

WHITEPAPER

The Oman Energy Industry-Academia R&D Protocol

Narrowing the Gap between Industry and Academia to Establish Efficient Partnerships



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EXECUTIVE SUMMARY

Oman's Energy Industry-Academia: A NEW ERA OF R&D

Pinning down strategies to better align the efforts of Industry and Academia while considering the role of Government is not a new conversation. But a growing sense of urgency to identify cost-effective domestic energy security and profitable export markets means unprecedented progress is now being made. It also supports Oman's National Vision 2030 to transform into a knowledge-based economy, thus climbing the global intellectual league table.

Opaque communication has long been the Achilles' heel of research and development (R&D) in Oman's energy sector, but no more. Leaders' calls for action at the Gulf Intelligence Oman Energy Summit 2016 in Muscat in October last year are being heeded. Supporting positive momentum amongst key parties is vital; the importance of speedy but sustainable progress will only increase in

line with Oman's growing population and ever-maturing oil and gas fields.

A concerted effort during multiple high-level meetings between Industry, Academia and Government in Muscat since 2015 have culminated in the Oman R&D Protocol. The Protocol is a roadmap to guide all parties down a united road; the stairways of progress for Industry and Academia will no long lead to different floors, but meet at a point of common understanding, trust and productivity.

Ejaad: The Next Step

Ejaad is a ground-breaking marketplace to identify R&D challenges and solutions that emerged in early December 2017. Ejaad responds to the need identified in the Oman R&D Protocol for a collaborative platform that helps marry the potential and excellence of the sultanate's Industry and Academia to create a robust, profitable and sustainable energy future.

Nurturing Oman's R&D Ecosystem: 3 KEY STEPS TO SUCCESS

Oman's historic entrepreneurial spirit has already reshaped the status quo of energy R&D. The long list of positive changes includes increasingly sophisticated enhanced oil recovery (EOR) technologies – such as Miraah, one of the world's biggest solar energy plants – to highly successful private-public partnerships that spur job creation for the sultanate's plentiful intellectual talent. Strategic R&D between Industry and Academia heralds a release valve on the growing pressure to master a delicate balancing act; sustain local production to support a swelling population while further safeguarding energy security by bolstering investors' confidence and geopolitical alliances.

Think Decades Ahead

Alongside other oil-producing centric economies, Oman stands at an unprecedented crossroads; embrace risk by shifting gears towards a diversified energy portfolio or risk becoming economically frail by sticking within traditional boundaries while competitors explore new methods. Hydrocarbons still account for 33.9% of GDP and 78.7% of Oman's state revenues, according to the Oxford Business Group, but the sultanate's non-oil sectors are playing an increasingly prominent role in the country's economic profile. One of PDO's many goals to enhance human capital includes 50,000 job and training opportunities for nationals outside oil and gas between 2017 and 2019. Oman's energy sector must also continue employing the digital toolbox of the 4th Industrial Revolution to boost operational efficiency while curbing rising costs. Artificial Intelligence (AI), predictive analytics and advanced robotics are the tip of an ever-growing digital iceberg that Oman would benefit from mastering before its competitors. The same ethos must apply to talent management; improving nationalisation, encouraging Oman's post-graduate talent to work locally and moulding a new generation of digitally-savvy and critical thinking workers who can flex to a rapidly changing job market. According to popular estimates, 65% of children entering primary school today will ultimately end up working in completely new job types that don't yet exist. Flexibility will be king.

Geography Matters

Oman's energy R&D ventures must leverage the country's geographical potential; the sultanate lies at the crux of the historic Old and New Silk Road, China's 'One Road, One Belt' programme and India's 'Think West' policy. Major port developments, such as Sohar and Duqm, are beginning to take full advantage of the sultanate's potential in terms of maritime logistics. But unexplored opportunities along the country's 1,740km coastline remain. For example, Oman's energy industry could emerge as a regional, if not global, leader in the R&D of desalination and water recycling. Such growth is especially pertinent as the World Bank said more than half of current water withdrawals exceed what is naturally available and 82% of wastewater is not recycled in the Middle East and North Africa (MENA). The region faces the greatest expected economic losses from climate-related water scarcity – up to 14% of GDP by 2050.

Every Size Counts

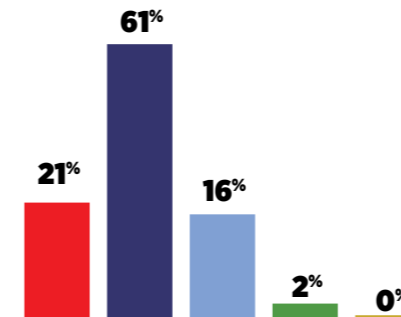
Oman must maximize the potential of its quickly growing pool of small and medium-sized enterprises (SME). The SME sector in the GCC region has the potential to employ over 22 million people in the next five years, research by Mena Research Partners (MRP) shows. For green growth alone, around 25% of the \$6.4 billion to be invested in clean technologies in the developing world over the next decade represent business opportunities for SMEs. Embarking on R&D efforts now – especially applied research – means Oman can take a good-sized slice of this emerging economic pie. Positive and quantifiable efforts are already underway, as illustrated by the business resources, services and funding solutions that are being provided to start-ups and SMEs by the new 'Meethaq Accelerate SME' portal.

STEPPING STONES TO SUCCESS

Survey responses during the Oman Energy Forum in 2016 highlighted the main gaps in the country's R&D ecosystem. The newly released Oman R&D Protocol and Ejaad platform aim to realign all stakeholders' goals to accelerate sustainable progress. Overall, the value of better communication is clear.

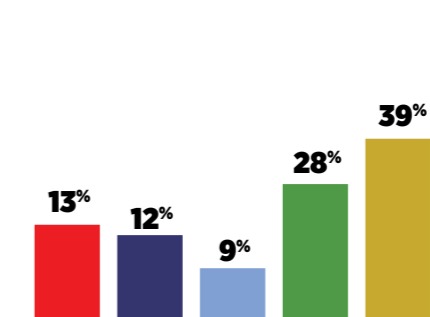
How wide is the gap between Oman's Industry and Academia that needs to be bridged to build an aligned 21st century R&D ecosystem?

- A. Very Wide as in > 5 years
- B. Wide but bridgeable in 3-5 years
- C. Not so wide as bridge already being built, completion in less than 2 years
- D. Vast and insurmountable
- E. There is no Gap – all is well

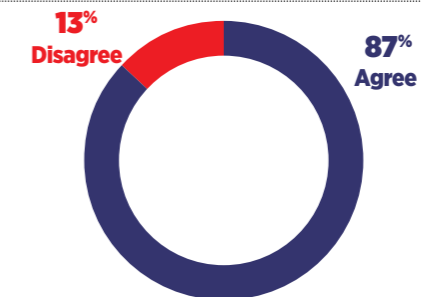


Which of the following is the greatest challenge facing efforts to bridge the gap between Industry and Academia on R&D?

- A. Available capital
- B. Available Talent
- C. Domestic market is too small
- D. Industry doesn't communicate clearly what it wants from R&D cooperation with academia
- E. Academia not structured for Applied research



A major conclusion of an OECD Growth Study was that Governments need to be more responsive to the rapid transformation of innovation processes and related business needs and strategies and that greater use of public-private partnerships can increase this responsiveness and enhance the efficiency and cost-effectiveness of technology and innovation policy.



IN FOCUS

What is R&D?

R&D refers to investigative and innovative activities aimed at improving existing products and thinking or that lead to the development of new products and methods. R&D typically aims to improve cost-efficiency, operational productivity and push the boundaries of the status quo.

Why does it matter?

Think back 100 years to families sheltering from the midday summer sun in the deserts of the Gulf, or the 2,000km trek by foot and camel to cross the Arabian Peninsula. Today, thanks to 20th century industrial innovations, Oman and its Gulf neighbours enjoy 24/7 air conditioning and the Peninsula can be crossed during a comfortable five-hour flight. Similarly, energy markets have benefitted from both

technological and intellectual growth. The scale and speed of Oman's operations in upstream oil production – sensors and automatic, predictive analytics to mention a few – are mind-boggling compared to the country's first drilling operations in the mid-1950s, for example. R&D is a cornerstone of making such dramatic and positive change possible; it inspires and nurtures humans' innate appetite to explore and push the boundaries of what we think we know. Without intellectual curiosity, progress stagnates. But ground-breaking R&D does not just happen. It needs robust foundation of financial, technological, regulatory and human capital tools to progress. Therein lies the value of the R&D Protocol; uniting efforts to make more meaningful progress at a faster pace. The only thing we know for certain is that there is much more to know.



Global Snapshot: ECONOMICS OF R&D

\$67bn

The volume spent on energy research and development worldwide in 2015, according to the International Energy Agency's World Energy Investment 2017 Report

4

Spending on energy technology generally or clean energy specifically has not risen in the past four years

28%

Europe and the US are the largest spenders, each accounting for just under a third of the total spend

1st

China is the highest spender on energy R&D as a share of GDP, after overtaking Japan in 2014

50:50

Although public and private sources each represent around half of the R&D total, most private R&D is in the oil, gas and thermal power sectors. Most public R&D is devoted to clean energy technologies

\$47bn

The future role of digital technologies has taken centre stage in energy discussions, with around \$47 billion spent in 2016 on infrastructure and software directed towards digitalization of the electricity sector alone. The oil and gas industry is also scaling up its utilisation of digital technologies to improve performance while curbing costs

Source: Compiled using the International Energy Agency's World Energy Investment 2017 Report

INTRODUCTION

Creating an



ECOSYSTEM

3
The majority of GIQ Survey respondents (88%) said in October that it is possible to bridge the gap between Industry and Academia within three years

62nd
Oman's ranking in the World Economic Forum's (WEF) Competitiveness Report 2017-2018 has moved up four levels, from 66th to 62nd in just one year. The UAE and Saudi Arabia rank 17th and 30th, respectively.

26%
The UN's growth estimate for Oman's population by 2030; from today's 4.6m to 5.8m

45%
The UN's growth estimate for Oman's population by 2050; from 4.6m today to 6.7m

INNOVATIVE OMAN: Hard Works Pays Off – But More Must Follow

77th
Oman's ranking on the Global Innovation Index for 2017, out of 127 countries

29th
Oman's global ranking when it comes to the ease of starting a business – ideal for nurturing the sultanate's entrepreneurial spirit

37th
Oman's impressive global ranking for Joint Venture–strategic alliance deals

39th
Oman's global ranking for its institutions; a combination of the sultanate's positive political, regulatory and business environment

61st
Oman's global ranking for gross domestic expenditure on R&D (GERD) financed by business

64th
The QS university ranking when considering the average score of Oman's top three institutions

73rd
Oman's global ranking in terms of gross domestic expenditure on R&D (GERD) performed by business

85th
Oman's global ranking for gross expenditure on R&D as a percentage of the sultanate's GDP

122nd
Oman's global ranking for patents by origin. Increasing the number of local patent registrations is a key goal, especially amongst the post-graduate community

Source: Global Innovation Index 2017

The success of R&D efforts in Industry, Academia and Government all feed back into accelerating Oman's economic growth and bettering its energy security. One part of the chain cannot succeed without progress in the other. A common understanding is essential.



“Incorporating financial sustainability into the R&D Protocol is vital to ensuring longevity. A clear financial methodology gives us the foundation for whatever challenges we face in the future and it avoids the creation of a philosophical protocol that lacks teeth. We now have a road map that promotes – rather than just discusses – the next steps to create tangible action. We have a protocol with a bite.”

H.E. AL RUMHY, MINISTER OF OIL AND GAS, MINISTRY OF OIL & GAS, SULTANATE OF OMAN



“We must move away from ideas and towards actionable goals – we cannot strategize forever. We have the ideas and we know who is responsible for each one of the ideas, but now they must be implemented. And we have a great deal of brainpower determined to see real change. Therein lies the value of the R&D Protocol.”

H.E. SALIM AL AFI, UNDERSECRETARY, MINISTRY OF OIL & GAS, OMAN

A Work in progress

Oman has demonstrated a sustained commitment to innovative R&D over the past decade. The sultanate's position as a world leader in enhanced oil recovery (EOR) is just one example of the fruits of such efforts. Not only have Oman's novel EOR strategies stemmed and reversed a dramatic decline in domestic oil output, but they have also acted as a global showcase of the country's appetite for innovative and positive change. Such fresh-thinking will only become more critical as Oman prepares to tap more of its heavy and complex crude oil reservoirs to sustain and advance production.

Stepping stones

The R&D Protocol acts as a map and compass for the next chapter in the sultanate's push to create a world-class R&D ecosystem that smoothly aligns the ambition and objectives of both Industry and Academia. Many of the innovative technologies currently used in Oman's energy market are still imported via international partnerships instead of being developed within the country's borders. Reversing this trend means supporting all the surrounding factors that will make the alignment of R&D a reality; leveraging financial resources and proactively supporting communication and collaboration, for example.

Let's talk

Communication is key to ensure that the right challenges being faced by Industry in the field are the challenges being tackled by Academia in the laboratories. Unprecedented shifts in the energy industry in Oman and beyond – notably the advent of the 4th Industrial Revolution and significant population growth – mean that the rules of the traditional game are evolving. It makes sense to learn the new rule book together, with what are two sides of the same coin closely collaborating. Greater clarity on funding costs, technological requirements, experimental facilities, timelines, field and research capacity and many other key factors is crucial.

Academia

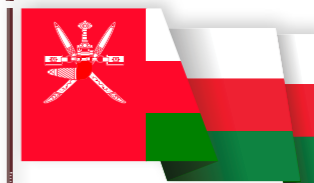
Academia cannot do research for research sake; efforts must be focused to deliver results that are useful to the Industry and support Oman's national goals. Academia must fully understand the challenges that Industry faces – legislative and economic hurdles, for example – and work with private and public companies to find solutions. Equally, Industry must respect the capacity and limits of local universities and research institutions. Oman is blessed with considerable intellectual and vocational talent, but Academia needs the correct signposts from Industry and Government to ensure such potential is steered towards careers that support the sultanate's national goals.

Industry

Industry must clearly and frequently communicate its key objectives and expectations to Academia, especially considering the fast-changing nature of the energy market. Industry needs the best tools – both intellectual and technological – to ensure it can continually sharpen its edge in what is a deeply competitive industry. It must also appreciate the capacity and funding limits of local universities and research institutions and be ready to come to the aid of institutions to help propel their learning and research capabilities. This will help ensure that Oman's Academia has the tools and facilities required to nurture a world-class R&D energy ecosystem.

Government

Government faces a delicate balancing act. It must act as a positive link between Industry and Academia and keep atop of developments to ensure it has a clear outlook of Oman's intellectual and technological value chain – both factors are integral to the country's National Vision and economy. State involvement can facilitate and not hinder progress by providing regulatory support that encourages positive and accelerated R&D progress in Industry and Academia.



“The R&D protocol is a clear win-win for all of us. Why do I say that? Because it facilitates industrial investments to better find solutions and broaden our scope of what we think is possible. It's about the evolution of information. We can apply research to create real solutions out in the field and then feed operational knowledge back to the research lab to support further innovation. It's an ecosystem that requires each component to take part.”

RAOUL RESTUCCI, MANAGING DIRECTOR, PETROLEUM DEVELOPMENT OMAN



“We need to narrow the gap between today's knowledge creation and application – this is where Ejaad comes in. It's a partnership institution – not a government, nor an academic, nor an industry institution. It is a collective effort where concepts and ideas can be transformed into viable options – a step of huge significance.”

H.E. DR. HILAL AL HINAI, SECRETARY GENERAL, THE RESEARCH COUNCIL

Lessons learned



REVIVING AMBITION:

What has hindered appetite for collaboration?

- ✓ Facilities required for experimental research are limited
- ✓ Research proposals from Academia for Industry lack clarity
- ✓ Limited clarity on availability of academic capacity and capability
- ✓ Limited in-country expertise to achieve some high-level research goals
- ✓ Expensive delays to discussions on potential solutions and scope of work

STUMBLING BLOCKS:

Why have some collaborations fallen short of expectations?

- ✓ Competency of the research team can be limited
- ✓ Unclear targets and timelines hinder depth and speed of projects
- ✓ Gathering data points in a timely manner from Industry can be challenging
- ✓ Industry and Academia have limited understanding of the other's capacity and capabilities
- ✓ Industry prioritizes solutions over understanding Academia's fundamental research challenges

PROMISING PROGRESS:

Why have some collaborations been successful?

- ✓ Industry communicated the nature of their challenge well
- ✓ Strong level of trust between Industry-Academia at the highest level
- ✓ Industry offered clear project expectations, transparent schedule and objectives
- ✓ Industry provided Academia with funding and relevant data to support research activities
- ✓ Industry-Academia had full and common understanding of the purpose behind the research

NEXT STEPS:

What is needed to encourage more productive collaboration?

- ✓ Continue to strengthen mutual trust – integral to the vital knowledge sharing processes
- ✓ Greater transparency between teams while safeguarding sensitive intellectual property
- ✓ Enhance Academia-Industry awareness of market requirements and research processes
- ✓ A holistic outlook: both sides to better understanding of overall challenges and opportunities
- ✓ Clear and accountable objectives, deliverables, key performance indicators (KPIs) and timelines

** Source: These top 5 responses for each key question were derived from the responses of fifty participants at The 2017 Oman Energy Industry-Academia R&D Protocol Ratification Seminar on October 24, 2017 at the PDO Learning Centre. Points not in order of priority.*

GOVERNMENT FOCUS:

Regulatory Burdens Affecting Industry-Academia Collaboration

- ✓ Inflexible rules and regulations
- ✓ Centralised decision-making processes
- ✓ Complex and lengthy administrative processes
- ✓ Career incentives linked with administration versus research
- ✓ Limited time for research due to administrative and teaching load
- ✓ Non-competitive, cost-focused and time-consuming purchasing policies

Source: The Research Council (TRC), 2016



FEEDBACK FROM R&D VETERANS*

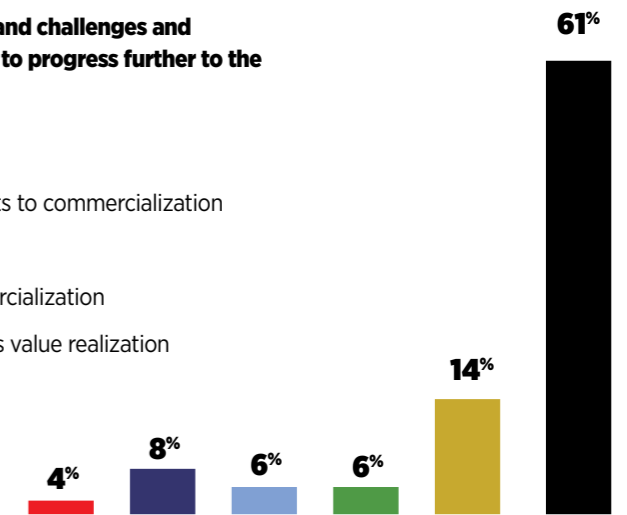
Factors for Successful Industry-Academia Collaboration in Oman

- ✓ An ecosystem needs to be created to align fragmented efforts and initiatives between Industry and Academia.
- ✓ A truly successful R&D partnership requires a culture of innovation, which serves as a foundation for further progress between Industry and Academia.
- ✓ Centers of excellence must be created to offer research grants for identified projects into which PhD students can contribute. This would avoid duplication and save on costs for both Industry and Academia, as resources and facilities would be shared.
- ✓ The secondment of staff from Industry to Academia is crucial for Academia to truly understand Industry's R&D requirements. In turn, this will enhance the success of future projects between universities and Industry.
- ✓ Clearer processes need to be established to improve the methods by which Oman's innovative research and spinoff investments are funded and commercialized, both domestically and globally.
- ✓ A clearer funding structure for basic, applied and experimental research must be established.
- ✓ A clearer governance structure between Industry, Academia, and Government must be established.
- ✓ A more robust Intellectual Property (IP) policy must be developed in Oman to leverage the country's R&D offering at home and abroad.
- ✓ The Government should act as a regulator and not as a service provider. The latter should be left to the institutions themselves in conjunction with Industry when appropriate. The Government can help create an environment where R&D and innovation can thrive, but it is up to Industry and Academia to collaborate and take advantage of the resources at hand.
- ✓ Successful partnerships between Industry and Academia are established when there is complete transparency between both parties. This allows for the development of clear objectives, accountability and targeted KPIs.

** Source: Ejaad 2017 Veterans Survey, GI Consultancy, Ministry of Oil & Gas Oman, Ministry of Foreign Affairs, Oman State council*

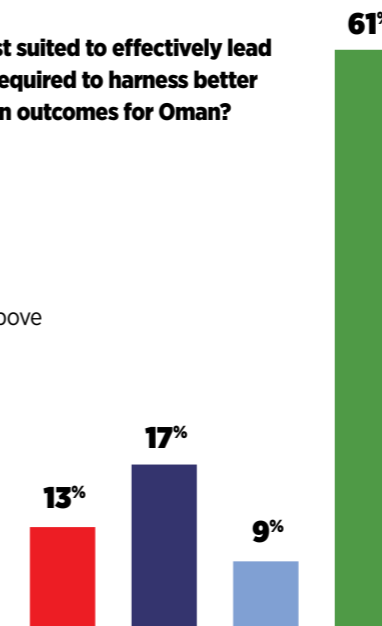
R&D Academia groups in Oman have taken on industrial ideas and challenges and produced reports and prototypes thus far. But they have failed to progress further to the commercial solution or product stage. Why?

- A.** Lack of a pre-defined commercialization plan
- B.** Lack of capability and resources in Academia to take the results to commercialization
- C.** Lack of effective follow-up and confidence from Industry
- D.** Lack of interest from industry due to costs of reaching commercialization
- E.** Inadequate interaction between Academia and Industry dilutes value realization
- F.** All of above



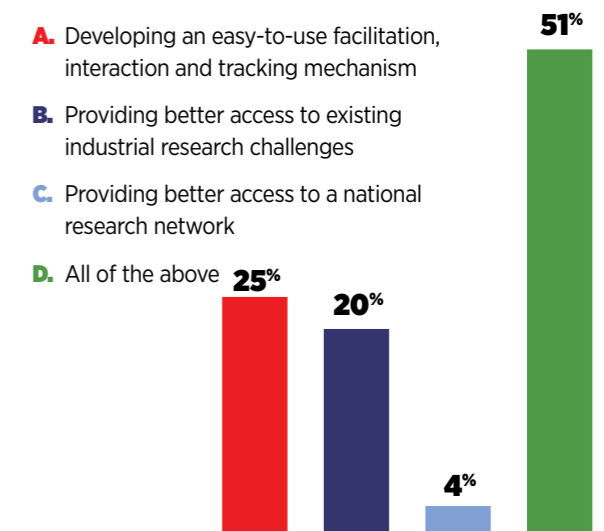
Which body is most suited to effectively lead the collaboration required to harness better R&D and innovation outcomes for Oman?

- A.** Government
- B.** Industry
- C.** Academia
- D.** A mix of all of above



The best way to bridge the gap between Industry and Academia is through:

- A.** Developing an easy-to-use facilitation, interaction and tracking mechanism
- B.** Providing better access to existing industrial research challenges
- C.** Providing better access to a national research network
- D.** All of the above




Source: The 2017 Oman Energy Industry-Academia R&D Protocol -- Ratification Seminar

The Origins of Today's Protocol

An active dialogue between all relevant stakeholders in Oman was held between 2015-2017 to narrow the gap between Industry and Academia and establish efficient R&D partnerships. Strategic communications consultancy and research firm Gulf Intelligence helped facilitating the delivery of the Oman Energy R&D Protocol. The Protocol was drafted by The Research Council (TRC) and Petroleum Development Oman (PDO). The Protocol was officially ratified and signed in June 2017 by H.E. Dr. Mohammed bin Hamad Al Rumhy, Minister of Oil and Gas; H.E. Dr. Hilal bin Ali Al Hinai, Secretary General of The Research Council; and Raoul Restucci, Managing Director, Petroleum Development Oman (PDO). Significant progress is evident with more than thirty signees of the Oman Energy Industry-Academia R&D Protocol as of December 14, 2017 (see page 16).

2015



26% Establishment of research clusters & incubators with universities across the country linked with promotion entities.

1% More Omani PhD students to get their PhD's in Oman


Stream 3
Research & Development
What are the top recommendations needed for aligning Academia and Industry to develop an enhanced R&D ecosystem in Oman?

73% Bring industry and academia together to establish public private partnerships for R&D

100 stakeholders from Industry, Academia, Government, energy, international organizations and the private sector gathered for The Oman Energy Forum (OEF) Industry Workshop that took place on 20 October 2015 to explore viable solutions to five key energy challenges that lie ahead. The five key challenges are: Energy Supply, Energy Demand, R&D, Labor and the Water-Food-Energy Nexus. The top recommendations from the workshop form the heart of the 25-Year Oman Energy Master Plan.


2016

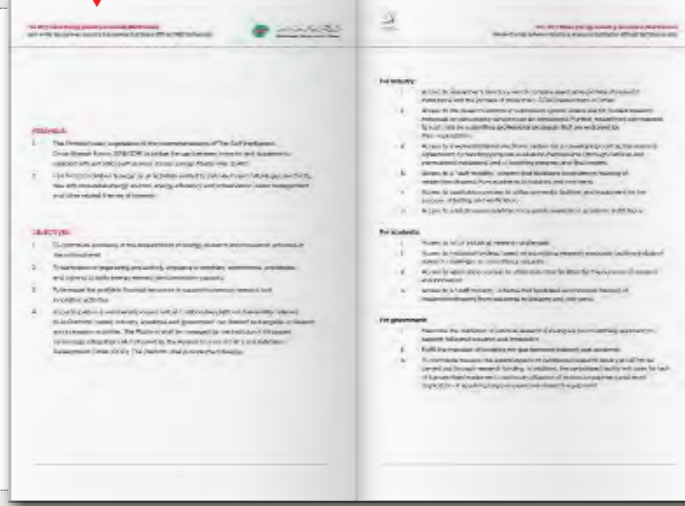
Recommendation	Adopting Institution
Draft an Oman Energy Industry-Academia R&D protocol with 10 principles that will be ratified with the signatures of companies operating in Oman's energy sector and their peers in academia.	
Develop a patent licensing office in Innovation Park Muscat dedicated to helping researchers file patents and understand patent law.	
Host a quarterly seminar that will help energy entrepreneurs, SMEs, inventors, and researchers understand each step of the patenting process and will give them the information needed to develop an individual patent strategy.	
Innovation Park Muscat to engage with venture capitalists, such as Innovation Development Oman Holding (IDO), to be based or have a physical presence in the park. This would help enhance	



The Oman Energy Master Plan 2040 put forward 15 recommendations for Oman to adopt, with the number one recommendation in the R&D stream calling on all stakeholders to 'Narrow the Gap between Industry & Academia to Establish Efficient R&D Partnerships.' On October 18, 2016 under the patronage of Sultan Qaboos University and supported by the Ministry of Oil & Gas Oman, The Research Council, and Petroleum Development Oman, over 150 key energy stakeholders gathered to produce an R&D action plan to align industry and academia in the delivery of an enhanced R&D ecosystem.

2017





The top recommendation on the Summit action plan was to produce an R&D Protocol with guiding principles that would be ratified by the national and international energy stakeholders operating in Oman.



Oman Energy Industry-Academia R&D Protocol

Narrow the Gap between Industry & Academia to Establish Efficient R&D Partnerships



June 2017

Oman's Ministry of Oil & Gas, Petroleum Development Oman (PDO) and The Research Council ratify The 2017 Oman Energy Industry-Academia R&D Protocol



PROLOGUE

May 2015

Gulf Intelligence meets with the Ministry of Oil and Gas in Oman

"We need a long term Oman Energy Master Plan that delivers recommendations and solutions that are aligned with All stakeholders from Industry, Academia, and Government"
- Senior Government Official



Oct 2015

The 2015 OEF Industry Workshop

One hundred stakeholders from energy industry, academia, and government, gathered for The OEF Industry Workshop on 20 October 2015 to explore viable solutions to five key energy challenges that lie ahead which are: Energy Supply, Energy Demand, R&D, Labour, Water-Food-Energy Nexus. The workshop delivers the intelligence and wisdom required to deliver the Oman Energy Master Plan 2040.



Nov 2015

Oman Energy Master Plan 2040 - Draft Report Published

The top three recommendations harvested from the OEF Industry Workshop for each of the key energy challenges addressed form the heart of the Oman Energy Master Plan 2040.



Nov 2015

Special Leadership Briefing with H.E. Dr. Mohammed bin Hamad Al Rumhy, Minister of Oil and Gas in Oman.

R&D PROTOCOL

Timeline

Dec 2015

Gulf Intelligence meets with Sultan Qaboos University and The Research Council to discuss the next steps in pushing forward the top R&D recommendation from the Oman Energy Master Plan 2040 - to 'Align Academia and Industry in the Delivery of an Enhanced R&D Ecosystem in Oman.'

2016

Oct 2016

The 2016 Oman Energy Industry-Academia R&D Summit

The Oman Energy Master Plan 2040: Tackling the top R&D recommendation is the key focus of the 2016 forum hosted by Sultan Qaboos University:

"Align Academia and Industry in the Delivery of an Enhanced R&D Ecosystem in Oman. The alignment between Oman's Industry and Academia must be urgently improved in order for the country to deliver an enhanced R&D ecosystem that fosters efficient public-private partnerships."



2017

Feb 2017

Special Leadership Roundtable Briefing with H.E. Dr. Mohammed bin Hamad Al Rumhy, Minister of Oil and Gas in Oman.

The top recommendation from the The 2016 Oman Energy Industry-Academia R&D Summit was to create an R&D Protocol to bridge the gap between Industry & Academia to establish efficient R&D partnerships.

H.E. Dr. Moahammed bin Hamad Al Rumhy selects PDO & TRC to champion the delivery of the Oman R&D Protocol for ratification.



March 2017 to May 2017

Gulf Intelligence, PDO and TRC collaborate and draft final R&D Protocol for ratification

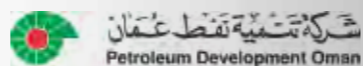




The Signed Oman Energy Industry-Academia R&D Protocol

The 2017 Oman Energy Industry-Academia R&D Protocol

Narrow the Gap between Industry & Academia to Establish Efficient R&D Partnerships



The 2017 Oman Energy Industry-Academia R&D Protocol

Narrow the Gap between Industry & Academia to Establish Efficient R&D Partnerships

PREAMBLE:

1. This Protocol takes cognizance of the recommendations of The Gulf Intelligence Oman Energy Forum 2015/2016 to bridge the gap between industry and academia to establish efficient R&D partnerships (Oman Energy Master Plan 2040).
2. This Protocol defines 'Energy' as all activities related to petroleum and natural gas, electricity, new and renewable energy sources, energy efficiency and conservation, water management and other related themes of interests.

OBJECTIVES:

1. To contribute positively in the development of energy research and innovation activities at the national level
2. To participate in organizing and actively engaging in seminars, conferences, workshops, and training to build energy research and innovation capacity
3. To leverage the available financial resources in supporting energy research and innovation activities
4. To participate in a membership-based virtual collaborative platform (hereinafter referred to as Platform) where industry, academia and government can interact and engage in research and innovation activities. The Platform shall be managed by the Institute of Advanced Technology Integration (IATI) formed by the Research Council (TRC) and Petroleum Development Oman (PDO). The Platform shall provide the following:

For industry:

- i. Access to researcher's directory which contains searchable profiles of research institutions and the profiles of more than ~3,000 researchers in Oman
- ii. Access to the research electronic submission system where call for funded research proposals or consultancy services can be announced. Further, researchers can respond to such calls by submitting professional proposals that are endorsed by their organization.
- iii. Access to a well-established electronic system for a) developing contractual research agreements, b) handling proposal evaluation mechanisms (through national and international evaluators) and c) handling progress and final reports.
- iv. Access to a "staff mobility" scheme that facilitates secondment/training of researchers/experts from academia to industry and vice versa.
- v. Access to application process to utilize university facilities and equipment for the purpose of testing and verification.
- vi. Access to a list of research/admin focal points available in academic institutions.

For academia:

- i. Access to list of industrial research challenges.
- ii. Access to industrial funding; based on submitting research proposals tackling industrial research challenges or consultancy requests.
- iii. Access to application process to utilize industrial facilities for the purpose of research and innovation.
- iv. Access to a "staff mobility" scheme that facilitates secondment/training of researchers/experts from academia to industry and vice versa.

For government:

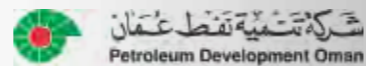
- i. Maximize the utilization of national research funding via fund matching approach to support industrial research and innovation
- ii. Fulfill the mandate of bridging the gap between industry and academia
- iii. To contribute towards the establishment of centralized research facility at IATI to be carried out through research funding. In addition, the centralized facility will cater for lack of standardized equipment, maximize utilization of existing equipment and avoid duplication of acquiring large or expensive research equipment.



The Signed Oman Energy Industry-Academia R&D Protocol

The 2017 Oman Energy Industry-Academia R&D Protocol

Narrow the Gap between Industry & Academia to Establish Efficient R&D Partnerships



The 2017 Oman Energy Industry-Academia R&D Protocol

Narrow the Gap between Industry & Academia to Establish Efficient R&D Partnerships

ROLES AND RESPONSIBILITIES:

For the purpose of realizing and accomplishing this Protocol, representatives shall:

Academia

- i. Provide to the Platform systematic information on the capabilities and capacities of respective laboratories/consultancies/resources.
- ii. Provide to the Platform a list of completed and ongoing R&D and innovation projects.
- iii. Provide to the Platform a list of research facilities and equipment.
- iv. Facilitate access to university facilities and equipment whenever is needed subsequent to the fulfilment of an application process.
- v. Adopt a "staff mobility" scheme that facilitates secondment/training of researchers/experts from academia to industry and vice versa.
- vi. Encourage joint-supervision of Postgraduate Students with supervisors from industry and/or IATI.

Industry

- i. Assign a focal point to liaison with the Platform.
- ii. Provide a list of industrial research challenges and aspiration.
- iii. Support at least one R&D project initiative per year over the next three years. This will be on project bases and subject to the Technical Committee agreement.
- iv. Reasonable endeavor in deploying and commercializing the output of R&D activities into their respective industry, through developing plans or endeavor to adopt some of the outcomes.
- v. Provide possible industrial funding; based on submitting research proposals tackling industrial research challenges or consultancy requests.
- vi. Operators shall consider joint industry-industry collaboration on projects of common interest such as thermal applications, fracing, water shut-off technologies and others.
- vii. Endeavors to adopt possible "staff mobility" scheme that facilitates secondment/training of researchers/experts from academia to industry and vice versa.
- viii. Endeavors to engaging in join-supervision of Postgraduate Students with supervisors from academia and/or IATI

Government

- i. Support industry to introduce R&D and Innovation levy into major contracts and monitor performance.
- ii. Steer, support and facilitate the collaboration between industry and academia.
- iii. Promote and develop IATI as a center of research excellence.

INSTITUTIONAL MECHANISM

For the purpose of pursuing this Protocol, a Working Team (hereinafter referred to as Team) shall be established to be responsible for developing, improving and executing this Protocol. This Team shall comprise primarily of staff from The Research Council (TRC) and Petroleum Development Oman (PDO).

The Team shall have the following functions:

- i. Coordinate the national agenda and set the priorities for the energy-related R&D activities.
- ii. Coordinate with different organizations in Oman to get them engaged with the platform.
- iii. Establish procedure and criteria for the operation of the Platform (project posting, proposal selection, fund awarding, staff mobility, facility sharing, etc...)
- iv. Report the activities of the Platform to top management at MoG, PDO and TRC
- v. Produce a rating system that measures Industry & Academia compliance with the protocol.

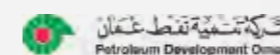
For each project to be tackled by the Platform, a Technical Committee shall be formed comprising representatives of the respective industry (i.e. company), academic institution(s) and member(s) representing the Team above. This Technical Committee shall be responsible to:

- i. Produce a practical work plan for each project to assure effective implementation of the project
- ii. Drive measurable KPI for projects
- iii. Monitor performance
- iv. Produce a commercialization plan for projects and align industry/academia for project success and value realization.

Raoul Restucci, Managing Director
Petroleum Development Oman

H.E. Dr. Mohammed Bin Hamad Al Rumhy
Minister of Oil & Gas, Sultanate of Oman

H.E. Dr. Hilal Al Hinai
Secretary General, The Research Council



5/06/2017
(Date)

5/June/2017
(Date)

5/6/2017
(Date)

Signees of the Oman Energy Industry-Academia R&D Protocol

*as of 14 December 2017

- ✓ Ministry of Oil & Gas, Sultanate of Oman
- ✓ Petroleum Development Oman
- ✓ The Research Council
- ✓ A'Sharqiyah University
- ✓ Caledonian College of Engineering
- ✓ Dhofar University
- ✓ German University of Technology in Oman
- ✓ Muscat University
- ✓ University of Nizwa
- ✓ Higher Colleges of Technology
- ✓ Sohar University
- ✓ Sultan Qaboos University
- ✓ BP Oman
- ✓ Occidental Oman Inc.
- ✓ Daleel Petroleum LLC
- ✓ GlassPoint Solar, Inc.
- ✓ Gulf Energy SAOC
- ✓ Oman Oil Company Exploration & Production LLC
- ✓ Oman Tank Terminal Company LLC
- ✓ Oman Society for Petroleum Services
- ✓ Oman Oil Refineries and Petroleum Industries Company SAOC
- ✓ Port of Duqm
- ✓ Shell Development Oman LLC
- ✓ Sohar Aluminium LLC
- ✓ Tasneea Oil and Gas Technologies LLC
- ✓ Lloyd's Register Oman LLC
- ✓ Target Oilfield Services LLC
- ✓ Falcon Oilfield Services LLC
- ✓ Oman Gas Company SAOC
- ✓ MEDCO Oman LLC
- ✓ Vision Advanced Petroleum Solutions LLC
- ✓ Schlumberger Oman & Company LLC
- ✓ Oman LNG LLC
- ✓ Al Baraka Oilfield Services SAOC

THE NEXT STEP: Ejaad Emerges As An Innovative Product Of R&D Protocol



Ejaad has been established in response to a key objective in the Oman Energy Industry-Academia R&D Protocol

A Key objective of the R&D Protocol

To participate in a membership-based virtual collaborative platform (hereinafter referred to as "Platform") where industry, academia and government can interact and engage in research and innovation activities. The Platform shall be managed by the Institute of Advanced Technology Integration (IATI) formed by the Research Council (TRC) and Petroleum Development Oman (PDO). The Platform shall provide the following:

“ Significant progress requires a robust roadmap, which gives all stakeholders clear signposts for the next step. Therein lies the value of Ejaad. Oman has developed this world-class tool to help marry all the intellectual and practical skills and needs of Oman’s energy sector in a sustainable manner.” ”

H.E. AL RUMHY, MINISTER OF OIL AND GAS, MINISTRY OF OIL & GAS, SULTANATE OF OMAN

Ejaad: What is it?

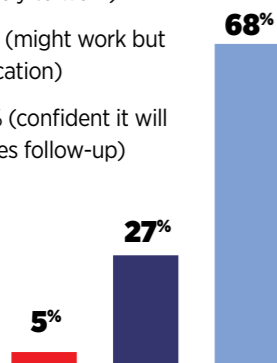
Ejaad is a virtual marketplace that is being hosted by Oman’s Institute of Advanced Technology Integration (IATI). Ejaad was developed in direct response to calls during the creation of the Oman Energy Industry-Academia R&D Protocol for a ‘membership-based virtual platform where Industry, Academia and Government can interact.’ Ejaad enables Industry to post challenges that Academia can see and propose solutions to these challenges. This common communications platform enables both Industry and Academia to clearly share ideas, track and apply solutions to

“ Oman is home to exceptional talent and natural energy resources – Ejaad is the platform that will unite these national treasures. Combining efforts between Industry and Academia on Ejaad will strengthen the sultanate’s economic and social growth for decades to come.”

RAOUL RESTUCCI, MANAGING DIRECTOR, PETROLEUM DEVELOPMENT OMAN

What is your confidence level that Ejaad is a step in the right direction to mitigate hurdles that confront efficient R&D partnership between Industry and Academia?

- A.** < 50% (unlikely to work)
- B.** 50% to 75% (might work but requires modification)
- C.** 75% to 100% (confident it will work but requires follow-up)



Source: The 2017 Oman Energy Industry-Academia R&D Protocol – Ratification Seminar



“ Ejaad is Oman’s R&D uber-like platform. It is a one-stop shop where academia and industry can capitalize on each other’s resources and fulfill R&D needs.”

DR. ALI AL SHIDHANI, DIRECTOR OF RESEARCH CENTERS & ICT RESEARCH, THE RESEARCH COUNCIL

major R&D challenges for Industry. Such a structured process means Industry can better harness the intellectual value of Oman’s Academia while giving researchers clear signposts for the main challenges that Industry needs resolving.

How does Ejaad work?

Once Industry have posted their challenge on the virtual platform for the attention of the research community, researchers will examine the information and post an expression of interest. The expression of interest will essentially detail how Academia would tackle the challenge, with Industry potentially receiving multiple proposals for a single challenge. Industry then chooses the best option – perhaps more than one – and corresponds with Academia to build a more detailed proposal that includes deliverables, timelines, milestones and so on. Thereafter, a research contract that TRC provides is

signed between Industry and Academia and Academia starts actively working to resolve Industry’s challenge. Each challenge has a technical committee, which comprises of one representative from Industry, one from Academia and one from Ejaad. This ensures there are no communication glitches between all parties and that both the research and commercialization of the challenge is aligned.

How do Industry and Academia sign up to Ejaad?

Ejaad is a user-friendly and unified process. Participants from Industry will receive a username and password to submit and monitor their challenge. Many participants from Academia already have their log in details as The Research Council has established data communication protocol with local universities.

How much information does Industry have to share?

When adding a challenge to Ejaad, Industry must put the title of the challenge and a description of the challenge. Other details include the sector, current practices and technologies associated to the challenge, the desired outcomes and the duration of the project. The latter relates to how long Industry wants the challenge to be hosted on the Ejaad platform. Ejaad has a default of one month, so Industry must actively adjust the duration if it is shorter or longer than four weeks. Industry can also use Ejaad to detail the budget for the challenge and attach supporting documents. If Industry wants to provide minimal information on the public platform to begin with – for intellectual property (IP) purposes, for example – researchers must sign a confidentiality agreement before receiving more information. The confidentiality document is then sent to IATI for endorsement.

What if Industry needs a very quick response to its challenge?

Industry has two options when sending a challenge. Option one is for Academia to give an expression of interest, as detailed



“ It is an honour and great pleasure to be part of Ejaad. This is a promising project that supports the enhancement of innovative research and will help sustain the production of energy for our future generations in the Sultanate.”

H.E. DR. ALI AL BEMANI, VICE CHANCELLOR, SULTAN QABOOS UNIVERSITY

above, before pinning down more details later. Option two accelerates the process by enabling Industry to ask for a full proposal straight away.

How to reassure Industry-Academia that the information and research is of world-class quality?

A researcher tackling Industry’s challenge will submit their workings and potential solution to a focal point in Academia. This means that the information is validated before being sent to Industry, which supports Oman’s ongoing transformation

into a world-class knowledge-based economy. This process hedges against the risk that a researcher may have overestimated their abilities, or is lacking necessary equipment to complete the challenge to the quality initially promised. Equally, Industry must have an internal focal point to efficiently review and feedback on the expression of interest from Academia. Having focal points in both Industry and Academia to double-check information will also accelerate the overall process by minimizing the need for back-and-forth queries later. Ejaad also facilitates

accountability by helping Industry approach researchers outside of Oman if they have queries on the initial feedback received from Academia in Oman.

How involved will The Research Council be?

The involvement of TRC will diminish in time as confidence and alignment between Industry and Academia using the platform continually strengthens. TRC currently plays a facilitating and educating role. Ejaad is an evolving system and additional improvements and suggestions may be integrated post-launch to continually enhance the quality of what is a unique offering. ■

OBJECTIVES:

CONNECT:
Link academic research to industry needs

PROMOTE:
Uphold industry-industry, academia-academia & industry-academia collaboration

EXPLOIT:
Maximize ICV by routing business R&D requests to local academia

ADD VALUE:
Deployment, commercialization and technology transfer of research outcome

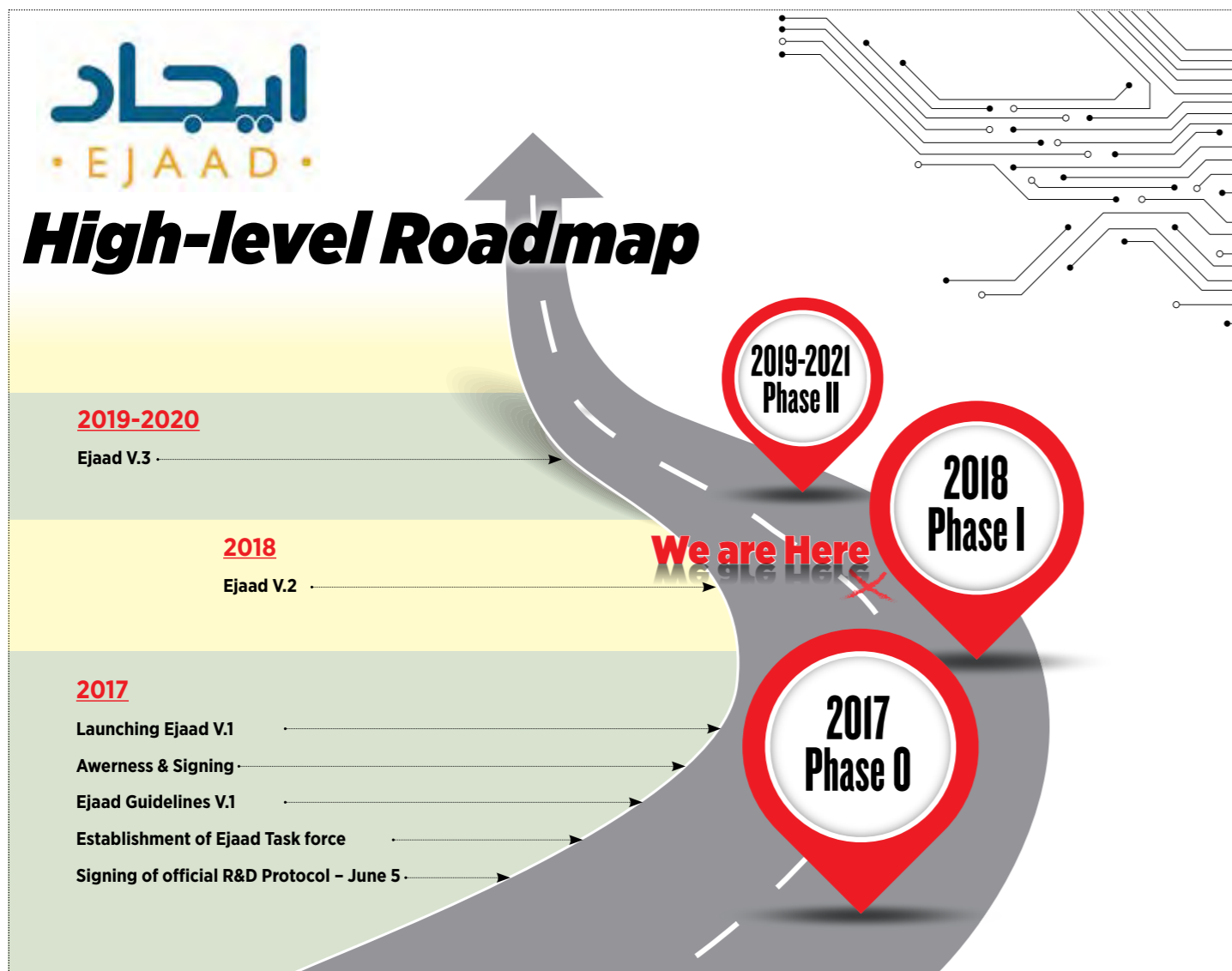


SERVICES

-  **Industrial Challenges**
A marketplace for industry to present challenges and for academia to propose solutions
-  **Equipment & Facilities Database**
Comprehensive list of available research equipment in academia and industry
-  **Researcher Network**
Access to +3,000 researchers based in Oman
-  **International Collaboration**
Access to international academia and industry
-  **Workshops**
A one-stop-shop for training, short-courses and workshops
-  **Consultancy**
A hub of expertise for those who are seeking an advice within a particular field
-  **Staff Mobility**
Secondment of expertise from academia to industry and vice versa
-  **Research Ideas**
A mean to leverage fund and support for research ideas that may lead to groundbreaking solutions

Source: www.ejaad.om

High-level Roadmap



EJAAD: SECURING SOLUTIONS IN THREE STEPS

1. Pre-award: posting challenges, call for solutions, evaluation and selection
2. Securing Award: research agreement between the parties
3. Post-award: fund release, technical committee, progress monitoring, review and feedback, commercialization

EJAAD: ADVANTAGES

Strategic

- ✓ Commercialization of research
- ✓ Linking academic research to Industry needs
- ✓ Maximize In-Country Value by routing business R&D requests to local Academia
- ✓ Promote Industry-Industry, Academia-Academia and Industry-Academia collaboration

Operational

- ✓ An easy-to-use platform
- ✓ Better access to the available research network
- ✓ A structured mechanism to track and report progress
- ✓ Readily available challenges, proposal and research contract templates

EJAAD: MEASURING SUCCESS?

Key Performance Indicators for Ejaad in 2018 & 2019 with expected yearly growth of (5% - 10%)

Year 2018

- ✓ Number of local JIPs
- ✓ Number of challenges posted in Ejaad
- ✓ Number of training/consultancy agreements on Ejaad
- ✓ Number of awareness sessions on Ejaad

2019 and beyond

- ✓ Number of offered research services
- ✓ Number of offered training services
- ✓ Number of offered consultancy services
- ✓ Number of offered equipment testing services
- ✓ Number of staff secondments on Ejaad

Source: TRC-PDO Task Force

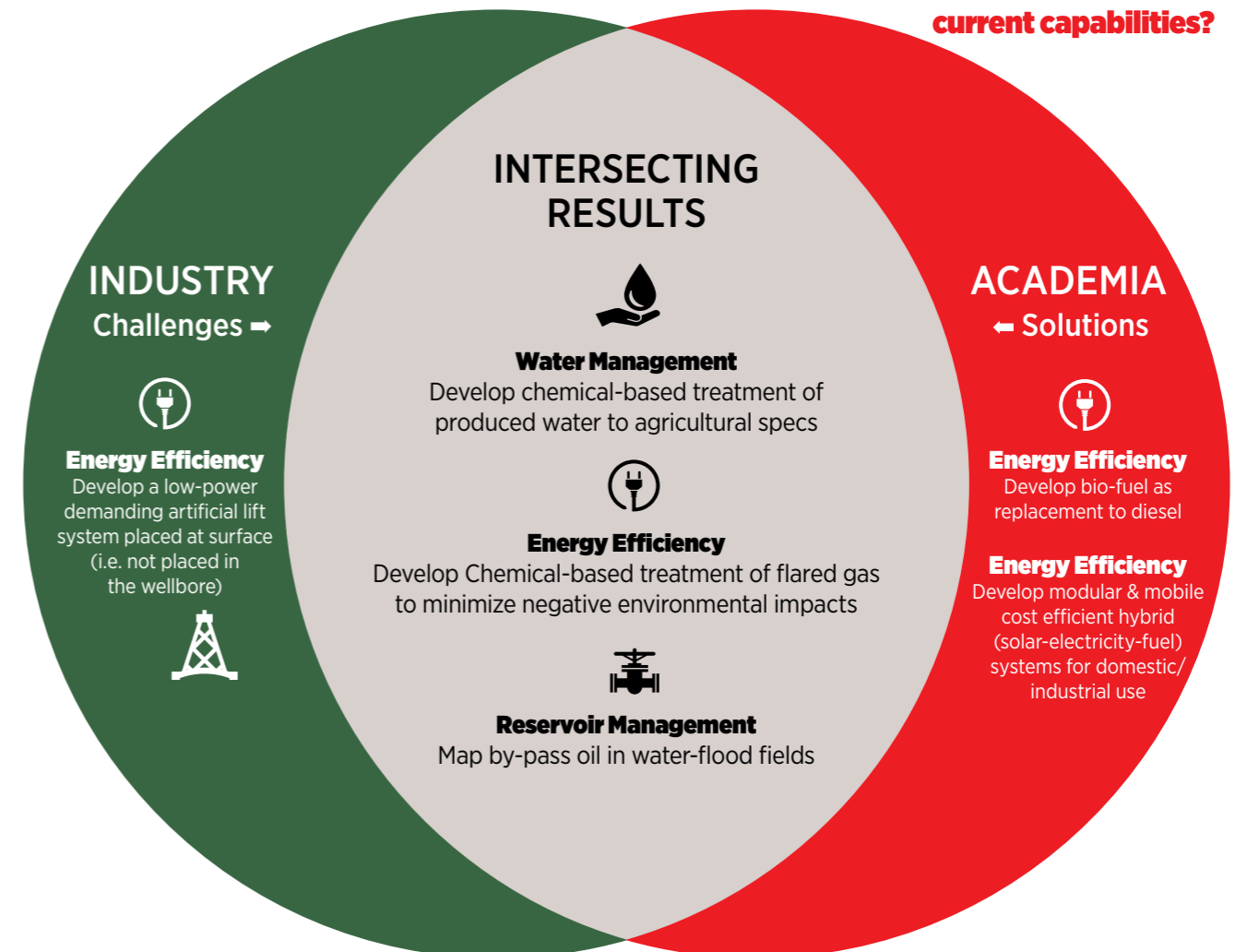
LOOKING AHEAD: TOP INDUSTRY & ACADEMIA RESEARCH CHALLENGES Survey Findings

The intersecting results below are a sample of key industrial R&D challenges, which Industry and Academia can start working on together following the launch of the Ejaad platform on December 10, 2017.

The results below were derived from a joint Industry-Academia survey taken in October 2017 to pin down examples of key industrial R&D challenges. Stakeholders in Oman's energy industry listed twenty hurdles that need urgent attention and from that list, Academia identified the challenges that can be tackled in a timely manner.

Identify the Top 5 Challenges that are most important to solve?

Identify the Top 5 Challenges that your organization can address based on current capabilities?



Industry & Academia Research Challenges – Survey findings taken from a sample of 70 Key Energy R&D Stakeholders in Oman in October 2017

How the teams for Ejaad interlink

Steering committee:

Steer, support and endorse the activities and way forward through monthly meetings

Ejaad Director:

Oversee the development of Ejaad and responsible to achieve Ejaad and R&D Protocol objectives

Advisors:

Give general advise on technical and operational issues

Technical committee:

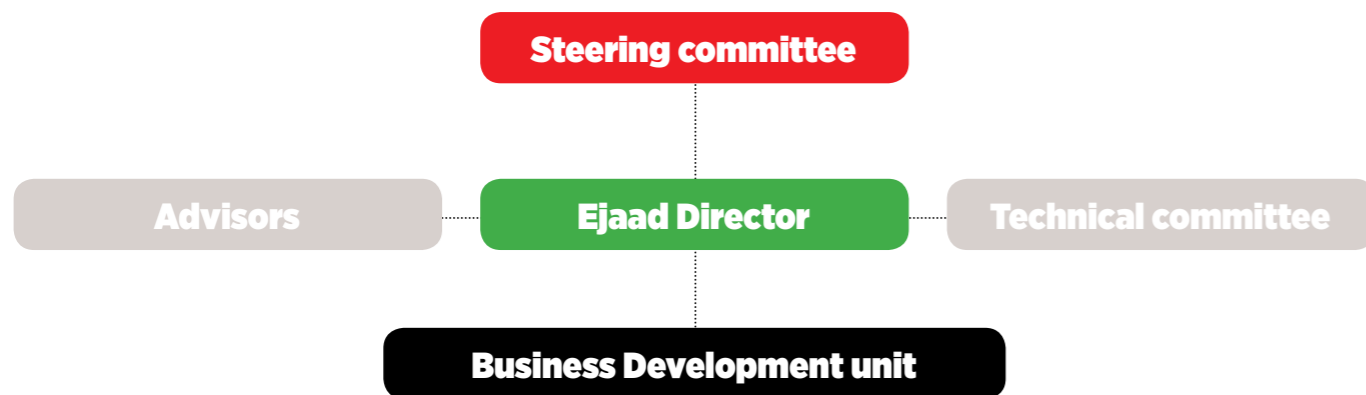
Monitor the progress of Ejaad projects and ensure commercialization plan in place per project

Business Development unit:

Engage with stakeholders and update Ejaad system and services

Industry Focal Point Roles and Responsibilities

- ✓ Become the organization's focal point in executing and fulfilling the Oman Energy Industry-Academia R&D Protocol requirements.
- ✓ Create awareness about Ejaad within the organization.
- ✓ Attend workshops/events related to Ejaad.
- ✓ Become the organization's point of contact on all matters related to Ejaad.
- ✓ Responsible for developing an "internal" system within the organization to support the operations of Ejaad



A PLATFORM FOR NATIONAL CHAMPIONS

Ejaad will play a significant role in deepening Oman's local vision and global reputation as an entrepreneurial nation. The potential of Ejaad is multi-faceted and touches many parts of Omani society and business.

- ✓ Job creation by establishing new industries as a result of solving industry challenges
- ✓ Building R&D capabilities in local academic institutions
- ✓ Cost-saving within industry by solving challenges and enhance the efficiency of its operations
- ✓ Ejaad will enhance human capital skills by:
 - Intense interaction
 - Staff mobility between industry professionals and researchers
 - Specialized training

www.ejaad.om

CONCLUSION



What's Next?

Detailed conversations, strategic brainstorming and open-mindedness have each played a fundamental role in establishing the Industry-Academia R&D Protocol – a roadmap of unprecedented clarity for Omanis today and for generations to come. The same ethos has been evident in the launch of Ejaad in December 2017, heralding a world-class tool that will help realize the Protocol's objectives in an efficient, sustainable and quantifiable manner.

Both the Protocol and Ejaad represent more than two years of dedication and hard work by stakeholders in Oman's Industry, Academia and Government, thus illustrating

the sultanate's entrepreneurial spirit. Both also mark a vital stepping stone - one with longevity - in Oman's transformation into a knowledge-based economy, while offering nations worldwide a clear template for achieving sustainable progress.

But, the journey does not end here – it has just begun. The Industry-Academia R&D Protocol and Ejaad represent the toolbox that Oman needs to make significant progress on key industrial R&D challenges. Now, Industry and Academia must leverage these new tools, open their intellectual doors to one another and focus on making quantifiable progress. A tool is only as good as those who wield it.



“Coming together is our beginning, staying together is our progress and working together is our success. Everyone is connected.”

DR. ABDULLAH AL ABRI, TECHNICAL LEAD, PETROLEUM DEVELOPMENT OMAN



Consultancy
Intelligence
Publishing