



# **THE FORCES OF CHANGE**



“There are two mega trends that are affecting our industry. One is energy transition; the other is ‘digital.’ Everything that we do from a change point of view connects to those two strategic drivers.”

**DR. JOHN PILLAY**, SVP Transformation, Worley

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IN LATE 2019, I was a guest on a podcast to discuss the current state of digital adoption in the oil and gas industry. Digital adoption appeared to be racing forward under full power. Earlier in 2017, the IEA had published a major study outlining the impacts that “digital” would have on the fortunes of the sector. That same year, the highly influential CERAWEEK event declared digital to be the latest must-do in the industry. The leading digital companies had started their domination of capital markets.

The interviewee posed the metaphorical question: If digital adoption were a baseball game for this industry, what inning would we be in?

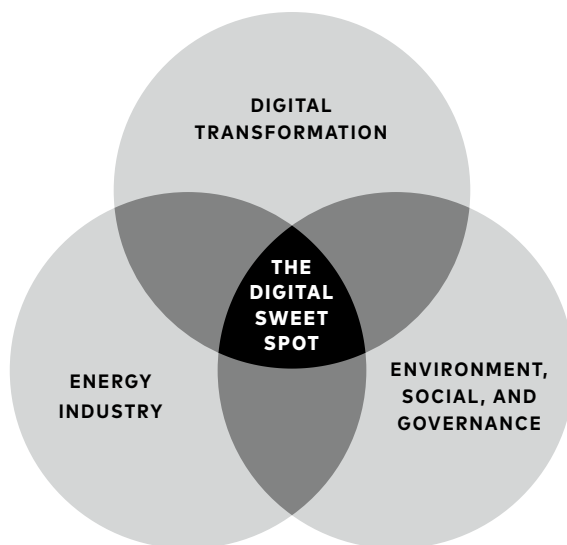
We’re in the early innings, I declared with considerable optimism. The game was clearly underway, a handful of digital technology companies that focused exclusively on the industry had emerged, and there were some modest successes.

In hindsight, I was completely wrong. The game had barely started. In the weeks that followed, BP released its latest forecast of supply and demand, predicting a fast-approaching demand peak. Capital market pressures, environmental and social changes, and the pandemic acted in concert to decisively propel digital investments throughout the industry.

Some of these investments yield significant benefits across multiple dimensions at once—environment and social, cost, productivity, growth and capital optimization—thereby accelerating digital transformation. I call this the digital sweet spot.

The question is no longer “Is digital a good idea?” but “How do we accelerate our adoption of digital?”

### THE DIGITAL SWEET SPOT



### Demand Uncertainty

The major sweeping change that is recasting the industry is the shifting demand profile. In a startling announcement at its annual general meeting in 2020, BP called peak oil demand a reality and indicated that it would arrive far earlier than previous modeling efforts had predicted.<sup>1</sup>

Their modeling across a handful of likely scenarios of the world of energy pointed to flat and declining global demand for oil, which prompted BP to embark on a fresh strategy to reduce its exposure to oil. Earlier in 2017, Shell announced a similar plan (a reorientation of resources to new energy) but without the hammer statement of peak demand.<sup>2</sup>

Almost two decades ago, BP rebranded itself with its new sunflower logo and catchy handle, “beyond petroleum,” which translated into

exactly nothing strategically. There is a risk that BP is again ahead of itself; that we're far from peak demand, and that the world will soon go on as it has. Transportation demand, which is based on 1.2 billion combustion engine cars, 300 million heavy trucks, fifty thousand military and commercial ships, and thirty thousand airplanes, will change only slowly.<sup>3</sup>

Almost all products (except perhaps the air we breathe and the water we drink) go through a demand S-curve, where product demand slips into decline after a peak. But oil is not the same as CD players, flip phones, or boom boxes. Petroleum is deeply entrenched in our way of life.

### **The Industry's Public Response**

Many oil companies, suppliers to the industry, and nation states dependent on oil have mobilized consulting studies and board meetings to discuss BP's position. Responses will likely vary, typically to justify a do-nothing action plan:

- Some companies will studiously ignore BP until they can formulate their own statements to manage their investors, employees, and communities.
- Some will dismiss the research as just "one man's opinion" and highlight all the tricky assumptions in the analysis that could yield a different answer.
- Some will suggest the analysis is self-serving. They'll point out BP's track record of climate and change missteps, its ill-timed rebranding twenty years ago, its much-publicized problems in Russia and the Gulf of Mexico, and its new-ish management need to break with the past.
- Some will pretend everything is fine, arguing that the huge structural demand that drives the sector is hard to change and will be enduring.
- Some will count on the short-term news cycle to push the story down the reading stack in the hopes that it will simply disappear.

- Some will be heartened by the post-pandemic energy shortages that point to swift demand recovery, evidence that society wants to return to business as usual.
- Some will be content to play wait-and-see, thinking it's too soon to draw any firm conclusions. (Of course, auto executives said the same thing about Tesla a decade ago, and retailers everywhere ignored Amazon too.)

Regardless of their stance, all companies in the industry are now at least alert to the coming changes in oil demand, the impacts and timing of which are still unknown, but predicted.

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**I'VE BEEN** through many oil market cycles, and there is but one truth. Only the low cost survive. My first downturn was in 1985 when I was working for an oil company in Toronto. The demand for oil at the time was around forty million **barrels** per day (mmbpd) but the available supply was around sixty mmbpd, most of which was from the Middle East. Since all that oil wanted to be consumed, the market collapsed, and prices fell from \$30 to \$10 **USD**.

To rid itself of surplus staff, the company launched a staff financial buyout scheme called Career Change Assistance Program, or C-CAP. Us staffers morbidly called it "Kneecap" or "Decap." I was newly married and in two weeks was supposed to transfer to the upstream unit in Calgary, but my transfer fell apart.

These cycles can get very personal very quickly. And it takes close to a decade for prices to recover. The company survived because it moved decisively to keep its costs low and its debt restrained.

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### **Ninety Days of Extremes**

Each cyclic downturn in oil is unprecedented, but each cyclic downturn is unprecedented in its own particular way.

For example, the price spike of 1973 was due in large part to the shortage of oil tankers needed to move crude to market (shipping costs eventually collapsed with the arrival of new carriers). In Canada, the industry has faced distressingly low prices since 2014 because of a lack of pipelines. The shocks to supply, demand, or both, rarely have the exact same cause every time.

All these downturns have similar consequences. Prices collapse, many players go out of business, layoffs are widespread, and it takes a few years (often a decade or more) for the industry to recover.

I have personally survived market routs in 2001, 2008, 2014, and 2020. In 2020, the most recent market upheaval, the cycle was about abrupt changes in both supply and demand.

### **Disagreements over Supply**

To understand the supply shift, we need to step back to 2008. According to BP, North American oil supply grew from 13.1 mmbpd to 22.6 mmbpd from 2008 to 2018.<sup>4</sup> This much growth this quick was unprecedented. Russian production overall barely budged, 12.7 to 14.5, and the suppliers from the Middle East only grew from 26.5 to 31.7. North American oil production growth was greater than that of the Middle East and Russia combined, and the oil was flowing to Asia, where the need for oil had grown from twenty-six mmbpd to thirty-six mmbpd in a decade.

American shale oil is relatively more expensive, technically complex to produce, and financed by borrowings on capital markets. It has taken market share from Middle Eastern and Russian oil resources, which are less costly and more easily produced by national champions. This might make sense if that expensive American oil commanded a higher price because it was somehow qualitatively better, but it's not.

By February of 2020, the economic ravages of the pandemic and its impact on oil demand were starting to emerge. China is both the biggest buyer of oil globally and the starting point for the pandemic. Both the customer (China) and the supplier (OPEC) could see the impacts of China's lockdown before anyone else. OPEC wanted deeper cuts, but Russia balked, and the producers decided to flood the market with oil.

Any eventual cuts agreed to by the producers are based on recent sales volumes, so the key to minimize the impacts of cuts is to maximize sales. Whether the oversupply was poor decision-making or a shrewd move to push the US out of the market doesn't matter. Supply surged ahead of demand by twenty mmbpd over March and April, leading to heaving inventories of 1.2 billion barrels, straining in storage.

In addition, the North American oil industry was in some pain. The **fracking** segment was already under siege because capital markets were growing increasingly suspicious about the fracking business model and the mountain of debt that these companies had taken on board. These are not low-cost businesses, and many would not survive.

Where supply meets demand is price, and we've seen the effects. The price of oil fell 85 percent within the year, from \$70.25 to as low as \$9.12, and in some markets under some conditions, the forward price was negative. The quantum of the fall is not without precedent—it fell further in 2008, from \$139 to \$45.<sup>5</sup>

The pain in the industry has not been uniformly shared. The control of 85 percent of the world's reserves is by governments that are highly dependent on the proceeds from oil sales and are relatively unresponsive to price moves, **carbon** pressures, activists, and capital markets.<sup>6</sup> They are trimming to weather through, but they're not necessarily changing course.

### **Managing the Fallout**

In the commodity oil industry, the price of the product is set by the marginal barrel. That is, in theory, when all demand but one barrel is fully supplied by the market, the buyer of that last barrel will pay a little more to get it, and in doing so, lift all prices at least a little.

Similarly, the marginal barrel sets the price when the market is oversupplied. In 2014, as the US was ramping up its shale plays, the market swung into oversupply by a mere 1 to 2 percent (or between one and two million barrels per day).<sup>7</sup> That oil was conveniently tucked away in storage, but once storage was full, the holder of the marginal barrel with no customer practically gave it away, causing short prices to collapse for everyone.



This played out again with stark consequences at the beginning of the pandemic in February 2020 when Saudi Arabia and Russia both decided to flood the market with their oil in the face of the demand collapse caused by the pandemic.<sup>8</sup> Prices promptly fell, and in some markets under some circumstances, prices went negative altogether with suppliers paying customers to take the product.<sup>9</sup>

If BP is largely correct, we are now, globally and much faster than anticipated, heading into a world that is structurally overbuilt for the demand, with the price of the product to be set by the marginal barrel.

The problem is that oil-producing states, provinces, territories, and nations cannot deliver a managed market structurally and are individually overly dependent on the riches thrown off by the most profitable global commodity that has been in perpetual growth mode for over a hundred years (a very long S-curve). There is no incentive, and in fact, substantial disincentive, to try to manage supply to the demand.

### **The Consequences**

The world has little experience in dealing with a permanently flat or declining oil market and no experience at all in managing an energy transition, which is playing out in late 2021. Oil and gas prices are rising very sharply as economies accelerate out of the pandemic following two years of low investment in energy infrastructure. Here are just some of the consequences that may well follow.

Structural advantage will favor the low-cost producers. That might not be OPEC, whose members are highly dependent on high oil prices to balance their national treasuries and pay for their social programs. There is space globally in the market for low-cost players everywhere. Upstream portfolios will be quickly reconfigured, leading to a wave of transactions and portfolio shaping—along the same lines as what happened in the gas industry.

At some level, capital markets price BP's negative view of the energy industry into their expectations for share value growth and future dividends. This has the effect of depressing all oil company stock prices. Capital for growth and expansion will be harder to secure for those producers outside of the national oil companies, and for those without a compelling story about cost leadership.

Oil companies will high-grade their projects, and only the very best—with the fastest time to market, the lowest capital cost, the highest reliability, the lowest operating cost, the least impact on the environment, and the highest possible production—will be sanctioned. Everything else will be at risk of being mothballed or stranded as boards see that shareholders are protected.

Existing production is now on notice to prepare to be shut down, sold off, or run out, unless there is a plausible plan and meaningful measurable action to become the low-cost asset. This applies to basins, wells, and facilities throughout the entire value chain. Even gas stations will need to transform or consolidate. Managers everywhere should take this to mean “we are now on war footing” with our costs and productivity.

Traditional suppliers to the industry (engineering firms, equipment companies, consultants) whose services reflect the commodity price will need to find new sources of revenue as capital projects vanish and cost pressures everywhere else pinch margins. This should trigger a wave of fresh innovative thinking about the industry, galvanized by successful changes introduced during the pandemic.

Employees in the industry will rethink their career choices. Those who have left the industry will feel vindicated. Long-service workers will be content to just wait it out, but their stock options and pension exposure to the industry will call for personal retirement fund diversification.

The biggest worry is that the talent pipeline influencers (parents, school counselors, social media, youthful activists) will more firmly steer youth away from the sector. The fallout will show up in five short years. Leaders will need to redouble their efforts to keep their people in the game, and they’ll need a much more positive story to tell.

**Rentier state** governments will urgently need to fundamentally rethink their economies as revenues from the industry experience a double fall (reduced volumes and lower royalties because of the lower price). Lower tax revenues mean weaker schools, poor health care, and imperiled retirements.

Short countries (that is, importers of oil) will revisit with renewed interest any green plans. Continued investments in oil import infrastructure will increasingly look like stranded money.

The biggest winners in the shakeout will be those with innovations that work to take out cost. The pandemic has shown the industry how to change fast, and many companies will need to do exactly that.

## Digital Lag?

If you are raising money in capital markets for an oil and gas venture, no matter the segment of the industry, chances are you will be asked how you are dealing with technology-driven change. The implicit message is that capital markets suspect that the industry is not fully prepared to embrace digital innovations.

### Is Oil and Gas Already Digital?

Capital markets ask about technology-driven change because so many other sectors failed to anticipate the impacts of digital innovations and delayed or avoided acting in the face of the threat. This do-nothing strategy resulted in the permanent destruction of capital. Retail has seen thousands of store closings because of Amazon. Video rental outlets vanished because of streaming. Newspapers have folded because ad revenue has swung decisively to Facebook and Google. Ubiquitous online communication **apps** have taken the market away from telecom providers and phones. Even maps are being displaced by widespread **GPS**. Sector after sector has been transformed.

Oil and gas professionals are quick to declare their industry highly “digital” already. In some very specific respects, it is a fair conclusion to reach. The upstream sector in particular is very data intense and has been collecting and interpreting gigantic **seismic** datasets for decades now. Big oil companies historically match governments in their ownership of super-large data centers and data-processing supercomputers. The industry has a history of selling its **subsurface data** at a level distinct from other sectors (save other resources industries). The sector

connects almost all of its infrastructure to **SCADA** (supervisory control and data acquisition) equipment.

### **Digital Tourism Is Over**

Virtually every large oil and gas company is now “doing something” in digital. It’s clear that the boards and management now get it. A few have put **digital natives** on their boards. Search the org chart, and you can probably identify the digital innovation team that is toiling away on digital, such as a small group that is trying to shepherd a portfolio of small-scale initiatives to scout out candidate solutions, launch some trials, test some ideas. Some companies even have investment funds that take positions in promising new business ventures.

If anything, it’s the supply chain to oil and gas (the thousands of specialized companies that sell services, supplies, and equipment to the industry) that are not very digital.

But the oil and gas approach to digital is consistently out of sync with a digital world that is expanding in capability on an exponential basis every eighteen months. The oil and gas industry business model is predicated on the scarcity of data, high-cost storage, expensive computational horsepower, a few large business partners, and a stately pace of change. Our overall business reality is rapidly shifting to a super-abundance of data, unlimited storage, flexible on-demand analytics, lots of clever startup innovators, and a hyperkinetic business cadence. A single digital company, Amazon, designs, tests, and introduces over fifty million software updates a year, during which time an oil and gas company might launch a few hundred.<sup>10</sup>

To describe the industry as “already digital” is a mischievous misdirection, if not categorically false. To quote Customer Centric and Optimization Technology Director Tomas Malango, from Repsol, “We need to improve our digital skills as a ‘sixth sense,’ to become better professionals.”

### **The Problems of Perception**

It is worrisome that some industry insiders think it helpful to paint the industry as on par with digital industry leaders.

It communicates to next-generation talent that there's no opportunity in the industry. This isn't healthy. The industry already faces strong headwinds from society, and the youth contemplating their career options have ample opportunities elsewhere. Oil and gas should instead be presenting itself as the center of digital innovation among heavy industries.

Capital market participants need strong encouragement to invest in oil and gas. There are a number of movements around the world to divest or severely restrict capital investment in the fossil fuel sector.<sup>11</sup> The industry needs a new narrative; it is not just leveraging technology but also pioneering cutting-edge technologies.

The "already digital enough" mindset robs the industry of much-needed attention from digital entrepreneurs. Since digital is impacting all industries at the same time, just not at the same pace and intensity, entrepreneurs and startups have plenty of opportunity to chase. Without clear signals of interest from the industry, these entrepreneurs will direct their attention elsewhere.

### **A Late Adopter**

There's ample evidence to suggest that oil and gas is a latecomer to the wave of digital change.

*Digital Vortex*, the book cowritten by IMD and Cisco, looks at a dozen industry sectors to forecast the timing and impact of digital innovation.<sup>12</sup> They conclude that oil and gas is eleventh out of twelve sectors, well behind retail, banking, transportation, and technology. Only the pharmaceutical industry will feel the effects of digital later. I reach similar conclusions in my book *Bits, Bytes, and Barrels*, in which I look exclusively at the various segments of the oil and gas industry (upstream, midstream, downstream, services).<sup>13</sup> The IEA, in their global study about the impact of digital on energy, argue that oil and gas adopts digital features relatively slowly.<sup>14</sup>

This makes complete sense. It's much easier and cheaper to design digital into a new asset than to add it after the fact to an older one, especially in a world of heavy steel assets. More than 85 percent of the assets in oil and gas were in place before digital was even a thing.

The window for adding digital smarts to an operating asset is usually pretty tight—confined to the regular **turnaround**, which is at most only a few days in duration. For **offshore** platforms, the window is even tighter, particularly if hardware is involved.

Oil and gas is a cautious industry and risk averse. For this, society is grateful. Spills of crude oil are hard to clean up, gas pipeline ruptures turn into fireballs, and the product is toxic. The industry applies the highest standards for safety and environmental compliance. Equipment must meet exacting engineering standards, and the introduction of new equipment, including digital, is done under strict management of change (**MOC**) processes.

Economically, it hasn't made much sense for the industry to invest in digital technologies. The downturn in commodity prices in 2014 scaled back the industry's ability to invest, and the limited capital available tends to go towards growth in reserves or production. With conventional oil basins operating only for a few more years, it is hard to justify investing in new technology. It's challenging for managers to demonstrate with clarity that a digital investment will pay off.

The culture of the oil and gas industry is also biased against external digital innovation. The industry relies on incumbent industry insiders to design and introduce new solutions. Those insiders are often tied to legacy technology architectures and designs that date back decades and were never built for the open environment within which digital thrives. They are incentivized by contracting models and licensing structures to keep small firms at bay. Big Oil struggles to figure out how to work with small, nimble startups.

Oil and gas is a long way from being digital. There is still untold opportunity for young people and tech entrepreneurs to find fortunes in the industry.

Just ignore the message that the industry is a digital leader. It's not.

## **Environment, Social, and Governance Pressures**

A second question posed by capital markets is about company responses to environment, social, and **governance** pressures, or **ESG**.

Many people wonder what ESG means. The concept is that companies will take ESG factors into account in their decision-making, so that they consider the long-term consequences of their choices.

I'm simplifying, but environmental considerations can include the impacts of enterprise on water, air, soil, land, plants, animals, fish, and oceans. These can be cumulative and absolute impacts that affect the overall balance of nature, the ability of natural systems to repair and rejuvenate, recover and renew. Social considerations can include impacts on communities, Indigenous populations, urban and rural settings, the disadvantaged, and the developing. Governance can include how decisions are made, and whose views are considered, including considerations such as labor groups, Indigenous peoples, communities, political systems, regulators, and capital markets. Again, impacts can be both cumulative and absolute.

ESG thinking has come about because, traditionally, the production and consumption decisions that countries, enterprises, and individuals make typically place a priority on short-term and narrow criteria, such as achieving the lowest price, maximizing shareholder needs, meeting capital market targets, or satisfying regulators, not on satisfying these broader, longer-stride societal factors.

### **We Do Not Have a "Planet B"**

It might seem absurdly obvious, but our planet is our only home. We all have a stake in it, whether we are from rich countries or underdeveloped nations, regardless of our background or age. Our planet is our collective responsibility, and we're accountable to not just part of the Earth, but all of it, from its plants and animals to its deserts and oceans, from its air and water to its farms and factories. We do not have an alternative planet to move to, although I am appreciative of the billionaires keen to colonize Golgafrincham.<sup>15</sup> Earth is indeed a home, because it's where we grow up, eat our meals, raise our kids, celebrate our successes and failures.

In this light, we should make decisions that help us keep the whole of the planet intact, safe, and long-lasting. All things feature a steady level of degradation: My neighbor's roof leaks, and they need to replace it. But we can't replace the planet, so what we need to do

instead is keep it from degrading to a point at which it can no longer be our home.

Ironically, Earth is structurally unsafe for us. There's a lot of visible danger on our planet, from wild storms, to searing heat, to destructive fires, to droughts, floods, volcanoes, earthquakes, and tsunamis. We are routinely under threat, yet we have done exceptionally well in weathering these dangers. We live much longer and healthier lives. But we are now pursued by some insidious new foes—from rising temperatures and rising sea levels, to water shortages, to air pollution—which seem to be of our own making. We are threatening the intactness of our home and our own safety.

Until we find an actual Golgafrincham, we need the current one to last forever. Forever is a long time, for people who sometimes only think in terms of election cycles.

### **The ESG Connection**

Absent any ESG influence, we have not been all that good about or consistent in thinking of the planet as our only home and making decisions that help it stay intact, safe, and eternal. In fact, there is ample evidence that suggests we have, for many decades, been rather short-sighted. To quote a comedian, if the planet were a car, we'd drive it like it's stolen.

Fortunately, some far-sighted governments have taken up the cause to provoke more attention to ESG in decision-making. Denmark has declared an end to exploiting its oil resources in the North Sea. The EU has stated its intent to be carbon neutral as a trading bloc by 2050. China has announced its goal to be carbon neutral as a country by 2060.<sup>16</sup>

In addition, the next generation of talent really appreciates ESG. The millennial generation, born between 1980 and 1994, is surrounded by technology and experienced 9/11, the 2008 recession, slow starts to their careers, and high housing and education costs. They stand at the threshold of their peak saving years and maintain a strong belief that the companies in which they invest should go beyond money-making to become part of the solution to environmental and social issues.



Millennials are far more likely to want to work for companies that make strong ESG commitments. Surveys in 2019 by the G&A Institute show that 40 percent of millennials would take a pay cut to work for a responsible employer, and 40 percent had already selected their employer on this basis, compared to just 17 percent of baby boomers.<sup>17</sup>

### **Capital Markets and ESG**

Capital markets have taken note of this tendency and are now exerting very real pressure on the oil and gas industry to declare its goals and intentions regarding ESG. Without that clarity, construction projects can't get insurance, and production can't get funding. Even mighty Alberta, the biggest Canadian investor in clean technology, the undisputed export engine of the country, and whose oil industry is among the most highly regulated globally, has been brought to heel by Wall Street money.<sup>18</sup>

One way to understand how capital markets view energy companies is through market indices. While not perfect (indices reflect more sentiment than just ESG measures), the indices provide an important gauge about market sensitivity. For example, the S&P TSX one-year oil index in 2020 was down 26 percent, while the S&P TSX clean tech and renewable index was up 80 percent.<sup>19</sup>

The problem with oil and gas is that the resource is, by definition, not sustainable. Once extracted, the resource does not naturally or quickly replace itself, like a forest or a fishery. Upstream oil and gas is best viewed as a self-destructive business model. Oil and gas generally is a scale business, and it carries a significant physical footprint. It struggles with its environmental track record in light of its spills and emissions. Some of its legacy designs, such as gas wells that intentionally use methane under pressure to actuate the well mechanics, are fundamentally opposite to ESG ideals.

And in case you think capital shifts are only a concern for energy companies, think again. Tesla—the muscular offspring of an ESG mother and a digital father—saw its stock rise 800 percent in 2020,<sup>20</sup> whereas GM and Ford shares rose by 50 percent, BMW and Volkswagen shares were flat, and Daimler was up by just 20 percent.<sup>21</sup>

### International ESG Efforts

Many nations and trading blocs are launching various ESG initiatives, with Europe leading the way. The European Green Deal, announced to much fanfare in December 2019, serves as a sweeping agenda to green up the continent—meaning achieving **carbon neutrality**—by 2050.<sup>22</sup> The deal has broad support—93 percent of Europeans see climate change as a serious concern.

The deal is illustrative of the kinds of changes that will become the norm across many societies in the years ahead. The EU is a large and influential trading bloc, and its regulatory environment is often used as a default standard by companies operating globally.

The Green Deal sets out five transformative goals:

- 1 to sign into law a binding requirement for member nations to act on climate change and spur investment;
- 2 to decarbonize the energy sector;
- 3 to renovate buildings to reduce their energy use and costs;
- 4 to help European businesses become world leaders in the green economy; and
- 5 to implement cleaner, cheaper, and healthier forms of private and public transportation.

While the deal highlights key areas in which policies will be developed to achieve carbon neutrality, fossil fuels are so essential to Western life that any new policies will have spillover impacts on the sector. EU member nations will be expected to tabulate the carbon emissions in the entire supply chain, not just those that occur on European soil, lest its economy craftily shift its carbon footprint off the continent, which would defeat the purpose of the policies.

European oil champions such as Shell and Repsol have already announced their goals to transform their own carbon footprints.<sup>23</sup>

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**THE PRODUCTION** and consumption of energy products account for fully 75 percent of the EU's carbon emissions, so the energy industry is going to get the lion's share of the pressure to change. The engineering industry anticipates a dramatic upswing in demand for new energy infrastructure. "Energy transition has been described as the biggest reallocation of capital in industrial history," says Dr. John Pillay, who is senior vice president of digital transformation at Worley.

The energy industry is expected to

- achieve 50 percent reduction in greenhouse gas (**GHG**) from a baseline in 1990 by 2030, and carbon neutrality by 2050;
- connect grids to better utilize renewable energy sources;
- boost energy efficiency;
- decarbonize the gas sector; and
- develop the offshore wind sector.

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## The Law

The details of the law are not finalized, but the intent is clear. EU member nations will become legally bound to achieve the 2050 target. What countries will do is bring into force the "rules" to achieve the outcomes that they need to be legally compliant. In practice, for example, to obtain a permit, a new business venture will need to demonstrate that its activities will not negatively impact the national target. National industrial policy will need to incorporate carbon neutrality as a key feature. State owned companies, national funding agencies, and sovereign wealth funds will quickly invest accordingly in order to demonstrate progress.

What follows are some of my predictions as to how this will play out.

### PLANNED VISIBILITY

Businesses will state in their circulars how they intend to become compliant with the rules. Importers will come under scrutiny to demonstrate that they are not simply exporting their carbon business model overseas beyond the reach of EU law.

By implication, companies that sell into an EU supply chain (energy producers, chemical companies, car parts, electronics, foodstuffs) are going to be pressed into accounting for their carbon emissions and into reducing their carbon footprints.

### NO NEW FOSSIL FUEL INVESTMENT

New **greenfield** long-life fossil fuel assets will not be built in Europe. Three decades seems like a long time, but not in the realm of oil and gas, where horizons are often measured in decades. For example, building a new liquified natural gas (LNG) export plant typically takes five to seven years, and such facilities are expected to be operational for at least twenty years, if not longer. Few boards will sanction large shareholder outlays against this backdrop.

Environmentalists now know that a few years' determined delays will be all that's needed to kill off new projects.<sup>24</sup> Investments in new coal, oil, and gas reserves will need to formally address the potential for those assets to become stranded. Any existing reserves on the books that cannot be brought to market promptly may need to be written down.

### DIVERSIFICATION OF ENERGY SUPPLY

To stay in business, fossil fuel energy companies will need to become carbon competitive with their zero carbon peers (the sun and the wind), which means achieving net zero emissions. Existing fossil fuel energy businesses (coal power, gas power plants) will need to minimize their carbon impacts, wind up operations, convert to some other purpose such as renewable power generation, and invest in relevant offsets such as carbon capture and storage or plant trees as carbon sinks. Companies will need strategies to progressively transition, or they will face extinction.

The European Green Deal, and many others like it, does not spell the end of the oil and gas industry. There's still a need for plastics, and

some transportation fuels (jet fuel) have no alternatives yet. But the pressure to change is suddenly, and legally, very real.

#### **INDUSTRIES BECOME SUSTAINABLE**

The European Green Deal sets out a specific goal to develop a true circular economy, whose intent is to address the stress the industry overall imposes on water resources, the generally high emissions footprint of the industry, and the shortcomings of the recycling industry.<sup>25</sup> Products that are harmful and do not allow for reuse, repair, or recycling will eventually be kept out of the market. Companies will need to offer proof of any green claims.

Key industries that will be targeted include steel, cement, textiles, construction, electronics, and plastics. Of these, the oil and gas industry is a big buyer of steel and cement, a consumer of construction services, and the source of virtually all virgin plastic. Oil and gas is also a major producer and consumer of water (steam generation, fracking, reservoir stimulation, drilling fluids). The deal will force reusable and recyclable packaging by 2030, putting downward pressure on virgin plastic demand. New business models based on the sharing economy (goods and services for rent) will be expected to play a role in all industries, including oil and gas.

Some industries will be uniquely impacted. The cement industry has a dual carbon problem—it consumes fossil fuel for heat to create cement, and the cement manufacturing process releases additional GHGs. Replacements for cement products will emerge. Oil and gas will need to stay in lockstep with the cement industry so that new low-carbon cement products also meet the facilities' standards of oil and gas.

The drive to create a circular economy for plastics will impact the demand for both virgin plastics and plastics better suited to recycling. Industry will be compelled to find better methods of recycling plastic. The demand for plastic raw materials is now much more uncertain, as it is dependent on these unknowns.

The construction industry is one of the more laggardly in adopting change, but the Green Deal has now created the conditions needed for the European construction sector to take a lead in transforming for a green future.<sup>26</sup> Others will be left behind.

**NEW TRANSPORTATION SOLUTIONS**

The deal aims to achieve a 90 percent reduction in GHG from transportation by 2050.<sup>27</sup> Road transport accounts for 72 percent of GHGs from transportation, with aviation and shipping about 27 percent, and rail about 1 percent. Big changes are coming to road transportation, specifically personal transportation.

Interestingly, the deal does not specifically encourage Europeans to drive less, but a few of the proposals look to achieve that outcome.

Some of the Green Deal's suggestions to reduce emissions include the following tactics:

- Impose much tougher vehicle pollution standards. Higher standards motivate the auto industry to shift to electric drive trains (a shift that is already underway) and remove the option for consumers to opt out of electric vehicles (EV).
- End subsidies for transport fuels. Subsidized fuels encourage trucking instead of rail and water trade. Presumably a few markets are still subsidizing fuel for their citizens, though you wouldn't know it from the fuel retail prices in the major European cities.
- Change road pricing. Low tolls encourage road use. By ramping up tolls, the EU hopes to push trade to use rail and water routes. Toll also make some personal road trips more costly than rail travel, and so encourage more use of public transit.
- Overhaul the vehicle refueling landscape. It is anticipated that an additional million public charging stations will be needed to enable dramatically more EVs. Today's fuel business will need to react, and quickly, likely by adding charging stations and refueling infrastructure for new cleaner fuels (such as hydrogen).

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**ASSUMING 50** percent of the refining capacity in Europe produces transportation fuels, which is admittedly a pretty blunt average, the implications on oil refinery infrastructure are severe—half of the oil refineries in Europe will eventually be surplus to need. The problem is that this applies to *half of each refinery*, since a barrel of crude oil typically produces separate portions of diesel for trucking, gasoline for cars, and kerosene for jet fuel. It will take a lot of investment in new refinery kit to reformulate these unwanted products into feedstock for plastics and lubricants, if there is a market.

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European oil and gas companies are already sorting out how they will respond to their new legal requirements. Companies hoping to continue to sell into Europe will also have to respond, or be prepared to sacrifice market access.

### **Getting ESG Right**

It's hard to get ESG right, particularly in the energy sector, as the elements are devilishly intertwined. I was schooled on this fact several years ago when I was invited to Vancouver to meet with representatives of five local Indigenous nations.

There was a proposal at the time to build an expanded oil export terminal, a subject on which I had some special expertise, in Vancouver Harbour, their traditional territory.

At the meeting, each leader took the podium for a few minutes to make their opening remarks. Unfailingly, they called out their reverence for Mother Earth, their reliance on natural fisheries for food, and their role as stewards of the land. They decried pollution, the loss of habitat for hunting, and the threat to salmon from an oil spill.

One leader stated, "Under no circumstances will a pipeline ever be built in our sacred waters," meaning the Vancouver Harbour, one of Canada's largest and most diversified ports and a gateway to Asia. I leaned over to the lawyer beside me and whispered, "Why are we here?"

At the break, I learned why. Each leader quietly pulled us away from the others and asked us a set of revealing questions:

- Can young people from my nation find jobs on this pipeline?
- Are there jobs in construction and operation?
- Do pipelines make money? How much?
- What would it take for us to be an owner in this project?
- How do we negotiate a stake in the project?
- What is the approval process for new pipelines?

They talked about the crisis of unemployment in their traditional territories, the anguish of substance abuse, their desire to break free of the chains of poverty. They completely recognized their reliance on petroleum for their snow machines, chainsaws, fishing boats, and heating. The prosperity, comfort, and relief from poverty that oil and gas jobs can provide was acknowledged. Unfortunately, these benefits are perceived to come at the cost of environmental sustainability.

This was the set of circumstances in the lead-up to 2020. European Green New Deal, ESG concerns, capital flight, and oil price collapse. It was a tense time, and although there are arguments that demand will return, and that these deals are far from perfect (or even possible), the future appears to be up in the air.

It seemed things could not get much more challenging.

## **The Pandemic**

It's now a meme to point out that COVID-19 has had a more transformative impact on industry than CEOs, boards, or CFOs. Although anecdotally accurate, the pandemic has really been more of an accelerant on an already-burning fire. Many of the changes put in place in reaction to COVID are now permanent. As John Pillay describes, "The pandemic has accelerated everything, in terms of virtualizing the proposition, globalizing the workforce. It won't roll back." The uncertainties of the virus and vaccination efficacy mean that more changes will come.



### COVID as Accelerant

A strange new virus appeared in Wuhan, China, transmitted by the unaware to the unprepared through microscopic airborne aerosols and causing pneumonia-like illness. The failure to contain its spread led to a pandemic that consumed the world for all of 2020 and 2021. The world is visited by weird new illnesses regularly, every decade or so. Recent examples in my lifetime include SARS, bird flu, swine flu, and MERS (also known as camel flu). These are on top of the seasonal flu, which befalls hundreds of thousands annually, with a high mortality rate among the elderly.

COVID-19 has brought home the impacts of virulent diseases to the masses. It is uniquely infectious, possessing a spike protein chain that allows it to hop from cell to cell, person to person, with incredible ease.<sup>28</sup> Where other viruses proved more containable, COVID-19 swept the world in a flash.

Prior to the pandemic, most of us spent precious little time thinking about how viruses impacted our human lives, and just as little time considering the role of viruses and other health threats in our industrial world. Most outbreaks of other illnesses were largely under control, contained by vaccination programs or otherwise. COVID-19 has prompted considerable introspection among boards and management teams about the health and security of their human talent.

At the same time, industry is adding billions of new sensors and digital **automation** into its infrastructure, creating a fertile new landscape for the transmission of computer malware, viruses, and other malicious elements.

The approaches to human health during a pandemic and the management of exposure to computer viruses are curiously similar. Companies are now much more practiced at dealing with computer viruses and are well advised to apply the lessons from their computer exposures to help with surviving this pandemic and preparing for the ones that follow:

- Computer viruses mutate and evolve over time, much like COVID. The idea that the industry can revert to its previous state once COVID is vanquished through immunization is false, as it is with

computer malignancies. Industry has invested in permanent changes to cope with computer viruses (training programs, audits, surveillance, armor) and disease prevention will now be added to our permanent defenses as well.

- Older technologies are particularly vulnerable to computer attack, similar to how COVID and other human diseases prey on the elderly and the immunocompromised. Industry already invests special attention on vulnerable older systems as a priority, particularly if those systems are mission critical, as they are with older SCADA systems, sensors, and networks. Industry now must reflect carefully on its insistence that its older workforce return to the office.
- Specialist expertise is required to provide adequate protective services across the range of computer systems in use by industry. The notion that two or three part-time security staff are all that is needed to defend against the **cyber** world is folly. Once hacked, companies typically need a range of services immediately, from brand damage control to technical skills and recovery expertise, and money is usually no object.
- Speed of response is critical to dealing with viruses of the computer variety. They spread quickly, with vigor, and largely undetected. Locking down, tracing the attacks, and quarantining the infected are the same actions that work in dealing with human disease. Having a plan that is frequently tested is key.

One important feature of the human virus world that does not meaningfully exist in the digital world is the information clearing houses that monitor and then share information about human afflictions. There are no equivalents to the World Health Organization and the Centers for Disease Control and Prevention in the computer world. One reason is that computer viruses are often inventions of state actors, and few governments wish to secretly fund a computer attack arm while publicly funding a virus surveillance unit. Another is that successful computer hacks can be very costly in terms of brand damage, stock price impacts, and out-of-pocket recovery expenses. Few companies are willing to go public with their cyber woes.

Companies will be highly dependent on specialist services to help maintain their defenses, and on building cybersecurity into their digital designs as a priority.

### **The Preparedness Imperative**

COVID-19 has schooled the world on the need for emergency preparedness to deal with virus outbreaks. Most nations, with the exception of Australia, New Zealand, and other island countries, did not act decisively at the onset of the virus. This wasn't split along political lines either; both Canada and the US, with liberal Trudeau and conservative Trump, respectively, waited until the eleventh hour to take any action. The disease appeared as far back as December of 2019, according to Canadian military intelligence, and arrived in North America en masse by March of 2020.<sup>29</sup> Still, international border closures and quarantines were not established until April in many countries. Eventually, though, lockdowns were imposed, and the world was trapped at home.

Some nations quarantined entire cities and built hospitals in a week. International borders closed tightly, cruise ships halted tours, and sporting events were canceled or deferred.

### **Pandemic Tactics**

Companies swiftly implemented a set of social distancing measures, such as a work-from-home strategy. This served well those employees principally in commercial roles, including finance, procurement, trading, HR, legal, administration, IT, and other similar service jobs. Entire buildings were closed or were operating in a split shift (half of the employees working from home, the other half more widely spreading out in the office setting).

But not everyone in oil and gas can elect to self-isolate. Field assets need continuous human supervision. Broken equipment cannot just repair itself. Control rooms are confining spaces, forcing operators to work in close quarters. Offshore platforms, where space is at a premium and off-shift accommodations are shared hot bunks, cannot easily meet social distancing targets.

New build, or greenfield, assets under construction are also a challenge. Oil and gas is often located in remote settings and serviced via work camps. (For example, the Fort McMurray area has some 32,000 workers flying in and out.<sup>30</sup> And Western Australia's mining industry is even more dependent on a traveling workforce.) Asset construction planning likely hasn't taken into account the CDC's recommendation that everyone maintain a six-foot (or two-meter) gap between each other.

These blunt-force measures are necessary not only because of how businesses have been designed, but also because of how our health care system works, how our institutional mechanisms have evolved to implement urgent change, and how we view privacy.

### **Hand-to-Hand Virus Combat**

In the heat of the moment, the normal human response to a novel threat is to apply the training one has learned for familiar threats and to rely on proven tools and tactics readily at hand.

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**ONE REASON** the Roman Empire fell was due to a new threat, the lightly armored mounted archer, who was superior in combat against Rome's slow, heavily armed foot soldiers. The Romans unwisely clung to their training and success formula but eventually fell after three hundred years. The early Middle Ages in England were punctuated by lightly armored warriors with shields and spears, fighting on foot. Norman knights on horseback brought the Angles, the Saxons, and the Vikings to heel. In the Second World War, the German tactic of lightning war, or blitzkrieg, swept through country after country for two years, until it met its match in the battle for Stalingrad. The desperation of the Russian people compelled them to try something new—street by street fighting, with constantly moving small bands of fighters able to outmaneuver the mechanized German tank forces and attack the supply line bringing fuel to the front.

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This phenomenon, the initial application of yesterday's solutions and tools to unfamiliar problems to see if they work, is what many Western societies and businesses applied to the pandemic. It was likely far more costly than it needed to be.

Over time, the oil and gas sector put into place a comprehensive program of pandemic response, but the solutions adopted are, in the short term, profoundly physical and manual in nature and cost additive.

First, they minimized the number of sites to manage by shutting down some facilities entirely, mandating work from home for suitable roles, and by furloughing employees to reduce the number of workers. Second, they upgraded ventilation systems where possible, bringing them to a much higher standard. Third, they altered site access by adjusting work schedules (which reduces crowding at start- and stop-work times, lunch period, and other breaks), instituting spaced queues at all entry and exit points, restricting access to untested workers and visitors, and mandating quarantines when infections appear. Fourth, they changed how some sites were used by adding more wash and sanitization stations; stepping up cleaning protocols; offering masks, gloves, and face shields; adding vapor barriers in tight quarters such as control rooms; and spacing out employees in offices through split shifts or rented space. Finally, they adjusted movements on sites by better managing shift changes, adding more on-site transit services, and restricting work gatherings.

None of these tactics fundamentally challenged the underlying business models and structures of the oil and gas business. Without more profound business change, these protocols will remain in place, and the degradation of business performance will become permanent.

These added costs now call for solutions that offer long-term relief, and as we'll see in the case studies, digital solutions offer the answer. For example, Senior Vice President of Operations and Technology Jay Billesberger, from NorthRiver Midstream, described how his company needed to do "a huge turnaround [...] during the pandemic but couldn't get people working closely together. So, we rolled out a digital permitting system in just three months, from conception to rollout. Permitting went from four hours to half an hour."

## Digital Is the Future

It may feel as though the case isn't there for oil and gas to adopt digital. Capital is very hard, almost impossible, to obtain. The demand is sliding ever downward, at least according to the industry pundits. Policy-makers are keen to slash and destroy demand as well, banning new petroleum vehicles earlier and earlier.<sup>31</sup> The energy transition is fully underway, with copious spending on new infrastructure programs.<sup>32</sup> Why, given all these headwinds, should oil and gas bother to invest?

The reality of the situation is far less dire, though, when you drill a little deeper. There is a market for hydrocarbons yet. The pandemic and energy transition are two new vectors for demand. In the short term, the post-pandemic era will lock pent-up demand for travel and services, while the energy transition will drive demand for fuel to build new energy sources. Digital promises to capture long-term benefits from short-term demand and will help avoid huge losses from demand destruction.

### Rising Demand

As vaccines roll out and people return to work, there will likely be a renewed demand for travel as borders reopen.<sup>33</sup> Although this may take a few years, there will be an increase in traveling internationally and vacationing by the average consumer when it becomes possible to do so. The forecasts vary, but leisure travel will likely return to normal in the years following 2022, given the pent-up demand for tourism, as governments lift restrictions. Time will tell how large the surge will be, but it will come.

Although demand for gasoline may decrease in the long term, jet fuel demand will certainly increase in the next five years. A renewed surge in jet fuel consumption will likely create market opportunities for oil and gas to capitalize, especially in the downstream. This will not replace demand for road-borne vehicles for sure, but air travel will still offer a market for oil and gas for the time being.

## Energy Transition Isn't Carbon-Free

The infrastructure projects being launched by governments globally, as well as the energy transition itself, present an opportunity for capturing hydrocarbon demand.

**Green energy** does not burn hydrocarbons to make electricity, that much is true. But it isn't as if steel, aluminum, concrete, semiconductors, copper wiring, or lithium-ion batteries come from thin air. They all require hydrocarbons, often in the form of kerosene or propane. Not to mention the volume of hydrocarbons necessary for the mining industry to just find all these raw materials. Oil and gas, ironically enough, is very much necessary to build its own replacements.

The amount of energy and capital involved in this project is staggering. One estimate has \$15 trillion for the cost of the transition alone; this amounts to having 56 percent of energy demand being met by renewables.<sup>34</sup> Another estimate, by BloombergNEF, suggests up to \$130 trillion will be spent globally to achieve 2050 targets.<sup>35</sup> Total replacement, alongside matching the increase in energy consumption, could balloon this number even higher. This results in a large amount of investment in capital projects and infrastructure, all of which will need hydrocarbons.

In short, the transition will entail a temporary increase in oil demand while it is underway, petering out by 2050. While gasoline demand may be gone by then, oil and gas will find business partners elsewhere in the supply chain.

Rise in travel demand after the pandemic and infrastructure and commodity market expansion are just two examples of how the demand for hydrocarbons may not vanish but actually go up in the short term. The fuel demand will return eventually, matched by a spike in industrial fuel demand to build all these infrastructure projects. Oil and gas companies need to move quickly to capture this windfall.

While there are some positives for the industry in the short term, it doesn't mean "business as usual" for oil and gas. Demand *will* disappear eventually. The grid will become much less dependent on hydrocarbons as fuel. Changes will still need to be made to ensure that short-term gains translate to long-term success. This is where digital comes in.

## Think Digital

In 2019, digital was viewed in oil and gas as “a future,” but not “the future.” Other possible futures, notably the status quo, still held sway. Teleworking and teleconferencing on a grand scale were politically impossible in December 2019 but are now part of the fabric for many **B2B** service providers that aim to prosper in the years ahead. As workers and bosses became used to teleworking, they demanded deeper digitalization of the work world. It became clear to many in the industry that digital innovations are one of the very few tools available, including for both energy producers and consumers, to lower costs and improve productivity, reconfigure business to improve its resilience, and meet ESG objectives. Expect to see more budget being applied to strengthen, expand, and evolve the digital foundations of business.

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**I’M REMINDED** of a quote from Milton Friedman.

“Only a crisis—actual or perceived—produces real change. When that crisis occurs, the actions that are taken depend on the ideas that are lying around.”<sup>36</sup>

Friedman goes on to say that only in a crisis can the politically impossible become the politically inevitable.

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I should point out that while some enterprises (Airbnb) will be asset-light, almost purely on a digital platform, not all businesses will have that option, and for now, oil and gas doesn’t. We still need fuel to grow food, energy to provide heat and light, power to manufacture clothing, and petroleum for transportation. Physical assets continue their central role in energy systems. Digital’s role is to help, not replace.

Here are some other digital insights that have gained life because of capital pressures, demand changes, ESG agendas, and the pandemic.

## DATA TRULY IS THE NEW OIL

Centralized workers in an office and shoulder-to-shoulder operators in a control room can, in their various ways, cope with poor quality



data about assets. But remote workers, at-home bosses, and robotic machine-based businesses incur heavy prices for poor data quality. The pandemic even prohibits impromptu site visits to survey installed equipment as a crutch for faulty records. High-quality data is now in high demand. Interest in data as the “product” rises.

#### **NETWORKS ARE CRITICAL**

Many at-home-workers are discovering that their home networks cannot cope with Zoom and Netflix, kids and adults, all competing for the same limited **Wi-Fi** resource. Companies have long resisted getting involved with network infrastructure outside the firewall, but now the productivity of the enterprise is dependent on how robust the home is, as well as the networks to the remote edges of the business. Expect to see telecom companies stepping up to deliver beefier networks.

#### **SENSORS WILL REPLACE HUMAN SENSES**

Instead of having workers traveling to sites to check equipment, operators can deploy cameras equipped with **visual analytics** to keep eyes on assets. Visual analytics is part of the digital field that includes facial recognition technology but is rapidly being applied to a huge range of industrial uses. One large construction company uses its overnight security cameras to identify the arrival of parts, equipment, and cement to its construction sites and to alert crews. Used in this way, cameras reduce carbon, lower costs, and keep employees out of hospital. Camera sensors are but one example—other sensors measure sounds, smells, vibrations, temperatures, pressures . . . the list is endless.

#### **EDGE DEVICES WILL PROLIFERATE**

The power of distributed inexpensive sensors coupled with **cloud**-enabled machine interpretation of sensor data will unlock demand for **edge devices** that continuously self-monitor and do not require constant human supervision. The first uses will be to run remote operating equipment in the field, with the occasional check-in as a satellite network link comes around.<sup>37</sup> As the industry grows more comfortable with the reliability and trustworthiness of these devices, they will take

on more of the routine field supervision role. **Drones**, the most rapidly developing class of edge devices, are advancing quickly because of low-power chips and better battery technologies.

#### **MACHINE-CENTRIC BUSINESS**

##### **MODELS WILL PREVAIL**

Business models that are dependent on people working in forced close contact are in peril. Workers are justifiably alarmed at the prospect of working conditions dependent on confinement and proximity. Oil and gas has invested in many rigid technologies that will remain human-centric for operations and maintenance, but edge devices that can run safely and reliably, and are virus-proof, are the future. The rise of the machine-based business model is here. Expect to see a big jump in interest in algorithms, **machine learning**, artificial intelligence (**AI**), and **autonomy** that contribute to keeping equipment working longer and harder without human supervision.

##### **BROWNFIELD ASSETS WILL GET NEW LIFE**

The majority of oil and gas infrastructure, from wells to gas stations, predates ESG concerns and the digital era. These assets now serve as a drag on the ability of companies to achieve much progress on their ESG commitments because they are so resistant to change. On the other hand, they can be data-rich assets because of their connections to SCADA and other monitoring systems, and they gain hugely from the analytic possibilities of machine learning and AI. Such tools can help improve the quality of legacy data so that it yields better analytic outcomes, as well as helping in conducting better analytics on new data. Better analytics leads to better operations decisions that include ESG targets. In time, **brownfield** assets can be managed more tightly and in conformance with ESG goals.

##### **CARBON MEASUREMENTS WILL IMPROVE**

Brownfield and greenfield assets will be material carbon sources for the foreseeable future, which means the industry will need to carefully track its carbon position so that it can make appropriate positive

offsets. Today, carbon measurements tend to be from engineering principles, whereby a given asset, designed to run at a certain level with a fuel of known characteristics, has an estimated carbon output.

However, assets leak, valves drift out of calibration, and different gases have wildly different impacts. Because of scale effects, minor variances in carbon measurement accuracy can add up to huge absolute differences from engineering estimates.

Digital tools such as edge sensors and satellite imagery interpretation can help provide near-real-time, continuous monitoring of actual asset carbon impacts by detecting vapors and recording measurement data with low latency in easy-to-access cloud databases.

#### **SUPPLY CHAINS WILL BE RECONFIGURED**

With in-person collaboration now a risky undertaking, and the proven ability of conferencing tools like Zoom and Teams to compensate for the loss of the in-person experience, expect to see collaboration tools—joint document editing (Google Docs), shared work tasks (Trello, Teams), team communications (**Slack**)—to be deployed more enthusiastically in the supply chain, with both contractors and suppliers. Global networks allow service companies to offer real-time asset supervision from anywhere in the world.

#### **SUPPLY CHAINS WILL BECOME TRANSPARENT**

The supply chain for oil and gas is long and complex. Tracing products throughout the supply chain to provide the assurance that the products were sourced from ethical suppliers with meaningful ESG practices is fast becoming a requirement of global brands. This is already very pronounced in consumer goods, pharmaceuticals, and many food products, and has now come to chemicals.

Digital innovations provide better tracking and tracing of fluids, gases, and commodities throughout the supply chain, given the chain's high level of fragmentation, multiple handoffs, discrete services, frequent changes in control, and high regulatory burden. Tools like **blockchain** are now very handy in helping deliver the transparency that supply chain participants need to assert to their ESG metrics.

**CAPITAL ACCESS WILL ADAPT**

Traditional capital markets are now skittish about lending to the fossil fuel industry, and regulators are forcing lenders to be transparent about their exposures to energy market transitions. At the same time, digital innovations are also creating new pools of capital that, until regulation catches up, may be used to finance the industry, by fractionalizing asset ownership, **tokenizing** oil production, and settling trade. It's a good bet that someone somewhere has already concluded an oil transaction using bitcoin. Expect the industry to progressively explore these new financing tools to assist with its operations.

IT'S BECOME clear that the adoption of new ways of working enabled by digital tools is a critical pathway to lower costs, boost productivity, and unlock new business models. According to Jay Billesberger, "digital takes noise out of your system. Everybody immediately knows what the baseline numbers are. You manage by exception."

Moreover, it turns out that digital innovations are *the* key solution to solving the problems of the pandemic *and* the cost challenges of the industry. And they've been in front of us for a couple of years now.

Those that embrace digital innovations can expect cost reductions of 20 percent or more and productivity gains of 20 percent or more. Some companies, like Repsol, have staked their future on achieving carbon neutrality, which can only be done if the work processes that generate carbon are overhauled, in line with solving pandemic challenges, and costs are lowered. Digital is the way forward.

## KEY TAKEAWAYS

Here are a few key takeaways from the forces of change facing the industry:

- 1 The transition to a more diversified and rebalanced energy mix is now in motion and measurable.
- 2 Future demand for fossil fuels for transportation is very much uncertain, but the demand for plastics and petrochemicals is still robust.
- 3 Environment, social, and governance factors now weigh very heavily in making decisions about energy sourcing and consumption.
- 4 The climate legislation from the European Union is the global pacesetter for the future of fossil fuels.
- 5 Capital markets now decisively favor digital companies.
- 6 The pandemic taught the energy industry that it can change quickly when necessary.
- 7 Digital tools that were in place but underutilized demonstrated their value during the pandemic.
- 8 The oil and gas industry is still far from capturing full value from digital innovation.

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