaries of state-controlled companies. A number of Russian private companies are interested in participating in the Arctic shelf and are lobbying for liberalization of access to shelf projects. Among them, LUKOIL has proposed the concept of a National Company, which might cover many private companies and grant such companies the right to participate in shelf projects. Currently Russian authorities are considering changes in the legislation on foreign investments in strategic sectors, including the oil and gas industry, to lighten procedures for foreign companies to participate in development of such projects.

Gazprom's proposed mega-LNG project in the Russian Arctic, the Shtokman development, to be developed jointly with Statoil and Total SA, faces increasing uncertainty. With cost estimates rising sharply and the expected market for much of the LNG – North America – effectively evaporating with the shale boom, Gazprom and its partners are "rethinking" the project. Statoil has since withdrawn from the Shtokman project, choosing not to renew its participation when the original agreement expired in June 2012. As a result, Gazprom has postponed any final investment decision until 2014. Notably, in the middle of December 2012 the company announced it would continue developing the project.

The recent agreement between Rosneft and ExxonMobil for joint offshore development in the Kara and Black seas, signed in August 2011, is a significant new step in exploring and producing hydrocarbons on the Russian shelf. This deal demonstrates that both domestic and international companies are interested in cooperating in this area. The total investment required in the project is estimated at US\$500 billion. Rosneft would control a 67% stake in the joint venture, while ExxonMobil would control the rest. Similar JVs are in place with Eni, to focus on Barents Sea exploration, and with Statoil, focusing on exploration in the Barents and Okhotsk seas.

Looking forward to 2020, it is expected that Rosneft and Gazprom will remain the main drivers in developing Russia's continental shelf. According to our estimates, based on information from public sources attributed to the Ministry of Natural Resources and Environment and the Ministry of Energy, licenses to exploit subsurface resources in the Arctic and Far East seas will be split between these two companies in 2020, with about 41 licenses belonging to Rosneft and 32 to Gazprom. The main targets for Rosneft are expected to be the Barents shelf (including its southeastern part, named the Pechora Sea) and Okhotsk seas (31 licenses), while Gazprom is expected to concentrate on Kara Sea projects (21 licenses).





# Canada

Canadian geologists long believed that the Arctic north had significant potential for petroleum discoveries. In 1967, a partnership between government and industry resulted in the formation of Panarctic Oils Ltd., and in the 1970s and early 1980s, the Canadian government invested in Arctic oil and gas exploration. Important discoveries were made in the Mackenzie Delta region, the Beaufort Sea Basin and in the Arctic islands. Exploration drilling in Canada's Arctic offshore began in 1972, and since then, approximately 90 wells have been drilled in the Beaufort Sea. In addition, 34 offshore wells have been drilled in Nunavut's High Arctic Islands, and another three wells have been drilled in the Eastern Arctic offshore. Most of this activity occurred in the 1970s and 1980s when a combination of increases in fuel prices and federal incentives made the Arctic an attractive place for companies to invest in exploration.<sup>5</sup>

Changes in market conditions for oil and gas, the end of government exploration incentives and the absence of infrastructure to ship oil and gas to markets, resulted in the withdrawal of companies from exploration drilling in the Arctic offshore during the 1990s. Since 1991, when the National Energy Board (NEB) took over the regulation of oil and gas exploration and production activities in this area, the only offshore well that has been drilled in Canada's Arctic was the Devon Paktoa C-60 exploration well. It was drilled in the Beaufort Sea during the winter of 2005-06 and was abandoned in March 2006.

Exploration interest in the Canadian Arctic offshore has increased in recent years. Six significant discovery licenses were issued in 2007 and 2008 to three companies exploring in the Beaufort Sea, and there has also been an increase in the number of active exploration licenses issued in the Mackenzie Delta-Beaufort Sea region. However, the NEB noted in its December 2011 report, there is currently no offshore drilling in Canada's Arctic, nor are there applications for drilling before the board, although a number of companies hold exploration licenses for areas in the Beaufort Sea.<sup>6</sup>

Following a regulatory update on oil and gas drilling regulation in the Canadian part of the Arctic Beaufort Sea, industry heavyweights Chevron and Statoil have joined forces to explore leases in the area this year. Chevron, previously the sole leaseholder, has farmed out a 40% stake to Statoil for an undisclosed amount but will remain the operator. The companies plan to launch a 3D seismic program for a 2,060-square-kilometer area on the back of strong confidence in significant resources being buried under Canada's Arctic ice and recent clarification on drilling safety regulation in the region.



5. Natural Resources Canada, "Arctic Oil and Gas," undated.

6. National Energy Board, "Backgrounder: Regulation of Offshore Drilling in the Canadian Arctic," undated.







Cairn has interests in eight offshore areas spanning more than 85,000 square kilometers and had budgeted US\$1 billion for its eight-well drilling campaign spread over 2010-11. But drilling results have been disappointing, with some hydrocarbon “shows” across multiple basins, but no commercial discoveries. Cairn is evaluating its next steps, while other existing acreage-holders, Shell and Statoil, are expected to ramp up their exploration activity in 2012-13. Statoil notably bought into Cairn’s Pitu license in late 2011. While disappointed with the Cairn results, the Government has already planned a second licensing round. In 2013, blocks will be offered in the Greenland Sea and offshore northeast Greenland.<sup>8</sup>

8. Cairn Energy plc, "Investor Presentation, February 2012", February 2012



# Norway

Norwegian oil and gas production is concentrated on the Norwegian Continental Shelf (NCS), with activity in the North Sea, the Norwegian Sea and the Barents Sea. The country is the world's fifth-largest oil exporter and the second-largest exporter of natural gas. After first starting production from the North Sea some 30 years ago, output peaked in 2001 at just over 3.4 million b/d and has declined since then – a situation reflected more generally across the region – even though recent significant discoveries have boosted confidence in slowing output decline rates.

The Norwegian Government's overall aim for the oil and gas sector is to ensure full exploitation of NCS resources within acceptable environmental limits. Even though the Norwegian fiscal regime requires higher taxes on oil and gas production than many other exploration and production centers in the world, Norway has continuously attracted high levels of investment through adhering to fiscal policy stability that sets the country apart.<sup>9</sup>

The Norwegian authorities opened the Barents Sea in the Arctic for exploration in 1981, and Statoil, the majority-state-owned oil company, discovered the huge Snøhvit gas fields that same year. Over the course of the next 30 years, Statoil and a number of other international players have developed fields and a strong foothold in the North, in part through the drilling of more than 80 exploration wells. In the Russian sector of the Barents Sea, Statoil participated in exploration drilling activity in the 1990s, and the company partnered with Total SA on the Arctic land-based Kharyaga field. More recently, together with Gazprom and Total, Statoil had been taking part in the evaluation of the gigantic Shtokman gas field, located 600 km from shore in the Barents Sea.<sup>10</sup> Expansion of

the Barents Sea as a petroleum province is set to be a key focus in the coming years; Norway's 21st licensing round has seen 12 production licenses awarded in the Barents Sea, on equal footing with Norwegian Sea licenses and confirming significant levels of interest in the area. The resolved border delineation between Russia and Norway will see more Barents Sea acreage become available in 2013-14, pending parliamentary approval. Nevertheless, the further development of the region remains controversial, given its environmental sensitivity, and is therefore likely to move forward at a slow pace. The issue will continue to be a source of significant debate in the governing Red-Green coalition of Prime Minister Jens Stoltenberg.<sup>11</sup>

Development of the Barents Sea as a petroleum-producing region is likely to be an increasing focus for operators on the Norwegian Continental Shelf as Norwegian Sea and North Sea fields mature. Statoil already operates the world's most northerly liquefied natural-gas production facility near Hammerfest, which draws gas equivalent to about 48,000 barrels of oil a day from the Snøhvit field in the Arctic waters off Norway. (Snøhvit is the world's only LNG facility north of the Arctic Circle.) By 2020, the company hopes to extract one million barrels of oil equivalent a day from new Arctic wells. It plans further exploratory drilling this year in the Skrugard and Havis gas fields, which were discovered in the Barents Sea in 2011.<sup>12</sup> Should further drilling confirm Statoil's reserve estimate, it would mean that Skrugard could be Norway's single largest offshore discovery. Skrugard's gas potential suggests that it could provide feedstock for a second liquefaction train at the Snøhvit liquefied natural gas (LNG) project. Statoil



9. IHS Global Insight, Inc., "Country Energy Profile: Norway," accessed February 2012.

10. Hege Marie Norheim, Statoil ASA, "Petroleum Activities in the Arctic," speech to the Nordic Council of Ministers, 26 May 2010.

11. IHS Global Insight, Inc., "Country Energy Profile: Norway," accessed February 2012.

12. Nature News, "The Great Arctic Oil Race Begins," 31 January 2012.



# 3



## Summary comparative assessments



Rather than get into detailed examinations of the individual legal, fiscal and regulatory regimes of the five countries, we offer a high-level summary assessment, essentially drawn from the work produced by Deutsche Bank's Russian analyst team. In Deutsche Bank's view, from an overall fiscal perspective, with its proposed new tax regime for the Arctic, Russia will arguably move slightly ahead of the US and Canada. Costs will be a challenge in every country, but perhaps slightly less so in Russia. A lack of infrastructure similarly is a challenge everywhere, although

access to existing infrastructure is most favorable in the US, given the TAPS. Production from the Norwegian Arctic would likely have the easiest access to markets. The potential for large-scale discoveries is probably greatest in the Russian and US Arctic regions, but Deutsche Bank believes that the prospects for turning discoveries into material value may be more favorable in Norway and Greenland. Broadly speaking from an overall perspective, Arctic opportunities in Russia are probably the most attractive, slightly more so than in Norway and the US.

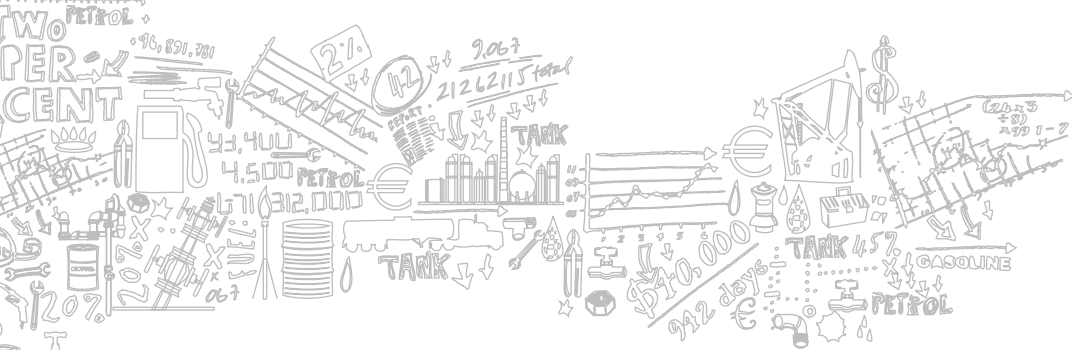
## Summary attractiveness of Arctic opportunities by country

As shown below, the fiscal and tax perspective is extremely important. In the accompanying table, we have summarized the key characteristics of the tax regimes of the five countries. Notably, we have included two "views" of the Russian regime: the current state and a summary of the proposed new regime for the Arctic offshore.

	US	Canada	Greenland	Norway	Russia
General fiscal terms					
Access to resources					
Competition for resources					
Cost environment					
Existing infrastructure					
Access to infrastructure					
Access to markets					
Potential for material discoveries					
Potential for material value creation					

Very favorable
  Favorable
  Moderate
  Unfavorable
  Very unfavorable

Source: Ernst & Young adaptation from Deutsche Bank Markets Research, "Is the Arctic the future of Russian oil?" 24 September 2012



## Summary Arctic tax regimes by country

	US (Alaska)	Canada	Greenland	Norway	Russia (current)	Russia offshore (proposed)
Fiscal basis <sup>1</sup> and key features	Profits-based Corporate income tax and royalties	Profits-based Corporate income tax and royalties	Profits-based Corporate income tax	Profits-based Corporate income tax with additional income tax for upstream activities	Revenue-based Royalties (Mineral Extraction Tax (MET)) and export duties	Profits-based Corporate income tax and royalties (MET)
Indicative average level of overall fiscal burden on project's economics at US\$80/bbl <sup>2</sup>	48%-72%	42%-54%	35%-40%	79%	75%-over 100%	Less than 70% <sup>3</sup>
Timing of taxation toward project's payout <sup>4</sup>	Weakly to average front-end loaded	Average front-end loaded	Weakly front-end loaded	Weakly front-end loaded	Extremely front-end loaded	Average front-end loaded
Investment incentives	Various capital allowances	Various capital allowances	Various capital allowances	Capital allowances and uplifts	Reduced royalties, limited holidays and lower rates for designated locations and specific fields	Production royalties (MET) significantly reduced, export duty abolished, import duties and property tax exemptions allowed, and capital allowances and uplifts
Loss carryforward/carryback period	20 years/2 years	20 years/3 years	Indefinitely/0 years	Indefinitely/0 years	10 years/0 years	70 years/0 years

1. Generally, under production – or revenue-based systems, the investor pays taxes before it deducts its costs.

2. Based on *World Rating of Oil and Gas Terms, Volume 3 (Rating of Arctic Oil and Gas Terms)*. PFC Energy, Van Meurs Corporation and Rodgers Oil & Gas Consulting, 2011. An overall fiscal burden or a government's "take" is the relationship of all payments to the government to economical project's profit (all income less all expenses).

3. The announced new tax regime applies only to offshore projects and envisages much more favorable terms for investors compared with the current terms for offshore. For the announced new tax regime for Arctic offshore, the government's take should be significantly lower (below 70%) than under the current terms. Per the estimates of certain experts, the government's take ranges from 30% to 70%, depending on project's specifics. Currently the announced regime is under development and has not yet been enacted. All other criteria (other than the government take) are provided for offshore projects only. The proposed tax regime does not apply to Arctic onshore.

4. Timing of taxation is more important than the level of a fiscal burden. The timing of the government's take depends on a composition of fiscal features; profits-based systems shift the timing toward the payout and after-payout period, while royalties and other non-profits-based systems could result in high fiscal payments before a project reaches a payout.

## Our perspective going forward

There is huge potential as well as risks associated with operations in the Arctic and the industry must prove that the Arctic can be drilled and developed safely. These operations are clearly on the outer limits of the both safety and commercial viability for the industry and a spill or accident there would be catastrophic. The economics of Arctic development are also looking forward to even higher oil prices which may or may not happen in the near term. There are two other factors that will ultimately shape the quest to develop these resources: geopolitical and commercial.

Geopolitics will play a critical role, as countries with varying interests use control through jurisdiction and regulation as opposed

to diplomatic cooperation. In such a political environment, the massive long-term investments and commitments that will be required to develop these resources are unlikely to be forthcoming, or at least more limited.

On a more positive note, commercial collaboration and competition, primarily based on the technology and resources of the major players in the Arctic (such as ExxonMobil, Shell, BP, Statoil, Eni, Total SA, Chevron and ConocoPhillips), along with the Russian giants Rosneft and Gazprom and possibly a few of the larger independents, will truly lead us to pioneer this frontier.

## How can Ernst & Young help?

The technological, managerial and logistical challenges of the new energy frontiers are as significant as their potential. Companies and their partners will face a business and operational environment with increasing demands for adopting best management, planning and control practices. Ernst & Young can assist in overcoming key logistical challenges, such as:

- ▶ Navigating and complying with complex tax systems
- ▶ Raising and managing capital
- ▶ Identifying, evaluating and completing a successful transaction
- ▶ Optimizing working capital
- ▶ Assessing and managing human capital requirements

To address these challenges and risks, Ernst & Young has established a global network of more than 9,000 dedicated oil and gas professionals in over 100 countries, supported by 12 Global Oil & Gas Centers.

Our oil and gas professionals are organized within four service lines: assurance, tax, transactions and advisory. Working in conjunction with local Ernst & Young staff, they bring both broad and deep oil and gas industry experience to the table and extensive experience with the major industry players, including national oil companies. Our experience and service offerings particularly relevant the oil and gas sector and industry include:

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- ▶ Risk advisory
- ▶ Supply chain
- ▶ Sustainability

### Tax services

- ▶ Domestic tax compliance
- ▶ International tax/transfer pricing
- ▶ Tax planning
- ▶ Human capital

### Transaction services

- ▶ Transaction due diligence/support
- ▶ Transaction tax
- ▶ Capital transformation (including valuation, restructuring, merger integration)

### Assurance services

- ▶ Statutory audit
- ▶ Internal audit
- ▶ Sustainability audit
- ▶ Fraud investigation and dispute services (FIDS)

## Ernst & Young's Global Oil & Gas Center contacts

**Dale Nijoka**  
Global Oil & Gas Leader  
+1 713 750 1551  
dale.nijoka@ey.com

**Marcela Donadio**  
Americas  
+1 713 750 1276  
marcela.donadio@ey.com

**Alexandre Oliveira**  
Emerging Markets  
+971 4 7010750  
alexandre.oliveira@ae.ey.com

**Sanjeev Gupta**  
Asia-Pacific  
+65 6309 8688  
sanjeev-a.gupta@sg.ey.com

**John Avaldsnes**  
Europe, Middle East, India & Africa (EMEIA)  
+47 51 70 67 40  
john.avaldsnes@no.ey.com

**Elias Pungong**  
Africa  
+237 33 42 51 09  
elias.pungong@cm.ey.com

**Enrique Grotz**  
Argentina  
+54 11 4515 2655  
enrique.grotz@ar.ey.com

**Russel Curtin**  
Australia  
+61 8 9429 2424  
russell.curtin@au.ey.com

**Beth Ramos**  
Brazil  
+55 21 2109 1400  
beth.ramos@br.ey.com

**Barry Munro**  
Canada  
+1 403 206 5017  
barry.g.munro@ca.ey.com

**KC Yau**  
China  
+86 10 5815 3339  
kc.yau@cn.ey.com

**Thorsten Ploss**  
Middle East  
+97 3 5354 553  
thorsten.ploss@bh.ey.com

**Jeff Sluijter**  
Netherlands  
+31 88 407 8710  
jeff.sluijter@nl.ey.com

**Alexey Loza**  
Russia  
+7 495 641 2945  
alexey.loza@ru.ey.com

**Andy Brogan**  
United Kingdom  
+44 20 7951 7009  
abrogan@uk.ey.com

**John Avaldsnes**  
Global Oil & Gas Advisory  
+47 51 70 67 40  
john.avaldsnes@no.ey.com

**Allister Wilson**  
Global Oil & Gas Assurance  
+44 20 7951 1443  
awilson@uk.ey.com

**Alexey Kondrashov**  
Global Oil & Gas Tax  
+7 495 662 9394  
alexey.kondrashov@ru.ey.com

**Andy Brogan**  
Global Oil & Gas Transaction Advisory  
+44 20 7951 7009  
abrogan@uk.ey.com

### Ernst & Young

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