The Abdullah Bin Hamad Al-Attiyah International Foundation
for Energy & Sustainable Development

~ CEO Roundtable Series ~

WHITE PAPER

INNOVATIVE TECHNOLOGIES: *Cutting Costs, Boosting Efficiency?*

INNOVATIVE TECHNOLOGIES OUTLOOK:

Adaptability Equals Profit

Innovative technologies, such as robotics, digital data and solar tools, are revolutionizing the energy industry as steam power did in the 1700s, electricity in the 1800s and hydrocarbons in the 1900s. The industry's status quo is being overhauled – again – and the days when PDFs of data were manually passed between engineers at refineries, or between desks at offshore oil rigs will soon be remembered as a charming historical habit.

Balancing the books for the Gulf's energy companies is not getting any easier. Turbulent oil prices, soaring energy demand, green regulations and competition from energy producers in the US, Iran, Russia and many others is only going to intensify. Innovative technologies represent the much-needed pressure release valve that can enhance safety, cost and operational efficiency. To unlock this potential, energy companies must get to grips with the rapidly evolving lingo and application – quickly. The pace of change for those who want to remain commercially competitive will not be measured in decades, but by a few years. The tick of the clock is louder than ever before.

OLD HABITS CANNOT DIE HARD

The hydrocarbons sector is often described as conservative, clunky and slow moving, with an internal bureaucratic structure that does little to foster and promote new ideas. It can be extremely risk averse and carries the mantra that there is everything to lose, as opposed to everything to gain. This will no longer suffice.

While the oil and gas industry helped trail blaze some digital concepts in the 1980s and 1990s, the evolution of the Internet of Things (IoT) and digital analytics in recent years, for example, means energy stakeholders must update their knowledge. The alternative is to fall behind while competitors widen their profit margins.

Using IoT – where objects have network connectivity that enables them to send and receive data – can significantly accelerate the pace at which companies build their historical and comparative databases, thus boosting safety and efficiency. The IoT market is estimated to grow from $157 billion in 2016 to $662 billion by 2021 at an annual growth rate of 33.3%. Such technologies enable industry to predict when a process may fail and why, which has the potential to cut the bill down to one hundredth of the initial cost.

Crossover technologies, which are tools from other sectors that can be applied to the energy sector, have long been applied to the energy industry. But squeezed finances mean they are increasingly popular strategies to hedge against very expensive unexpected shutdowns, safety challenges and environmental hazards.

Examples include automated image analysis used by security forces for facial recognition being applied to determine drill bit damage and using data mining that is typically applied to reducing the drag on a racing car whizzing around a track at 200km/hr by milliseconds to bolster efficiency in oil and gas operations. Ultrasound technologies originally developed for medical uses can be used to detect cracks during upstream exploration, which is especially vital for the maturing fields onshore and deep-sea sites that need special attention.

Lessons can also be learnt from different parts of the value chain within the energy industry. Robotics, which have long been used in underwater exploration, can be programmed to 'crawl' along the tens of thousands of kilometres of the Gulf's oil and gas pipeline network to detect leaks and corrosion before costly damage occurs, for example.

Low oil prices mean savings are especially popular in today's penny-pinching industry. Global up-

NEED FOR ENERGY SECURITY IN THE MIDDLE EAST WILL ONLY INTENSIFY

49%
Energy consumption in the Middle East is expected to climb by 49% by 2035, according to BP's Energy Outlook.

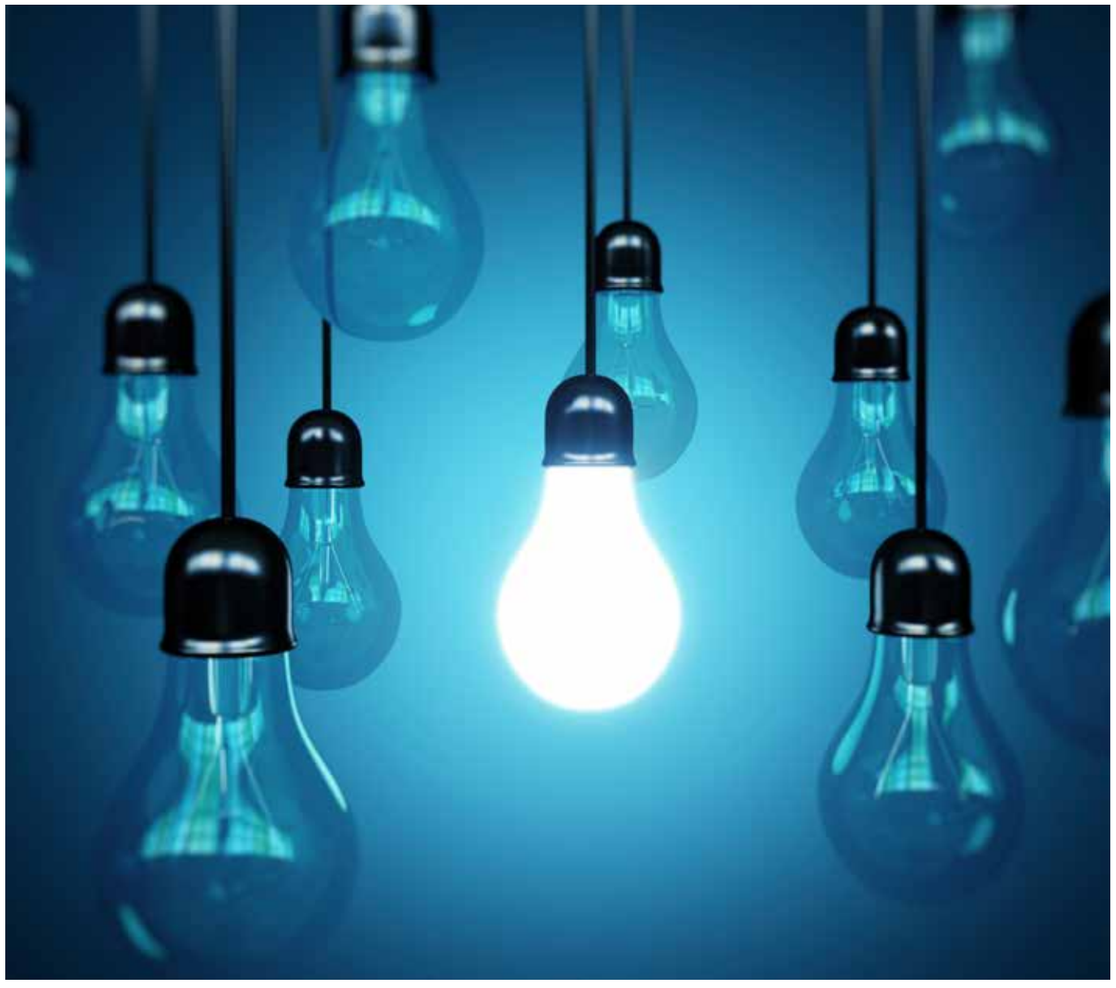
X8
Qatar's population of 2.67 million could swell eight-fold by 2050.

5
Dubai's population is expected to double to 5 million by 2030.

500,000
Half a million people this year will join the 12 million people already in Cairo – one of the world's fastest growing cities.

QATAR: SETTING THE TREND

Many energy voices in the Gulf claimed that Qatar's geography would spell the end of its foray into the liquefied natural gas (LNG) markets in the early 1980s before it gained any traction, as the country is not located close to the ports in East Asia, Europe, or the US. Fast forward three decades and Qatar is the world's biggest LNG exporter, with revenues from LNG, natural gas and oil accounting for approximately 70% of government revenues and 85% of export revenues. The country also has one of the world's highest rates of GDP per capita. How did Doha sharpen its competitive edge in an industry so focused on keeping shipping costs low by prioritizing convenient geographies? Qatar's innovative mindset led it to creating an integrated value chain – from production to shipping – that cut costs and established Qatar as one of the world's most reliable suppliers. This was best illustrated by Doha's ability to immediately divert every possible ton of LNG to support long-time ally Japan following the Fukushima nuclear crisis in 2011. Novel ideas have also been used to respond to new global environmental guidelines and in support of Qatar's National Vision 2030, such as reducing gas flaring to almost nil and correcting damaged coral reefs.



"Innovative technologies require imaginative minds – there are no short cuts."

6,000
Innovative solar technology will enable Oman's Miraah project to create 6,000 tons of steam per day to support enhanced oil recovery operations at the country's Amal field.

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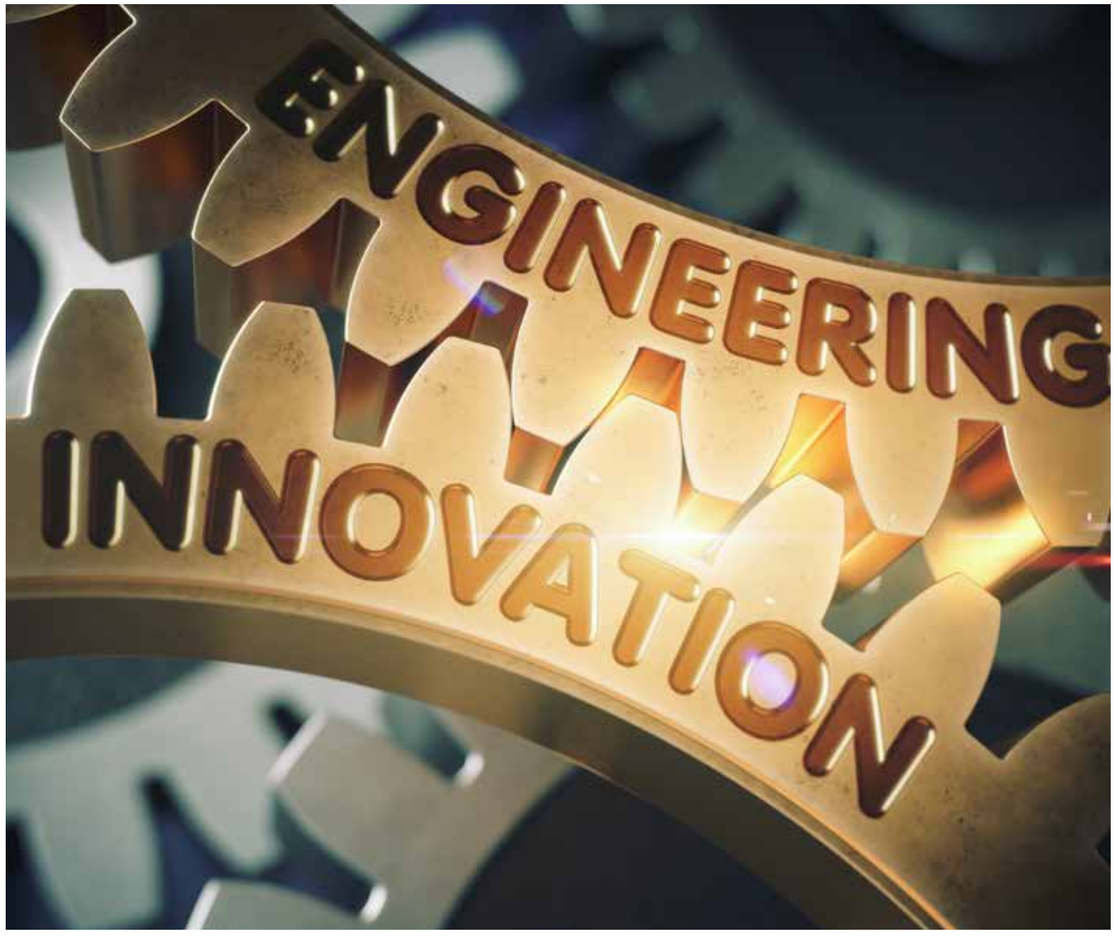

stream oil and gas investments fell by more than $300 billion in total over 2015 and 2016, which marks the greatest fall in more than 40 years, according to the International Energy Agency (IEA). The bearish trend is expected to continue in 2017.

FAIL FAST

The 'fail fast' concept is gaining traction, with the view that covering as much ground in R&D as possible keeps high-value talent engaged in an industry that sees a lot of staff movement. It also raises the chances of R&D efforts hitting gold – the launch of an innovative technology. The 'fail fast' approach differs to exploratory R&D, which is typically associated with allocating a team to work for several years on a project with no definable finish line. While equally valuable in the field of technical and scientific research, exploratory R&D does not feed industry's hunger for quarterly and annual progress.

Whatever the route, industry needs to communicate more clearly with government and academia to ensure that global talent working on R&D are confident that their efforts will have tangible value in day-to-day operations. This will raise the chances that a R&D team will see a project through its 'life', rather than an idea being left rudderless as staff move onto new pastures.

Innovative technologies require imaginative minds – there are no short cuts. R&D teams must have the grit and perseverance to fail and fail again. The eureka moment will eventually come – Amazon, Google and Apple are just a few of the world's biggest names that have all had multiple failures.

33.3%

The IoT market is estimated to grow from $157 billion in 2016 to $662 billion by 2021, with an annual growth rate of 33.3%.

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Thomas Edison, US inventor and businessman, said it best: "Innovation is 1% genius and 99% perspiration." Such perspiration must be facilitated by a forward-looking management, as well as governmental support and corporate partners who share a thirst for reasonable risk and knowledge sharing.

An individual will struggle to think outside the box when the confines of that box are bogged down with processes, procedures and guidelines. Initiatives that can be introduced include Google's 20% rule, which sees employees spending a fifth of their time working on novel ideas that they think will most benefit the company. Industry could also adopt aspects of much bigger changes, as seen in the UK where the Financial Conduct Authority (FCA) has created a 'regulatory sandbox'. This structure allows financial technology firms to test their innovative business models, products and services without strongly stipulated processes stifling their progress.

FLEXING INTELLECTUAL MUSCLE

A simple question lies at the heart of fostering a collaborative partnership to create, fund and apply innovative technologies in the energy industry: what do you think? Tactfully exposing internal company challenges will generate solutions faster. Speed is vital.

"The Captains of the first ships to set sail into uncharted territories often claim the greatest treasures."

Large organizations like national and international oil companies with sizeable R&D budgets often fall into the trap of keeping information close to their chests for fear of hampering their intellectual property (IP). They tend to hire in-house R&D teams instead of working with external thinkers, which can create circular theories – the recycling of the same ideas that leaves the status quo unchallenged. Therein lies the importance of nimble small and medium-sized enterprises (SMEs) and entrepreneurs, which also represent the fastest growing work force in the Middle East. Qatar alone estimated in late-2015 that SMEs accounted for 97% of the country's companies. Continually reducing the financial entry hurdles into R&D and innovative technologies for SMEs and entrepreneurs worldwide is essential to ensuring that small ideas bloom into influential progress.

20%

One of Google's rules includes employees spending a fifth of their time working on novel ideas that could cut costs and benefit the company.

Enabling the brightest brains to break free of conventional thinking in the field of green energy could prove especially profitable as illustrated by Oman's Miraah solar project, which will start coming online this year and will eventually be one of the world's largest solar plants at 1,021 MW of peak thermal energy. The project will create 6,000 tons of steam per day to support enhanced oil recovery (EOR) operations at the country's Amal field. In the UAE, Al Reyadah, a joint venture between ADNOC and Masdar, officially inaugurated the Mussafah facility last November. The first commercial-scale carbon capture, utilization and storage (CCUS) facility in the Middle East, Al Reyadah will capture up to 800,000 tons of carbon emitted from Emirates Steel and transfer it to ADCO's Bab and Rumaitha fields via pipeline for EOR. The two projects are just the tip of the iceberg.

As Andre Gide, the winner of the Nobel Prize in Literature in 1947, said: "Man cannot discover new oceans unless he has the courage to lose sight of the shore." The Captains of the first ships to set sail into uncharted territories often claim the greatest treasures.

114

The number of countries that have ratified the Paris Agreement as of last November, which encompasses around 79% of global emissions. Political momentum for green innovative technologies has never been stronger.

CORPORATE INNOVATION IN 5 STEPS:

LEVEL 1: **Innovation to sustain the deployment of a project. The majority of the energy industry is already adept at maintaining this level.**

LEVEL 2: **Applying innovation across an organization by redirecting teams and resources to explore a new area, or direction.**

LEVEL 3: **Emerging as a regional leader in innovation by spearheading a new process, or product on a widespread basis.**

LEVEL 4: **Enhancing the level of innovation industry-wide by importing ideas from outside the industry and creating something new.**

LEVEL 5: **Creating a unique concept that can be used on a global basis.**

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