

Viewpoint

THE FUTURE IS INNOVATION

ENERGY & UTILITIES

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INTRODUCTION

Energy and utilities are facing some of the greatest sustainability challenges of any sector in the GCC. Exacerbating the slow and steady depletion of the region's finite resources is an energy consumption on the rise, with Qatar, Kuwait, the UAE and Bahrain displaying among the highest rates of per capita primary energy consumption in the world. The imbalance between limited supply and near insatiable demand is stark, and the need to address it, urgent.

Here, a number of key factors come into play. Public awareness, leadership, discipline and a desire amongst stakeholders to focus on sustainability in the first place are all fundamental to the future of the energy and utilities industries—but it is in the area of innovation that some of the greatest challenges and greatest potential lie.

The troubling reality is that, at the level of industry, the Gulf's energy and utilities sectors remain amongst the most lacking when it comes to innovation and R&D.

The outlook, however, needn't be bleak. Already, willingness to invest in innovation is evident in the upstream oil and gas sector, and momentum is growing in the realm of renewable energy too. Now is the time for other energy and utilities players to follow suit, and embrace the value that innovative technologies can add to the performance and long-term sustainability of their business.

To seize the potential that exists, the industry must develop strategies that nurture innovation on multiple fronts: encouraging employees to think outside the box, boosting investor confidence in R&D, and exploring new financing options that make sustainable energy not just a viable alternative, but the only option.



LANDSCAPE

The energy debate is not new. For years—decades even—the world’s hydrocarbon heavyweights have been aware of the need to explore energy alternatives that are not only friendly to the environment, but to economic growth, too. However, with every passing year, the debate becomes more serious and the stakes, higher.

Combined, the six GCC states hold almost a third of proven crude-oil reserves and approximately a fifth of global gas, but while the region’s reserves are still plentiful, they are not infinite; one day, they will inevitably run dry. Moreover, defying the logical premise that finite resources command higher prices, the value of oil—in per-barrel terms at least—has plummeted in recent years in the face of rising production in countries such as the United States.

And the challenge doesn’t end with supply and cost concerns. In addition to declining reserves on the one hand, and declining revenues on the other, a third factor is adding pressure to the energy equation: consumption. Rapid industrialization, population growth, increasing water desalination and rising domestic energy demand, are testing the region’s capacity to its limits.

During the 2000s, regional energy consumption grew at an average of five percent per year, according to the International Renewable Energy Agency (IRENA)—that’s faster than India, China and Brazil. Meanwhile, on the global stage, Saudi Arabia now counts as the seventh largest consumer of oil in the world. IRENA research states that domestic consumption amounted to about 28 percent of production in 2014, compared with 17 percent at the turn of the century.

Ever-increasing energy consumption calls into question the GCC’s ability to maintain the kind of

“the key to sustainable success lies in a force constantly promoted yet all too infrequently embraced: innovation.”

export levels necessary to sustain its economic strength. Such is the severity of the consumption concern, some oil and gas producers are even turning to imports. For instance, despite possessing the world’s seventh largest natural gas reserves, the UAE now imports gas in order to meet rising demand, mitigate lag times for domestic production and honour existing export obligations.

In potent combination, these factors have forged an energy landscape in need of fundamental change. Shifts in policy and national budgets across the GCC indicate that the region’s governments are responding to the call to action, and renewable energy sources have grown in both sophistication and uptake. Yet, at the level of industry, the region’s key energy and utilities players still lag behind other sectors when it comes to adapting their modus operandi to the new realities of our world.

With time ticking, the question for oil companies needs to shift from how much they can extract, to how long they can extract for, while corporate strategies designed to engineer faster, larger, tougher and cheaper energy must now center on the all-important principle of sustainability.

Here, alongside the issues of leadership and collective desire for change, one of the keys to sustainable success lies in a force constantly promoted yet all too infrequently embraced: innovation.



FRAMING THE DISCUSSION



Innovation is a buzzword that has been catapulted to the top of corporate agendas across industries and sectors—and rightly so. In an age where unprecedented technological evolution, diminishing natural resources and aggressive competition combine, the need for companies to innovate is beyond doubt. Yet, how many of us truly know what innovation looks like? Or, more importantly, how to achieve it?

There is a tendency in the corporate world to view innovation as synonymous with research and development (R&D), but this is just one component of innovation. Research and development seeks to find solutions through structured approaches, with equally structured boundaries. It has an “owner”—often scientists and academics—and findings are dictated by the laws of science and data.

By contrast, innovation almost relies upon breaking the rules. It is much broader, more flexible. With the overarching aim of fostering an environment of creativity and idea-sharing, innovation provides both direction and freedom for ideas to evolve. While data is important, innovation values observations and experiences over hard science or numbers, and can originate from any employee at any level of an organization.

For energy and utilities companies that have traditionally towed the line of convention, embracing the fluidity and diversity of innovation can be a formidable challenge—yet arguably the most important to overcome in the quest for a sustainable future.

R&D VS. INNOVATION

R&D	INNOVATION
	
OBJECTIVE Finding a solution through a structured approach	OBJECTIVE Foster an environment of creativity and idea-sharing across the organization
DESCRIPTION <ul style="list-style-type: none">Is conducted primarily by the R&D department of a companyFollows a highly structured and scientific processIs typically owned by people with strong academic and research-oriented backgroundsPotential ideas are generated through a scientific and data-driven approach	DESCRIPTION <ul style="list-style-type: none">Uses inputs from across the organization—R&D being one of the inputsThe process followed is loosely structured and needs to be appropriately channeled and managed to create impactAllows freedom for people to come up with any ideas, yet provides the direction for increasing the impact of the ideasInnovation ideas could originate from employees regardless of their levels, education, or backgroundsIdea generation could be less data-driven and much more open to observations and experiences





CHALLENGES

That an industry in need of potentially world-changing reform should also be one of the least innovative, is not without contradiction. Energy use is linked to several global issues—concerns over greenhouse-gas emissions, conflicts over oil supplies and loss of industrial productivity due to shortages, to name but a few—yet utilities companies continue to resist the call for innovation. In fact, according to the International Energy Agency (IEA), global energy investment (both public and private) fell 12 percent in 2016, marking a second consecutive year of decline. Investment in fossil fuels along with renewables used for transport and heat were hit particularly hard, with each dropping by 25 percent in the space of a year.

The reasons for this lackluster investment stem from genuine concerns that plague the energy industry, with **intellectual property (IP)** prime amongst them. Competition in the energy and utilities space is stiffer than ever, causing companies to keep a tight grip on the knowledge and technologies that afford them a competitive edge. In the eyes of many stakeholders, a trade secret shared equates to essential dollars lost.

That's not to say that energy and utilities companies don't collaborate—they do. But, that collaboration occurs with companies outside of their industry. While drawing on external knowledge has led to advancements in areas such as drilling, modelling and surveying, it has hindered innovation within the sector, with progress stunted further still by lack of investment.

Closely guarded or not, coveted R&D can only go as far as **investment** allows, and herein lies another key challenge for energy and utilities companies. Industry-wide, reluctance exists amongst stakeholders to invest in new research and explore uncharted territory. Despite the need for sustainability, the uncomfortable reality is that as long as fossil fuels remain the cheapest way to produce energy, utilities companies have little incentive to take a serious look at greener alternatives.

Yet, innovation isn't just about renewables. According to a study by the United States government's Lawrence Livermore National Laboratory, more than 60 percent of the energy we use is lost between the time it is generated and the time it is consumed. This means that innovations with the power to reduce energy loss can also result in financial gains for industry players.

This prospect, however, has thus far failed to whet stakeholder appetite for innovation, due largely to a deep-seated **reluctance to adapt and change**. According to the 'Oil and Gas

Technology Radar' report prepared by Lloyd's Register Energy, 42 percent of survey respondents stated that their firms lacked a culture of innovation, with more still admitting that they had failed to fulfil their innovation goals. Where innovation goals are met, as a result of lower oil prices, those goals focus on reducing costs and boosting efficiency. This often means that projects with shorter maturity dates are likely to be fast-tracked, leaving longer-term projects on the shelf.

The absence of a company-wide culture of innovation trickles down to the employee level too. As a general trend, there is a prevailing tendency for industry professionals to **adhere to tried and tested practices**, at the expense of progress.

Even where appetite for change does exist, the energy and utilities industries are still confronted by the perennial challenge of **financing innovation**. Given the propensity for energy companies to safeguard their R&D, they have historically also funded their own research in order to limit external involvement. Meanwhile, those who do seek external support encounter different obstacles: as with all R&D, the lifecycle of many energy projects can be long, and with no guaranteed payoff, outside investment for R&D can be hard to secure.

From securing investment and financing, to protecting IP and nurturing a culture of innovation, the challenges faced by energy and utilities players are formidable. However, from small companies to energy giants, signs of progress are emerging world-wide, paving the way for the rest of the industry to follow.



SIGNS OF PROGRESS

Despite the challenges, there are some clear examples of progress in the sustainability stakes. Already, willingness to invest in innovation is evident in the upstream oil and gas sector, and momentum is growing in the realm of renewable energy too.



Setting the benchmark in fossil fuels, the world's largest oil and gas services company, Schlumberger, spends an average of US\$280 million per year investing in new techniques, while fellow industrial services company, Baker Hughes, spends about US\$92 million. These sizeable figures are dwarfed by the investment made by international oil companies, with Shell spending around US\$1.18 billion per year, Exxon \$1.02 billion and BP an average of US\$646 million. For their part, some GCC national oil companies go further still, with Qatar Petroleum committed to spending around US\$10 billion over the next decade and Saudi Arabia's Aramco, US\$40 billion, allocating that investment primarily in upstream and offshore innovations.

The signs are positive for renewables too, with the year 2015 producing a new record for global investment in renewable energy. The amount of money committed to renewables, excluding large hydro-electric projects, rose to US\$285.9 billion, exceeding the previous record of US\$278.5 billion achieved in 2011.

Unlike oil and gas, however, the bulk of investment in renewables comes from asset finance, with corporate R&D notably absent. To uncover corporate investment in innovation, we have to turn to the energy sector's smaller companies, largely in the United States and Europe. For instance, a company in New York City is using a block chain network to facilitate energy trading among neighbors, while a firm based in San Francisco monitors energy usage in commercial buildings, before processing that data in the Cloud using artificial intelligence and flagging improper usage that can be optimized to save energy.

These examples of progress may be small in scale and geographical reach, but they demonstrate the possibilities where the resources and—more importantly—the will, exist.

The MENA region is still at the nascent stages when it comes to innovation and energy sustainability, but some organizations have begun to take meaningful steps in the right direction. With expert external support, several companies have identified a number of tracks along which to drive their innovation efforts. Examples of such tracks include:

1. stakeholder happiness,
2. technology,
3. sustainability,
4. operations,
5. business model.

Fostering a culture of innovation and pushing for sustainability are difficult tasks, but by separating out target areas in this way, the potential exists for organizations across MENA to hone in on the challenges and opportunities specific to each, and develop focused objectives and effective strategies as a result.

THE STRATEGY

Only when the vision is clearly defined, can an appropriate plan of action take shape. Here are some key considerations to factor into any strategy for innovation.

VISION: SET YOUR COURSE

As energy companies large and small are demonstrating, where there is the will, there is a way. Of course, given the size and complexity of larger national or international firms, the road to sustainability can be significantly more challenging, but with the right strategy in place, sustainable energy is an achievable feat.

Yet, strategy alone is not enough. In parallel, companies must also create a vision that paints a clear picture of the level of innovation—and impact—they are aiming for. Here, four factors are key:

- the novelty and creativity of the product, service or process
- the financial impact that innovation will have on the organization

- the value-add to customers
- the impact on the national agenda of the company's home country.

Where levels of each of these four factors are low, business sustainability is likely to be modest. As these levels increase from low, to moderate to high, so too does the impact. Where innovation is limited, companies can expect little or incremental progress. In contrast, firms that invest heavily in core innovations that benefit company, customer and country, could be on their way to becoming regional, industry or even global leaders.

WORKFORCE: ENCOURAGE OUT-OF-THE-BOX THINKING

Even for energy companies rich in natural resources, human capital counts as their most valuable asset where innovation is concerned. Traditionally, employees in the industry have towed the line of convention and rarely strayed from the tried and tested. As a result, engendering a culture of innovation amongst teams can be a big ask. Efforts to encourage innovation thus far have involved companies incentivizing employees to generate ideas. However, in today's highly connected environment, ideation—while important—is not the most difficult aspect of innovation. Much more challenging is turning ideas to clear concepts—proposals that are feasible and that can be implemented to benefit both the organization and its stakeholders.

To this end, the following advice can help organizations on the path to boosting innovation within their workforces:

Take a Broader View

It's important for organizations to think of innovation across a spectrum that encompasses the company, regional, industry and international levels. At one end of the spectrum is sustaining innovation, which refers to innovations that are new to an organization. Next is innovation that is new to the region and makes the company responsible a regional leader. This is followed by innovation that marks an industry breakthrough. Then, at the other end of the spectrum comes disruptive innovation which counts as a world first. The ideas generated

within an organization can be much more effective if employees are aware of these different categories of innovation and are offered incentives depending on the type of idea that is generated.

Extend Incentives to Implementation

While incentivizing employees to create the right kind of ideas is important, the incentives should not stop at idea generation. Rather, they should continue until the idea is implemented in order to keep employees motivated and allow them to feel a sense of pride and accomplishment. If done correctly, this approach can also create the long-term and permanent benefit of developing a culture of innovation within the organization.

Fail Forward

A key ingredient in motivating employees to innovate is willingness to accept failure on the road to success. It is important for all levels of a workforce to understand that failure is an important part of learning and development. In fact, it is often through failure that we are able to improve or enhance products, processes or services. Here, it is vital to develop a “fail-forward” culture. Unless employees feel safe to experiment, they will not be willing to come up with or share innovative ideas as the fear of failure and resulting consequences will overpower their creativity.



INTELLECTUAL PROPERTY: WORK OUT WHAT TO SHARE AND WHAT TO PROTECT

Industry concerns over sharing intellectual property are well-documented and deeply entrenched in the energy and utilities spheres. To address this issue and to promote innovation, it is important for companies to not view IP, patents and protection as one and the same. In reality, not all IP needs to be patented, and not all patents need to be monetized. With this in mind, a more structured approach to IP will allow companies to foster innovation, while protecting the IP that is critical to their operations. As a first step, companies can classify their IP into three categories:

- IP required to grow the business;
- IP required to defend the organization's business against infringements; and,
- IP that could be used to encourage industry-wide innovation and adoption.

A powerful example of using patents and IP to foster innovation is the Eco-Patents Commons, a platform for businesses to share intellectual property that can further

sustainable development. Through this platform, a number of leading patent holders such as IBM, Nokia, Sony and global e-commerce solutions provider, Pitney Bowes, have policies of giving away their patents free of charge to anyone who wants to develop a clean-tech solution. Since the launch of Eco-Patent Commons in 2008, around 100 patents have been pledged by 11 companies.

This is an encouraging sign for other companies wishing to follow suit. However, they should bear in mind, that for such efforts to be effective, the initiative to share IP should result from a coming together of the private sector; it should not be driven by government. Any government-driven initiative may be seen as an infringement of a company's rights and might stifle the private sector's desire to invest in the development of new ideas. This, however, does not mean that governments have no role to play. In fact governments can be instrumental in promoting IP sharing by developing incentives or platforms to encourage and facilitate private sector collaboration.

KNOW-HOW: HARNESS THE POWER OF ORGANIZATIONAL KNOWLEDGE

While sharing intellectual property with other organizations can play an important role in driving innovation, another source of inspiration lies much closer to home, within a company's own workforce. Historically, organizations have paid most attention to capturing explicit knowledge. That is, the kind of information that can be captured and internalized from manuals, processes, copyrights and patents. Today, however, there is an increasing realization that innovation is typically driven not by this explicit knowledge, but by tacit knowledge that resides in the minds of an organization's employees. In order to drive innovation, therefore, companies need to implement mechanisms that best harness the power of organizational knowledge.

While explicit knowledge, such as technical or academic data, centers upon the “know-what”, tacit knowledge can be described as the “know-how”—the personal knowledge, unique to every individual.

When it comes to innovation, the fact that tacit knowledge cannot easily be accessed or replicated by competitors makes it more valuable than its explicit form. However, it is not easy to capture and companies need to leverage a variety of mechanisms in order to seize its potential and drive innovation. Such mechanisms could include online forums, design thinking sessions, gamification and communities of practice through which groups of employees create common practices in areas of common interest.



ACCESSING IDEAS: BOOST YOUR INNOVATION THROUGH COLLABORATION

A key issue within the intellectual property debate relates to the question of collaboration. On this topic, evidence suggests that the most effective way to access innovative ideas while protecting vital IP is to collaborate through both open and closed techniques. The former largely revolves around cooperation and knowledge-sharing between companies on the one hand and academic institutions, research centers, startups, communities or individuals on the other. The latter, meanwhile involve internal R&D and the creation of corporate ideation platforms.

Benchmark Companies: Open Collaboration in Action

Through its academic outreach program, Google supports university research, academic development and technological innovation across all geographies. For its part, German electric utilities company, RWE, collaborates with R&D centers such as the Siebel Energy Institute at University College Berkeley in the

US towards the development of new ideas in areas such as power grid resilience and distribution efficiency. Amazon is another case in point. Through its Catalyst program with the University of Washington, the e-commerce giant provides funding and mentorship for globally impactful projects proposed by members of the university community.

Google is also a key driver of collaborative innovation at the start-up level. For instance, Google for Entrepreneurs has partnered with Startup Grid, Techstars and AstroLabs to create business incubators operating in Europe, Asia and Latin America. US biotechnology company, Illumina, is also noteworthy in the startup space. Illumina Accelerator and Illumina Accelerator Boost Capital offer extensive mentorship, financial support and access to sequencing systems, reagents and lab space to start-ups.

A further string in the open innovation bow takes the form of targeted acquisitions, through which companies acquire innovative ideas and IP from other firms. For example, since its launch in 1998, Google (now Alphabet), has acquired more than 170 companies; its most costly acquisitions including satellite imaging company SkyBox Imaging, video monitoring company Dropcam and e-mail and web security service Postini.

French transnational utilities company, Veolia, also serves as a case in point when it comes to other forms of open innovation techniques, including innovation competitions, challenges and crowdsourcing platforms. Through The Institute, an online platform for discussions and debate, Veolia brings together a network of distinguished scientists to discuss ecological and environmental issues.

Benchmark Companies: Collaborating on the Inside

While collaborating with external parties can boost innovation, so too can turning attentions closer to home. By encouraging cooperation, collective thinking and idea-sharing between existing teams, many energy and utilities companies can chart their own course for innovation, without outside support.

When it comes to home-grown innovation, Google features once again, with products such as Google Wave developed entirely in-house.

Of course, this kind of innovation requires significant resources and while collaborating with external parties can boost innovation, so too can turning attentions closer to home. By encouraging cooperation, collective thinking and idea-sharing between existing teams, many energy and utilities companies can chart their own course for innovation, without outside

support. Here, Google features once again, with products such as Google Wave developed entirely in-house.

Of course, this kind of innovation requires significant resources and often involves the creation of new departments or entire R&D centers. For instance, to facilitate their innovations, Google's mother company Alphabet, understands that investment is vital, and in 2015 alone, spent US\$9.8 billion on R&D.

However, while Google's achievements are impressive, Amazon's investment in R&D is far greater, with the company channeling US\$13.3 billion into research and development in 2015. Lab126, a subsidiary of Amazon, is a dedicated R&D center charged with developing new hardware and software for Amazon devices.

For its part, RWE focuses its R&D efforts on CO₂ reduction processes, gasification and biomass, spending US\$111 million in the process; while Italian electricity company Enel dedicates its considerable R&D efforts to socio-economic research spanning policy/regulation, finance and energy markets, energy security and sustainable development and innovation.

Both RWE and Enel are also frontrunners when it comes to corporate ideation. In 2014, Enel employees presented 1,300 ideas to address challenges defined by the company in the Eidos Market platform developed by Exago, while RWE Effizienz, the company's innovation arm, uses HYPE to manage its ideation process, allowing 150 employees of the entity to participate.

As the examples taken from these global corporate giants demonstrate, innovation arises from a combination of open collaboration with the outside world, and boosting idea-sharing, R&D and investment on the inside.

BUY-IN: ENGAGE STAKEHOLDERS THROUGH INNOVATIVE R&D

While examples from companies such as Google and Amazon demonstrate the power of innovation and the centrality of research and development to nurturing it, stakeholders in companies across industries remain reluctant to invest heavily—or sometimes even sufficiently—in R&D. Even R&D-dependent industries have, in many cases, focused on shortening the research and development cycle in recent years, with energy and utilities companies being no exception.

In the energy sector, as in all other fields, stakeholders want to see results. Therefore, to encourage buy-in, energy and utilities companies must be sure to adopt the right approach to R&D—an approach that balances outcomes with investment.

Here, organizations must first make a choice between fundamental research, which requires significant resources and funding, and applied research, which is less resource-intensive.

Efficiency and transparency are also important factors when it comes to securing investment. Therefore, once the choice between fundamental and applied research is made, the organization needs to develop a strategy that incorporates both factors into the R&D process. For example, a start-up could help test a product with a much faster turnaround, or a crowdsourcing challenge could be used to create multiple solutions to an issue, on an open and transparent platform.

A fundamental tenet of such processes, is that they encourage an organization to use all internal and external resources at its disposal, instead of treating R&D as a purely internal, monolithic, and linear process. Such an approach often results in increased stakeholder buy-in and reduced risk for the organization.



IN CONCLUSION

The GCC's energy and utilities industry may be facing some of the greatest sustainability challenges of any sector, but by harnessing innovation, they have the power to build bright, sustainable futures that benefit not only the environment, but the bottom lines of companies across the region too. Even where insatiable energy demand meets limited supply, with the right vision, strategy, resources and support in place, the GCC's energy players can change the game and continue fueling the region's growth long after the world's fossil fuels run dry.



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For more than 15 years, Dr. Sleiman has advised both public- and private-sector clients in the Middle East and Europe. In doing so, he has worked across a broad range of industry sectors including energy, utilities, technology, chemicals, financial services, telecoms, healthcare and transport. As leader of the Digital Energy platform in the region, Dr. Sleiman supports the technology and smart grid agendas of a large number of MENA utilities. He holds a Ph.D. in communications and signal processing, as well as a master's degree in electrical and electronic engineering, from Imperial College London.



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The background of the entire page is a close-up, artistic photograph of a human hand, specifically a finger, touching a surface that glows with a complex, blue, circuit-like pattern. The pattern resembles a printed circuit board (PCB) with various lines, nodes, and circular components. The lighting is dramatic, with the hand and the glowing pattern being the primary light sources against a dark background. The overall aesthetic is high-tech and digital.

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