

“Perfect Storm” hits industry

With a one-two punch, the economic impact of the Covid-19 virus and an oil-price war walloped the upstream industry in March. OPEC and Russia failed to curb output, which bloated inventories. The spreading virus blunted appetites for oil and gas, creating out-of-balance supply-and-demand dynamics.

Like Covid-19, plunging oil prices didn't discriminate.

Like Covid-19, plunging oil prices didn't discriminate. Values of future cash flows dragged down balance sheets of independents, IOCs and NOCs alike.

Prices nosedived to \$20 a barrel March 18 before increasing to \$24 a day later. The first of the year, the WTI oil price benchmark was \$61 a barrel.

U.S. not at a tipping point yet

“Cash flow for shale producers will be down in 2020 as crude oil falls, but few big energy companies have debt maturities coming due this year,” reported cable broadcaster *CNBC*.

Of the \$53 billion in speculative-grade debt maturities through 2024, less than \$2 billion will mature in 2020, the broadcaster reported.

U.S. producers urged the federal government to waive the Jones Act that mandates only American vessels transport goods among U.S. ports, reported *Bloomberg* news service. The U.S. government was considering a federal aid package for the shale industry involving low-interest loans, *Bloomberg* reported. Texas regulators discussed restricting oil production, reported the *Wall Street Journal*.

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Data systems in place to work remotely with clients

“Ryder Scott receives most client data electronically, which has helped overcome work and travel limitations,” said **Dean Rietz**, CEO. “During the coronavirus pandemic, systems already in place will facilitate meetings, data collection and logistical challenges, as quarantining grows around the world.”

Ryder Scott uses the WebEx platform for virtual meeting spaces. “It allows sharing of desktop spaces, audio and video possibilities,” said **Ronald Watt**, IT manager. “We can also use Zoom and other conference solutions.”

The firm has video and audio conferencing facilities with workspaces. For file sharing, Ryder Scott uses Citrix ShareFile.

“This service allows our clients to share files directly with our staff in a secure, ‘logged’ solution,” said Watt.

Staff members have several ways to work remotely. They connect to the Ryder Scott network through VPN to use remote desktop tools and access systems, network data and licenses remotely. Staff can also use Citrix Remote Desktop solutions to connect to most applications, said Watt.

For more information, a client should contact the group leader in charge of the project team or a team member. Emails for personnel in Houston, Denver and Calgary are posted at <https://www.ryderscott.com/employees/>



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Striking a balance between progressive, regressive fiscal terms

— **Andrew Wright**, *associate economist*

International oil companies (IOCs) negotiate upstream petroleum contracts based on cost-recovery incentives and profit potential from their shares of gross production under various policy and contract models. They see progressive fiscal systems as opportunities to maximize profits and upside.

At the same time, IOCs are not looking past host countries offering contracts under regressive fiscal systems. Those contractors target consistent cash flows from the exploitation of large, less risky portfolios of reserves with well-developed, profitable oil economies. As countries strike a balance between government take and profitability for IOCs, they are offering exploration-and-development (E&D) tracts under petroleum contracts with both regressive and progressive elements.

Regressive policies, national interests

For some basics, regressive petroleum fiscal regimes are those where the host government take, as a relative percentage of revenues, increases as project costs increase relative to gross revenues. That is a slightly reworded definition from the textbook, "International Petroleum Fiscal Systems and Production Sharing Contracts," by **Daniel Johnston**, PennWell Corp., 1994.

Another way to view regressive elements are as contract terms or laws that could cause a marginally profitable project to have a negative cash flow for the contractor because of government take, as cited in SPE Paper No. 130127-MS, "Designing Efficient Fiscal Systems," by **Mohammad A. Mian**, 2010.

Early in an integrated project's timeline, regressive policies are often in place and applicable to upstream activities. They are unresponsive to material changes in specific project conditions, such as field size, or macroeconomic changes, such as oil price increases or decreases.

Examples of regressive policies are signature bonuses and royalty arrangements. In production-sharing agreements (PSAs), where the contracting oil company has yet to recover all of its costs, cost-recovery caps are regressive.

Governments include regressive policies in their fiscal systems for various reasons to support their national interests. Royalties and cost-recovery caps guarantee the host government a minimum share of oil revenue by establishing an effective royalty rate, even in PSAs, as cited by Johnston.

Regressive policies allow governments to receive payments up front, which is especially important for cash-starved developing economies attempting to diversify away from oil.

The double-edged sword is regressive policies can ding host governments, just as they hurt oil companies. They discourage participation in bidding, licensing rounds and negotiations involving direct assignments. Disincentivizing E&D spending, especially in frontier areas or marginal fields, invariably reduces government revenues.

Consider Nigeria and its proposed, regressive National Petroleum Fiscal Policy (NPFPP). Recently, staff at Addax Petroleum

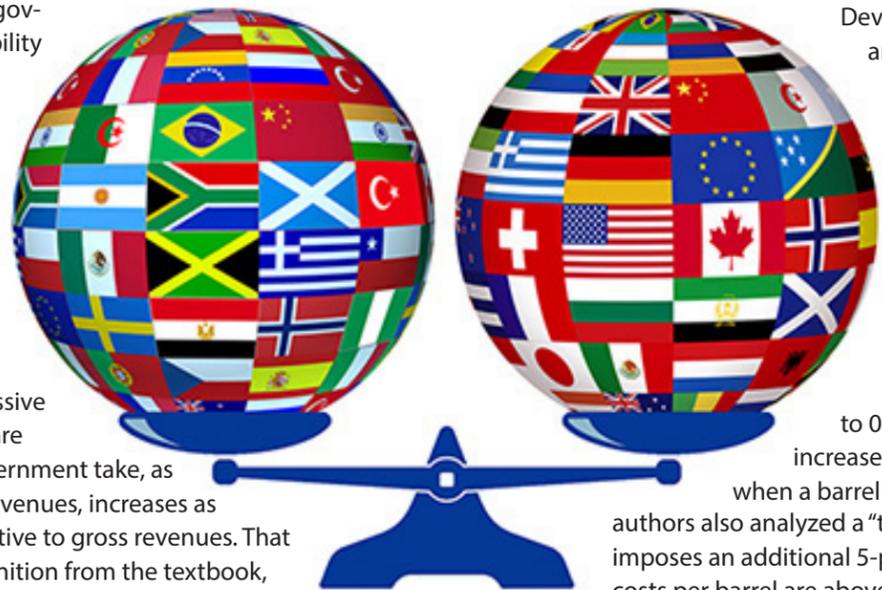
Development Nigeria Ltd. analyzed elements of the policy and published their findings in SPE Paper No. 193460-MS, "Nigerian National Petroleum Fiscal Policy – Fiscal Levers & Attendant Impact on Value of Oil Projects," **Segun-Oki** et al, 2018.

They focused on a 0.2- to 0.3-percent royalty increase on value that is triggered when a barrel of oil reaches \$50. The authors also analyzed a "tax inversion penalty" that imposes an additional 5-percent income tax when costs per barrel are above 30 percent of the price

per barrel. By creating a decline-curve forecast of government oil revenue, the authors demonstrated that while the proposed changes in the NPFPP maximized government revenue, they also choked off investment, because of negative net present values for IOCs at project levels.

A lack of flexibility in regressive contract terms also means that the government take decreases as profitability of the project increases. For example, a flat, volume-based royalty of \$2 a barrel cannot respond to major oil price increases, such as those during the 1973 oil crisis or the 2008 spike.

In the government's view, large oil-price increases give oil companies windfall profits at the expense of its national interests and citizens. For those reasons, increasingly, governments are transitioning to contracts with progressive terms, and passing laws regulating oil and gas production.



Shell Nigeria E&P Co. Ltd. has operated the Bonga FPSO offshore Nigeria since 1994. The company anticipates that with further development, the Bonga field will produce more than 200,000 BOPD, although at reduced profits because of an increasingly regressive fiscal system. In November, Nigeria passed an amendment imposing additional royalties when the price of crude exceeds \$20 a barrel. Shell and other contractors have criticized the move.

Win-win progressive policies

Progressive policies expose both host governments and contracting oil companies to economic fluctuations relating to oil price, capital and operating costs, reserves and production rates, observes Mian.

Think of progressive policies like the U.S. personal income-tax bracketing system. Those who report higher wages pay higher income tax rates. As the profitability of an oil field development increases (growth of taxable income), so too does the host government take based on a higher percentage of revenues (tax rate increase). Some common mechanisms in progressive policies include R factors, sliding-scale royalties and rate-of-return systems.

In theory, progressive fiscal systems reduce government take, especially on a discounted basis, as payments to governments are received further downstream, and therefore, later in project life, states Segun-Oki et al.

In practice, however, progressive policies arguably bring more investment to the host country than regressive ones. An example is in SPE Paper No. MS-185473, "Uruguayan Petroleum Fiscal Regime," **F. Ferro** et al, 2017.

He and the other authors, who included staff members at national oil company Ancap, stated that Uruguay was able to "revive exploration" despite the fact that "there has never been a hydrocarbon discovery in ... (the country) and the exploratory areas which the country offers are a classic example of high-risk frontier exploration."

In addition to "excellent upstream market conditions at the time," the paper attributes the success of the second offshore bidding round to the progressiveness of the PSC terms.

The Uruguayan PSC has no royalties, no bonuses, no surface rentals, and Ancap must reimburse the IOC its share of E&D costs to back in. Ancap staff also created a detailed probabilistic

technical and economic model that shows that in a wide range of reserves and economic scenarios, government take is consistent.

Profit-based, progressive contract elements, such as profit-oil splits, also encourage the contracting oil company to keep costs low.

Cost containment is measured by calculating the savings index of a project, as cited by Johnston. The index is only affected by profit-based contract terms, so contractors, under progressive fiscal systems, have more incentives to lower costs.



Without any domestic production or feedstock, Uruguay has one refinery, La Teja at Montevideo, which processes imported oil. A \$1.5-billion exploration commitment in Round II bidding eight years ago generated no discoveries so far. However, progressive fiscal terms were partly responsible for attracting the participation of 11 IOCs in eight offshore blocks.

Dealer's choice

With the use of progressive and regressive contract terms, host governments can strike a balance "between increasing economic rent and incentivizing investment," states Segun-Oki et al.

However, for contracting oil companies, conclusions are somewhat tougher to draw. They involve soft, strategic considerations — such as geopolitical risk and relationship with government — and bottom-line considerations, for example, for investors who use capital asset pricing models to determine theoretical required rates of returns of assets if added to their portfolios.

While IOCs can overcome even the most onerous regressive contract terms, if the discoveries are big enough and costs low enough to justify them, exploration in frontier environments of ten only makes economic sense with highly progressive terms.

Investors seeking exposure to E&P activities should consider whether to target progressive fiscal systems to maximize upside access, or to aim for consistent cash flows from the exploitation of large portfolios of reserves under regressive policies.

Editor's Note: The email address of Andrew Wright is andrew_wright@ryderscott.com. All SPE papers cited in this article are available for online purchase at <https://onepetro.org>.

PE for oil and gas in flux

— **Katherine Wauters**, staff reporter

At a recent Houston Geological Society panel discussion, professionals in petroleum engineering, law, tax and finance offered advice on the path forward for the E&P industry. Several years into an energy downturn, the buy/drill/flip game is over, said participants at the February event, “The State of Private Equity in Oil and Gas.”

Panelist **David Wishnow**, head of energy technology at Darcy Partners LLC, said, “The traditional game of punch a hole in the ground and flip it is done. We have clients today, who two years ago, would have thought, ‘I’m not going to operate this asset. Why would I ever need production surface technology?’ Today, they say, ‘we really could use some sensors and flow meters.’”

Investors expect a high level of operating efficiency now more than ever.



Morrow

Panelist **Gabrielle Morrow**, senior vice president at Ryder Scott, said, “The reluctance by private equity to invest in deals is a loss of trust. If banks and investors trust operators to deliver volumes in a capital-efficient manner, year-in and year-out, then they’re probably going to spend money.”

Panelist **Chris Micsak**, director of private equity at Pickering Energy Partners LP, opined that

while capital is tight, opportunities are available.

“There’s all this private equity capital that’s sitting there on the sidelines. That’s a lot of dry powder,” he said. “We’re starting to see a lot of interesting opportunities moving toward the operating side, but you have to be at the table to play the game.”

During the downturn, teams working in private equity (PE) have scaled back management and operating staffs. Panelist **Clark Sackschewsky** said management firms are slimming down to create more value. He is U.S. natural resources industry leader, tax market leader at BDO USA LLP.

“What we’re starting to see is elimination of management and operating teams altogether,” said Sackschewsky. “Why have 10 teams when one on the payroll creates greater value? That eliminates a whole level of overhead costs.”

The “rightsizing” of private equity teams and oil and gas companies are not the only signs of consolidation. PE firms are considering options to merge companies within their investment portfolios despite obstacles in gaining agreement among shareholders and other parties.

Panelist **Glenn Reitman**, attorney at DLA Piper LLP, said, “The most interesting thing I’m hearing about, but haven’t seen yet, is consolidation mergers among portfolio companies. There’s a lot of talk about ‘expect the unexpected,’ because it makes sense from a value perspective.”



ESG and carbon neutrality

The latter half of the panel discussion focused on environmental, social and governance (ESG) and fossil-fuel divestments. Some universities have moved their endowment funds out of oil and gas. Insurance companies, pension-fund managers and others have also divested.

PE firms are not divesting for the sake of ESG. However, shedding fossil-fuel investments is a near-term concern of the oil and gas financial community.

“North American E&P companies have a staggering level of debt maturing over the next five years, when they’ll likely continue to face tight access to the credit markets,” said Moody’s Investor Service in February.

Ethical investing, carbon neutrality

“Investors are constantly looking at renewables and other opportunities,” said Morrow. “If our industry had a better image, then PE managers might be more willing to invest.”

Oil and gas companies support ESG issues, for instance, by buying carbon credits to claim carbon neutrality. Morrow said that the Society of Petroleum Engineers has begun to create awareness of environmental sustainability programs.

Oil not going anywhere

Morrow compared the longevity and economics of oil and gas to other energy sources. “Oil and gas is not going anywhere, not by a long shot,” she said.

“To say that solar and wind are going to take over oil and gas doesn’t make sense. As for BTUs, solar and wind don’t come close,” said Morrow.

Oil and gas comprise about 55 percent of global energy sources today, states the latest outlook by Exxon Corp. By 2040, hydrocarbons will supply more than 50 percent of global energy — only a 5 percent drop relative to all energy sources.

Undeniably, investment will be required to arrest natural production declines and to meet demand.

Some prognosticators say that oil and gas will no longer be the dominant energy source by 2040,

including BP. It claims that renewable energy will be the world’s main power source in 20 years.

Morrow disagrees, “Oil and gas is going to be king for a long time.”

*Editor’s Note: To access the Exxon report, go to <https://corporate.exxonmobil.com/Energy-and-environment/Looking-forward/Outlook-for-Energy/Outlook-for-Energy-A-perspective-to-2040>. **Mark Hamzat O. Erogbogbo** at Mark@ProsperoOG.com coordinated and produced the HGS event.*

Juniors fall short in meeting production forecasts

Large and midsize public oil and gas companies in Canada are doing a better job of meeting production forecasts than juniors, according to 2018 year-end reconciliations. The Alberta Securities Commission published those and other results in its latest Oil & Gas Review.

Senior public issuers slightly overestimated their technical reserves while intermediates slightly underestimated them. Juniors fell short of their forecasts at year-end with a negative 4-percent revision.

The results for seniors and juniors skewed negatively because of outliers. A senior disproportionately influenced its peer group’s outcome 42 percent with downward revisions, while

one junior accounted for 21 percent of the slide in its group.

Craig Burns, manager petroleum at the ASC, confirmed the disproportionate influences were negative. The published review did not address that.

In its analysis, the ASC summed gross proved-plus-probable reserves by group as disclosed under Item 4.1(2)(c) of Form 51-101F1. The review is at https://www.albertasecurities.com/-/media/ASC-Documents-part-1/Publications/2019_Oil_and_Gas_Review_Report.ashx.

Pipeline constraints in Canada and the rise of take-or-pay contracts have hurt juniors more than larger integrated companies, observers say.

Petroleum engineers join Ryder Scott



Yao Tian

Yao Tian joined the Houston office as a petroleum engineer in the reservoir simulation group. She is an expert in petrophysical interpretations of both conventional and unconventional reservoirs.

Most recently, Tian worked at Ryder Scott as a contractor on a multidisciplinary team estimating the reserves of offshore properties in China. Before that, she was a post-doctoral fellow at the University of Houston during 2016 to 2018.

At the university, Tian conducted petrophysical analyses of several oil and gas properties in the Upper Bakken shale and Upper Three Forks formation. She also used machine learning to select controls for regional production from 2,100 wells in the Bakken play.

Tian also helped develop and teach an unconventional resources engineering class in petrophysics.

Before that, she worked at Marathon Oil Corp. as a petrophysicist, starting in 2014. She conducted analyses of completion designs in the Eagle Ford shale play. Tian also performed studies of formations in the Austin chalk, Mowry shale, Woodford and Caney shales and Marchand and Medrano sandstones.

She has a BS degree in petroleum engineering from China University of Geosciences in Beijing, and MS and PhD degrees in petroleum engineering from Texas A&M University, where she also

received a faculty award of excellence.

Tian wrote nine published technical papers while studying and working at the universities.

Steven Beck joined the newly formed facilities engineering group as a project engineer - integrated services. His experience in process engineering comprises simulation and optimization for facilities, including midstream, pipelines, downstream and petrochemicals.

Beck also developed process data — from design and sensitivity through equipment sizing and cost estimation to financial analysis and investment profiles.

Before joining Ryder Scott, he was a consultant in advisory services at Kellogg, Brown & Root Inc. where he worked on due diligence and related strategy. In 2017, Beck was a process and production engineer at Westlake Chemical Corp. He analyzed cooling-water flows to streamline future design and optimize flow patterns at chemical facilities.

Before that, he worked at P.O.&G. Resources LP as an engineering analyst. Beck evaluated and optimized operating costs of fields in west Texas and Oklahoma.

He has a BS degree in chemical engineering from the University of Texas. Beck is a member of the American Institute of Chemical Engineers.



Steven Beck

Ryder Scott integrates upstream, midstream services into turnkey product



– **Sandeep Khurana**, head advisor upstream and midstream integrated services

Ryder Scott has responded to recent increased demand for integrated services by forming an in-house group with facilities engineering expertise. For decades, industry has recognized Ryder Scott for its work in general reservoir engineering, reserves evaluations, field development planning and economics.

We have also conducted management advisory services for more than 20 years. During that time, we have leveraged our multidisciplinary expertise on turnkey projects while calling on trusted alliance partners in facilities engineering, marketing

HSE stewardship that leads to carbon-neutral emissions.

To acquire funding and project contracts, other clients have requested assessments related to financial and legal engagements. Now, with commodity prices falling, Ryder Scott has become part of the solution to put a more resilient approach in play and confirm profitability for our clients.

A flow chart of our overall services is in Figure 1.0. We aim to capture value for our clients by incorporating three independent work streams — subsurface, development and commercial assessments — into one integrated product.

Each work stream has its own objective as follows:

- **Subsurface work stream** — Review basin geology and reservoir engineering work to generate estimated product flow streams subject to technical uncertainties in forecasting. That feeds into the surface facilities to monetize hydrocarbon resources.

- **Development engineering work stream** — Review the drilling, facilities and project execution plan. Project execution entails reviewing major contracts to deliver an in-place project. Execution also addresses HSE with emphasis on regulatory requirements and permits. The objective is to assess the development schedule, costs and related risks.

- **Commercial work stream** — Review fiscal regimes, production-sharing arrangements, etc. The objective is to assess the commercial parameters and assumptions within the business case for each project and simulate an economic or fiscal model. Our services extend to providing advice on the optimum business model.

In just the past six months, we have used those work streams to perform assessments for international unconventional basin entry, midstream and LNG business restructuring, and for an overseas company investment in an operatorship in the U.S. Gulf of Mexico.

The key features of our new, in-house facilities engineering group, as it provides development assessments, are to conduct technical reviews, generate investment profiles, perform HSE evaluations, and conduct risk identification and mitigation advisory services.

Figure 2.0 – right, depicts a more detailed overview of our methodology.

Using our development-assessment methodology, we generate investment profiles, analyze sensitivities, benchmark against industry norms,

review and evaluate operations and liabilities, and, if necessary, perform physical inspections and analyze asset integrity and safety performance.

By integrating our subsurface, development and commercial assessments into one product, we can appropriately value an asset, understand technical risk, price risk into the investment and ensure that our client reaches its financial goals. At Ryder Scott, we will assess oil and gas

SPE adds rigor to experience levels, audit standards



Dan Olds at 2018 Ryder Scott reserves conference in Houston.

A “qualified reserves evaluator” under SPE guidelines now must have five years of practical experience and three years of evaluation experience — an increase from three years and one year, respectively.

Other changes to SPE standards are posted in “Standards Pertaining to the Estimating and Auditing of Oil and Gas Reserves Information,” at https://www.spe.org/industry/docs/Reserves_Audit_Standards_June%202019_Final.pdf.

The society also recommended that “an entity reserves audit should represent all or at least 80 percent of an entity’s reserves,” and that “the portion of reserves audited must be clearly stated.”

Dan Olds, managing senior vice president at Ryder Scott and vice-chairman of the SPE Oil & Gas Reserves Committee, said, “A significant change was to align the threshold level of reserves to review in an audit with the 80-percent level already required in an evaluation.”

The change has not altered industry practice, just formalized it. For decades, practitioners have had options to use an 80-20 methodology in an entity reserves audit.

In that approach, fields in the upper 20th percentile, as ranked by size, typically comprise 80 percent of the reserves base.

Changes in the SPE audit standards document, published last year, also included minor edits and word changes. “The document received full treatment of the SPE style guide,” said Olds.

For perspective, the Society of Petroleum Evaluation Engineers requires 10 years of experience for a full membership, with five of those in evaluations.

resources, guide the development of projects, safeguard investments, lower transaction costs, quantify profitability, increase confidence in investment decisions and realize full development potential to add maximum value.

For more information, please contact Sandeep Khurana at sandeep_khurana@ryderscott.com.

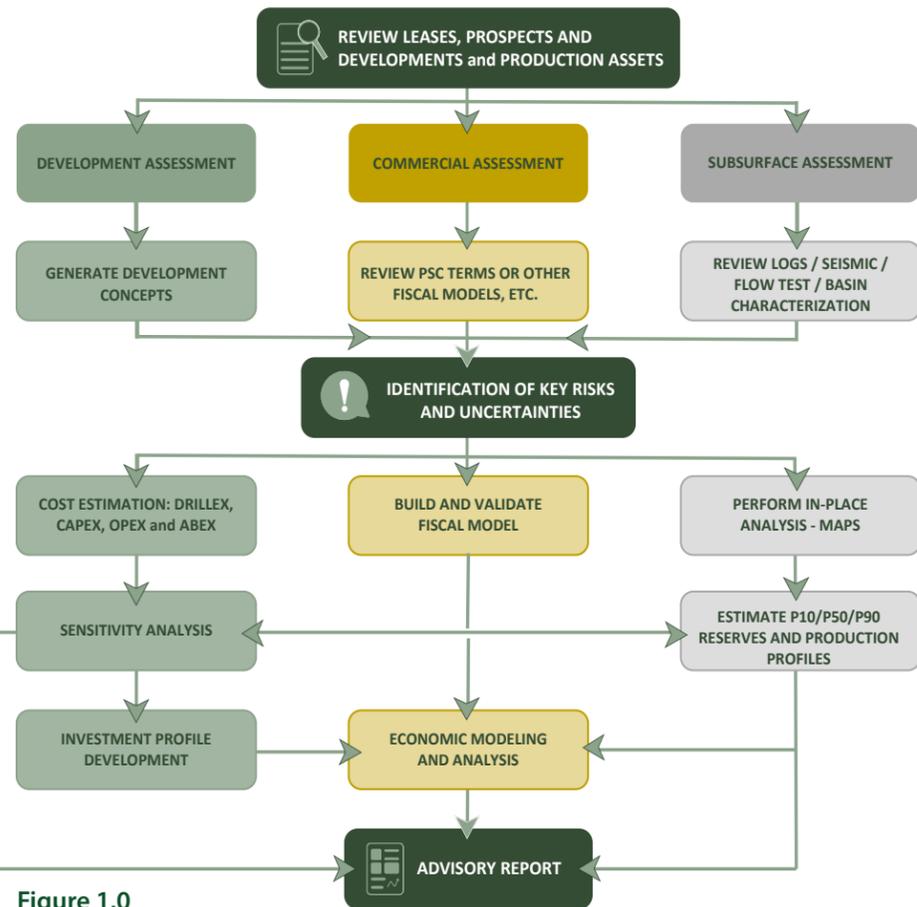


Figure 1.0 Overall Capabilities

and HSE (health, safety, and environment).

While we have continued to fill those requests, we now are glad to announce an expanded focus by creating the Integrated Services Group within our firm. Ryder Scott saw the need to do this because clients increasingly contacted us to discuss development downstream of the wellhead, including facilities engineering and more recently,

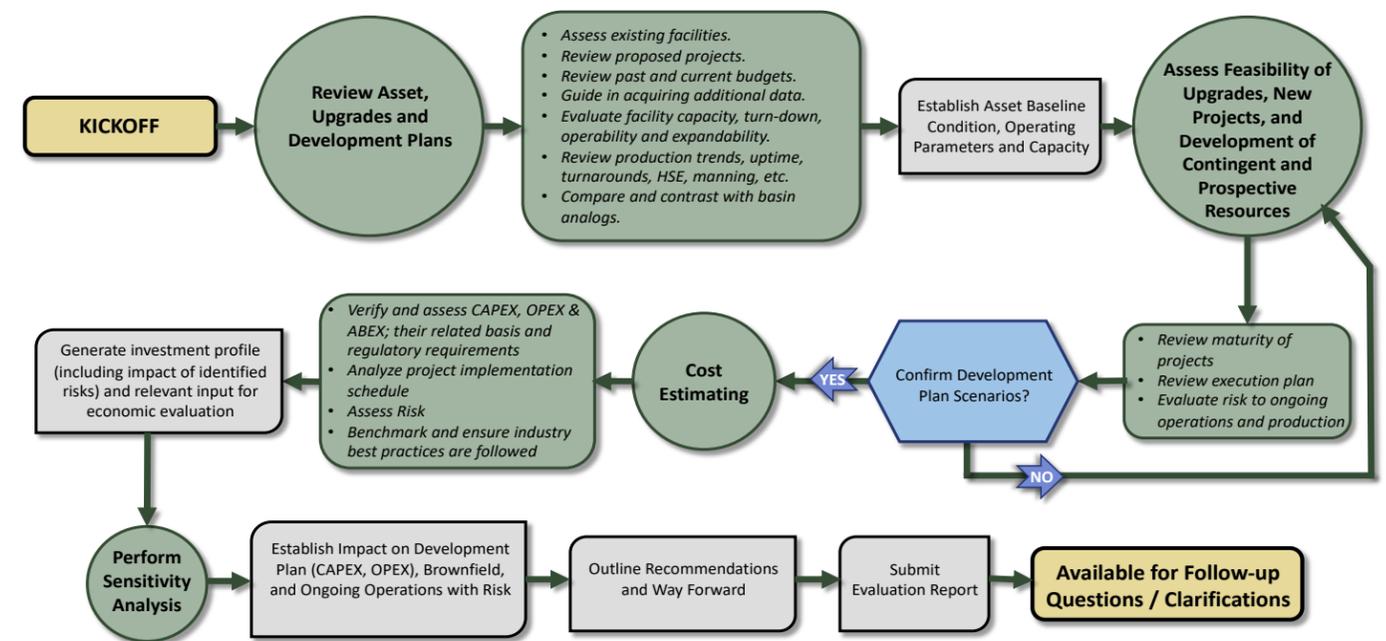


Figure 2.0 Development Assessment Methodology

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"Perfect Storm" hits industry – Cont. from page 1

Worldwide markets

The world hunkered down in quarantines, as risks to human capital spiraled. One of the more interesting forecasts for not only oil demand, but for the proliferation of the virus, was the second edition of the "Covid-19 Report," published March 17 by Rystad Energy AS. It is posted at https://www.rystadenergy.com/globalassets/pdfs/covid-19-report-week-12_final-version.pdf.

The energy research company stepped outside its area of expertise to model the future spread of Covid-19 in several countries.

"Our advanced analytical tools have already been utilized to create a system dynamics model of global oil price fluctuations, and applying the same tools to the Covid-19 situation allows us to build a very sophisticated model of the virus spread," the report stated.

The takeaway was quarantine, quarantine, quarantine. Rystad studied the behavioral changes that follow quarantines, and forecast the trends making assumptions.

Rystad also forecast oil demand. On March 11 in its first edition, it expected global oil demand to fall by 500,000 B/D in 2020 vs 2019. Six days later, the firm stated the epidemic could collapse demand by more than 10 million B/D of oil by April, a staggering downward revision.

Forecasters worldwide in every market whiffed, as the unknown reared its ugly head each day.

Calgary reserves conference canceled due to Covid-19 virus

The sixth Ryder Scott Canada reserves conference, scheduled for May 28 in Calgary, has been canceled due to the Covid-19 pandemic. On March 17, Alberta declared a public health emergency, banning gatherings of groups of 50 or more.

Publisher's Statement

Reservoir Solutions newsletter is published quarterly by Ryder Scott Co. LP. Established in 1937, the reservoir evaluation consulting firm performs hundreds of oil and gas reserves studies a year. Ryder Scott multi-disciplinary studies incorporate geophysics, petrophysics, geology, petroleum engineering, reservoir simulation and economics. With 116 employees, including 76 engineers and geoscientists, Ryder Scott has the capability to complete the largest, most complex reservoir-evaluation projects in a timely manner.

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