



# INNOVATIVE R&D

## *Transforming Ideas into Realities*

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**W**HAT IS A CORNERSTONE IN THE GLOBAL quest for energy security? Innovative and successful research and development (R&D). Transforming innovative ideas into applicable technologies and policies requires three pivotal ingredients: consistent expertise, money and time. Still, R&D cannot be sidelined until budgets are flush and stresses are low. Steady and fluid investments create a robust knowledge foundation that sharpens the energy resilience of countries and companies during both

prosperous and volatile times. Energy R&D is also a key component that lends support to the UAE's National Vision to become a knowledge-based and globally competitive economy.

Global awareness and momentum to support energy R&D is on the rise again. The total public energy research, development and demonstration (RD&D) budget neared \$18 billion last year among member governments of the International Energy Agency (IEA). After four years of decline since 2012, the budget rose significantly to

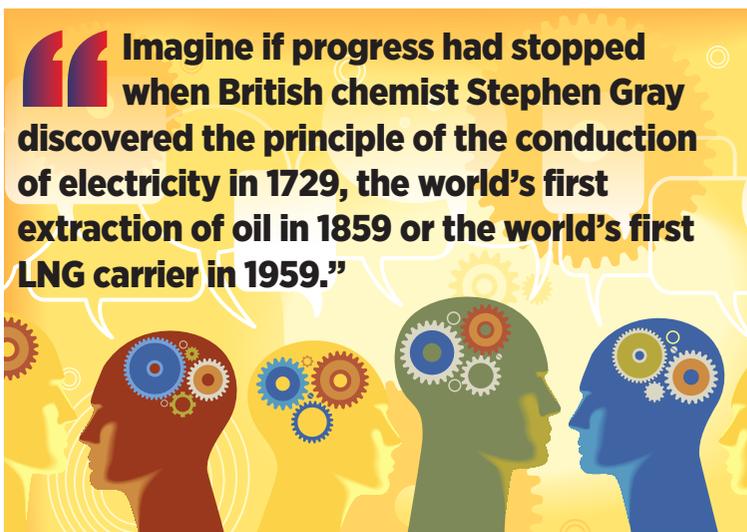
## EXCELLING IN NEW TERRITORY?

reach 2014 levels – climbing by 7% between 2016 and 2017.

Vigorous efforts have long been underway in the UAE. Recently, Dubai Electricity and Water Authority (DEWA) said investments at the R&D Centre at the Mohammed bin Rashid Al Maktoum Solar Park will hit AED500 million (\$136 million) by 2020 and Abu Dhabi-based RDPETRO (Research & Development Petroleum Conference and Exhibition) is now establishing itself as a global hub of the brightest innovators for technologies of the future in the petroleum industry. Mubadala, a global investment company with a mandate to create sustainable financial returns, has shared plans to invest another AED82.5 million (\$22.4 million) for R&D into its Aerospace, Renewables & ICT platform over the next five years.

### GREEN INTELLIGENCE

Energy companies and investors' efforts to strengthen environmental awareness is also playing an integral role in spurring innovative R&D. Spending in low-carbon energy technologies reached \$17.3 billion last year, noted the IEA. Unsurprisingly, more ground-breaking projects that highlight the



limitless opportunities of combining fossil fuels and renewables are emerging with the aim of reinforcing energy security in the 21st century.

Greener enhanced oil recovery (EOR) is one sphere of much-lauded cutting edge progress. Oman’s Miraah solar-thermal plant uses 36 glasshouses to generate 6,000 tons of steam per day to support state-owned Petroleum Development Oman’s (PDO) existing thermal EOR technology. In the UAE, al-Reyadah officially inaugurated the first commercial-scale carbon capture, utilisation and storage

(CCUS) facility in the Middle East in late-2016. Al-Reyadah will capture up to 800,000 tons a year of carbon emitted from Emirates Steel and pipe it to Abu Dhabi Company for Onshore Petroleum Operations for use in EOR.

Innovations are also prevalent in other areas of energy and engineering. GE Power funneled \$2 billion into R&D and three years of intensive development by a team of 1,800 to create the 9HA gas turbine, which gained a spot in the Guinness World Records due to its 62.22% efficiency rate. And the Troll

**“A student cannot jump to a PhD level of knowledge overnight; stepping stones are laid in early education so that expertise can be reaped later. The same applies to R&D. Efforts made today to push the boundaries of what we know pay dividends later as it can take years – if not decades – for a novel idea to transform into a commercial innovation.”**

A gas platform is one of mankind’s engineering marvels as the largest construction ever moved on the earth’s surface.

### WHAT’S NEXT?

What else can we achieve? This is a pertinent question raised by the examination of the rapid progress of the energy market over the last century, from output, scale, affordability, safety, transport and many other successes.

How can more ideas on paper be transformed into innovative policies or technologies that streamline efficiency and affordability? How can talent be incentivized to share ideas

and how can those ideas then flourish in incubator programs within government, industry and academia? What is the best approach to send the right message to financiers to ensure that the much-needed funds that underpin R&D keep flowing?

There is no one right answer to address these complex questions. What we know for sure is that nurturing a R&D ecosystem is a never-ending effort and that early starters reap the greatest rewards. Energy companies must ramp up their efforts now in order to see the benefits in the 2020s and beyond. The exploratory path of R&D is a marathon and not a sprint.

### R&D: EBBS & FLOWS

**40**

Investment from IEA member countries in energy RD&D has become progressively more diverse over the last four decades.

**8%**

RD&D budgets for fossil fuels were at their highest in the 1980s and 1990s. They have fallen from 14% in 2013 to 8% in 2017 – their lowest share since 2000.

**1974**

Nuclear was dominant in 1974 with 74% of the total public energy RD&D budget. It witnessed year-on-year reductions, sliding to 19% in 2017.

**1st**

The US and Japan have the largest absolute spend on energy RD&D among IEA member countries. France, Germany, Korea, the UK and Canada are next in line.

**#3**

The total budget of the European Commission, under the Horizon 2020 program, ranks 3rd place when compared to IEA member countries after the US and Japan, respectively.

Source: IEA Energy Technology and RD&D budgets 2018

## Mastering a tightrope

Leveraging R&D to achieve a nexus of reliability-affordability-efficiency in the energy market will only become more pressing. BP Outlook estimates that the Middle East needs to meet a 54% rise in energy consumption by 2040, while obliging the ambitious lower-carbon targets outlined in National Visions and the Paris Agreement.

Add the United Nations’ (UN) warning that the global population is rapidly rising to these increasing demands; a growth rate that is echoed in the Gulf countries. The number of UAE residents alone could swell by 40% to 13.1 million by 2050. R&D is one of the primary pressure relief valves for energy companies grappling with how to meet these highly

challenging energy and environmental demands while safeguarding budgets. R&D is often an unsung champion of positive disruption. Consider the state of today’s energy market without curiosity to discover what lay around the hypothetical corner. Imagine if progress had stopped when British chemist Stephen Gray

discovered the principle of the conduction of electricity in 1729, the world’s first extraction of oil in 1859 or the world’s first LNG carrier in 1959. Imagine if energy companies shunned the 4th Industrial Revolution for pen and paper, essentially putting themselves in the digital dark ages while other industries finessed their digital fluency.

## Incubator programs

### UNLOCKING POTENTIAL

A key goal should be to uproot and change the way we all think and do business via incubator programs in companies, government and academia. This creates positive disruption in markets, delivers quantifiable value to the ‘host’ entity and value for the end user. Essentially, we must provide answers to new and unseen challenges.

### FOUR CORNERSTONES

Curiosity, commitment, courage and compassion are the four pillars of a flourishing and innovative ecosystem. Examine every point of view; evaluate opportunities with a critical eye; and focus on connections and collaborations. Following these directives will capitalize on untapped potential and release vast economic, social and cultural value – all key growth points in the UAE’s National Vision.

### NATIONAL GROWTH

Incubator programs give employees and partners the confidence to bring their ideas forward. It is essentially an intellectual safe haven where ideas can be freely shared, nurtured and evolve into innovative commercial technologies and policies. A healthy and sustained R&D ecosystem can identify and address weak points in the value chain while leveraging new opportunities that can ultimately strengthen energy security and the UAE’s global competitiveness. For example, pushing intellectual and practical boundaries enabled the discovery of oil in the Middle Eastern region in 1908 to transform the region into the global epicenter of fossil fuels. What other ideas are waiting to be unlocked? □