

Saudi Aramco annual review

2017



unmatched  
opportunity

unmatched  
opportunity



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**King Salman ibn 'Abd  
Al-'Aziz Al Sa'ud**  
The Custodian of the  
Two Holy Mosques



**His Royal Highness Prince  
Mohammed ibn Salman ibn 'Abd  
Al-'Aziz Al Sa'ud**  
Crown Prince, Deputy Premier,  
and Minister of Defense





**HE Khalid A.  
Al-Falih**

HE Khalid A. Al-Falih has been Chairman of the Board of Saudi Aramco since April 2015.

He is Minister of Energy, Industry and Mineral Resources for Saudi Arabia. HE Al-Falih served as the President and Chief Executive Officer of Saudi Aramco from 2009 until 2015, and previously held a range of roles at the company.

HE Al-Falih has an MBA from King Fahd University of Petroleum and Minerals, and a Bachelor's degree in Mechanical Engineering from Texas A&M University.



**HE Dr. Ibrahim  
A. Al-Assaf**

HE Dr. Ibrahim A. Al-Assaf is Minister of State and a member of the Council of Ministers, having previously been the Minister of Finance of Saudi Arabia. He is the Governor of the Islamic Development Bank and serves as a Governor at the International Monetary Fund and Arab Monetary Fund, among other roles.

HE Al-Assaf has a Ph.D. in Economics from Colorado State University, a Master's degree in Economics from the University of Denver, and a Bachelor's degree in Economics and Political Science from King Saud University.



**HE Mohammed  
A. Al-Jadaan**

HE Mohammed A. Al-Jadaan is currently Minister of Finance for Saudi Arabia. He also serves as Chairman of the Board of Directors of the General Authority of Zakat and Tax, Chairman of the Fiscal Balance Program Committee, Chairman of the Financial Stability Committee, and Chairman of the Board of the General Authority of Customs. He also serves as a member of a number of international boards, including the Board of Governors of the International Monetary Fund, and the Board of Governors of the World Bank.

HE Al-Jadaan has a degree in Islamic Economics from Imam Muhammad bin Saud Islamic University, and a degree in Legal Studies from the Institute of Public Administration, Riyadh.



**HE Mohammed  
M. Al-Tuwaijri**

HE Mohammed M. Al-Tuwaijri is currently the Minister of Economy and Planning for Saudi Arabia. In addition to other roles, he serves as Chairman of the National Center of Privatization, Chairman of the General Authority for Statistics, and is a member of the Saudi Council of Ministers. He has formerly served as CEO and Head of HSBC's Global Banking & Markets, MENA, and as Managing Director of JP Morgan Chase Bank, Saudi Arabia. HE Al-Tuwaijri has previously served on the boards of HSBC Bank Egypt, HSBC Holdings, MENA, and Saudi British Bank.

HE Al-Tuwaijri has a Bachelor's degree from the King Faisal Air Academy, and an MBA from King Saud University.



**HE Yasir O.  
Al-Rumayyan**

HE Yasir O. Al-Rumayyan currently serves as the Managing Director and Secretary General of the Board of the Saudi Arabian Public Investment Fund. He is also Advisor to the Saudi Council of Ministers. In the past, HE Al-Rumayyan served as the CEO of Saudi Fransi Capital LLC and as a Member of the Board of Directors at The Saudi Stock Exchange (Tadawul) Company.

HE Al-Rumayyan has a Bachelor's degree in Accounting from King Faisal University, and has completed the General Management Program at the Harvard Business School.

## board of directors



**Sir Mark  
Moody-Stuart**

Sir Mark Moody-Stuart serves as Vice Chairman of the UN Global Compact, and Chairman of the Global Compact Foundation, and Chairman of the Innovative Vector Control Consortium. Previously, he served as Managing Director of Royal Dutch Shell, as a Non-Executive Chairman of Anglo American plc, and as Director of Accenture plc. Sir Moody-Stuart was a Non-Executive Director of HSBC Holdings plc, and also served as co-Chairman of the G8 Task Force on Renewable Energy.

Sir Moody-Stuart has a Bachelor's degree in Natural Sciences and a Ph.D. in Geology from Cambridge University.



**Mr. Andrew  
N. Liveris**

Mr. Andrew N. Liveris is a member of the Board of Directors of IBM Corporation, an Executive Committee Member and past Chairman of the U.S. Business Council, and on the Board of Trustees of the King Abdullah University of Science and Technology. He formerly served as Chairman and CEO of The Dow Chemical Company, and was a member of the Board of Directors of DowDuPont Inc. and of Citigroup Inc.

Mr. Liveris has a Bachelor's degree in chemical engineering from the University of Queensland in Brisbane, Australia.



**Mr. Andrew  
F.J. Gould**

Mr. Andrew F.J. Gould serves as Chairman of the International Advisory Board at Boston Consulting Group Center for Energy Impact, and as Director of BJ Services, a private oil field services company. Mr. Gould was the Non-Executive Chairman and Non-Executive Director of BG Group plc, and served as the CEO and Chairman of Schlumberger Oilfield Services.

Mr. Gould has a Bachelor's degree in Economic History from Cardiff University, and a Chartered Accountant degree from the Institute of Chartered Accountants in England and Wales.



**Ms. Lynn Laverty  
Elsenhans**

Ms. Lynn Laverty Elsenhans is currently a member of the Board of Directors of Baker Hughes, a GE Company, as well as GlaxoSmithKline plc. She previously served as Chairwoman, President, and Chief Executive Officer of Sunoco Inc. and worked for Royal Dutch Shell, where she held a number of senior roles, including Executive Vice President of Global Manufacturing. She has previously served on the Boards of Flowserve Corporation, International Paper Company, and Motiva Inc., among others.

Ms. Elsenhans has a Bachelor's degree in applied mathematics from Rice University, and an MBA from Harvard Business School.



**Mr. Peter L.  
Cella**

Mr. Peter L. Cella is currently a member of the Board of Directors of ServiceMaster Global Holdings Inc. He previously served as President and CEO, Chevron Phillips Chemical Company LP, and as Senior Vice President, Petrochemicals, North America, BASF Corporation. He has also served on the boards of Chevron Phillips Chemical Company LP, and the American Chemistry Council.

Mr. Cella has a Bachelor's degree in finance from the University of Illinois at Urbana-Champaign, and an MBA from the J.L. Kellogg Graduate School of Management-Northwestern University.



**Mr. Amin H.  
Nasser**

Mr. Amin H. Nasser has been President and Chief Executive Officer of Saudi Aramco since 2015.

He has served in a number of leadership positions at Saudi Aramco, including as Senior Vice President for Upstream.

Mr. Nasser has a Bachelor's degree in Petroleum Engineering from King Fahd University of Petroleum and Minerals, and has completed the Senior Executive Program at Columbia University.



## chairman's message

Over the course of 2017, the oil market strengthened significantly as the global economic recovery contributed to healthier oil demand, and the industry ended the year with a generally more upbeat sentiment. Saudi Aramco performed exceptionally well during the year, with its strong performance aided by the oil market recovery.

Notwithstanding an improved market picture, the oil industry's preparedness for the future remains in question as the sector has lost an estimated \$1 trillion in planned investments since the market downturn began. The situation becomes more disconcerting when seen in the light of global demand growing at the rate of 1 to 1.5 million barrels per day annually, and maturing oil fields around the world exhibiting steepening natural declines that must also be offset by continuing investment in the industry.

To respond to this situation, significant new investments are required in additional capacity and expanded and upgraded infrastructure, as well as the development of pioneering technology to make petroleum energy more sustainable and accessible. Saudi Aramco is committed to playing its unique part in meeting the world's energy needs today and tomorrow by continuing to invest wisely throughout the cycle and across the value chain, reinforcing our preeminent leadership position in the industry.

Because petroleum is expected to remain a major part of the world's long-term energy mix, Saudi Aramco is not only investing to further strengthen our premier upstream oil position, but also working diligently to lighten the carbon footprint of oil. We are leveraging our excellence in research and innovation to address areas of strategic technology importance. These include advancing sustainable transport through the development of ultra-clean and integrated fuel engine systems of the future, and driving other high-impact solutions such as carbon capture, utilization, and storage as well as beneficial uses of carbon. In addition, considering the projected rapidly growing role of cleaner natural gas, the company expects to double the domestic production of gas while taking steps to establish a profitable international gas business.

Concurrently, Saudi Aramco is moving steadily to build a world leading position in the downstream segment of the business. As detailed in this *Annual Review*, state-of-the-art refining and marketing manufacturing complexes continue to be implemented in the Kingdom and in the fast growing markets of Asia and the United States. Oil feedstocks are playing an increasingly larger role in the company's petrochemicals production, which is on its way to becoming a world-class business. In addition, differentiated and branded base lube oils, manufactured at wholly owned and joint venture facilities, are moving toward a leading international position. We

believe this stronger downstream portfolio will not only add more value, promote sustainable growth, and secure outlets for future oil production, but also strengthen the company's resilience and robustness.

We must be able to depend upon a reliable supply chain for Saudi Aramco to remain the lowest cost operator and the most reliable supplier of oil. That is why the Board supports the localization of goods and services within Saudi Arabia with the aim of enhancing the efficiency and reliability of the supply chain, helping industrialize and diversify the Kingdom's economy and promoting small- to medium-sized enterprises. Besides advancing the company's strategic and operational goals, these initiatives are also fully aligned with Vision 2030, the Kingdom's blueprint to develop and diversify the Kingdom's economy and position it as an economic powerhouse for the 21<sup>st</sup> century.

In the meantime, the company continued to prepare itself for the listing of its shares, a landmark event the company and its Board anticipate with excitement.

To intensify the development of a world-class workforce ready to man and steer its expanding domestic and international businesses, to help the Kingdom's youth seize these wide-ranging opportunities, and to rapidly grow the proportion and participation of women in its workforce, Saudi Aramco is committed to supporting education and training in science, technology, engineering, and mathematics (STEM), as well as finance, business, and other important disciplines. These efforts will not only strengthen the growing industrial base in the Kingdom, but also help realize the ambitions of the Saudi people.

I would like to emphasize that Saudi Aramco's many accomplishments over the past year would not have been possible without the vigorous support and visionary guidance imparted by The Custodian of the Two Holy Mosques King Salman ibn 'Abd Al-'Aziz Al Sa'ud, and the Crown Prince HRH Mohammed ibn Salman ibn 'Abd Al-'Aziz Al Sa'ud.

On behalf of the Board of Directors, I thank the men and women of Saudi Aramco across the world who once again delivered outstanding performance amid a challenging environment. I would also like to thank our customers, partners, suppliers, and the communities in which we operate for their contributions to our shared success.

**Khalid A. Al-Falih**  
Chairman of the Board of Directors



## president's foreword

At Saudi Aramco, we are united in our determination to be the world's leading integrated energy and chemicals producer. This year we made significant progress to realize this aspiration.

To maintain our preeminence in the upstream sector, we remained focused on our core objective of creating and sustaining value from the Kingdom's hydrocarbon resource base for generations to come. We discovered two new oil fields in 2017 and stayed on course to increase the capacity of our Khurais field by 300,000 barrels per day in 2018. In gas, we readied our Midyan nonassociated gas field, commenced projects to expand production and processing capacity, and brought online the first unconventional gas in Saudi Arabia. Boosting our gas supplies is in line with our core upstream objective to provide additional fuel and feedstock for local industry while enabling increased exports of higher value liquids.

In the downstream sector, our primary objective is to extract maximum value along the hydrocarbon value chain and elevate our downstream business to the level of leadership we enjoy in upstream. In pursuit of this objective, we continued to expand our global network, completing key agreements and projects. In the United States, the full acquisition of Motiva Enterprises was finalized, with Saudi Aramco retaining the Motiva name and becoming the sole owner of North America's largest single-site crude oil refinery at Port Arthur, Texas. In Malaysia, we reached an agreement with Petronas to participate in RAPID, a refinery and integrated chemicals complex in the state of Johor. In China, we signed a Memorandum of Understanding with Norinco, a diversified industrial conglomerate, to participate in the expansion of one refinery and build a new one. And in Saudi Arabia, we fully commissioned the Sadara chemicals manufacturing plant, our joint venture with Dow Chemical.

Elsewhere, we continued to seek solutions for safe, sustainable, and reliable supplies of energy that help to address the climate challenge. We sustained growth while maintaining strong cost discipline, enabled by our Operational Excellence program and our focus on capital efficiency. Even more importantly, we improved our safety performance, reducing lost-time injuries.

We also know that the transformative power of innovation is integral to our future success. In 2017, we pursued breakthrough technologies across a number of strategic domains, including low emission transportation, carbon capture, utilization, and storage, and the direct conversion of crude oil to chemicals. Our research and development strategy seeks to unlock greater value, create more economic opportunities, and reduce greenhouse gas emissions, delivering benefits for energy consumers and producers alike.

This year we were granted 230 U.S. patents — a record high for Saudi Aramco.

In the Kingdom, we intensified our efforts to facilitate a diverse and competitive energy sector, forming joint ventures for onshore and offshore drilling, a maritime yard, and engineering services. In 2017, the metric for iktva, our global supply chain efficiency initiative, showed improvement. Our localization strategy is intended to optimize our costs and build a world-class supply chain ecosystem, strengthening our ability to meet our commitments to customers around the globe.

All these developments are designed to enhance the robustness, resilience, and integration of our business — not only to weather challenging times, but to thrive in them. However, no one company can do so alone. In 2017, we continued to expand our strategic collaborations with other energy producers, service providers, manufacturers, research institutions, and universities. Together, we are committed to reliably meeting the energy demands of billions of people for decades to come, helping to meet society's lower carbon goals, and remaining at the cutting-edge of technology.

The past year was an exceptional one for Saudi Aramco — made possible only through the outstanding efforts of our talented men and women. I thank them for their relentless commitment to safely, reliably, and responsibly deliver energy to the Kingdom and the world, helping ensure a brighter future for us all.

**Amin H. Nasser**  
President and Chief Executive Officer

# our operations

- Saudi Aramco headquarters
- global office
- R&D center/technology office
- wholly owned refinery

- power and water utility venture
- terminal

refining and chemical joint ventures, and listed subsidiaries:

### SAUDI ARABIA

- Rabigh Refining and Petrochemical Company (Petro Rabigh)
- Sadara Chemical Company

- Saudi Aramco Mobil Refinery Company (SAMREF)
- Saudi Aramco Shell Refinery Company (SASREF)

- Yanbu Aramco Sinopec Refining Company (YASREF)
- Saudi Aramco Total Refining and Petrochemical company (SATORP)

### MAASTRICHT

- ARLANXEO Holding BV

### SEOUL

- S-Oil Corporation

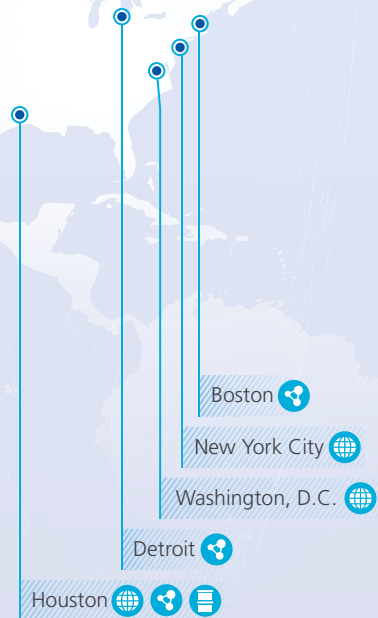
### FUJIAN

- Fujian Refining and Petrochemical Company Ltd.
- Sinopec SenMei Petroleum Company Ltd.

### TOKYO

- Showa Shell Sekiyu KK

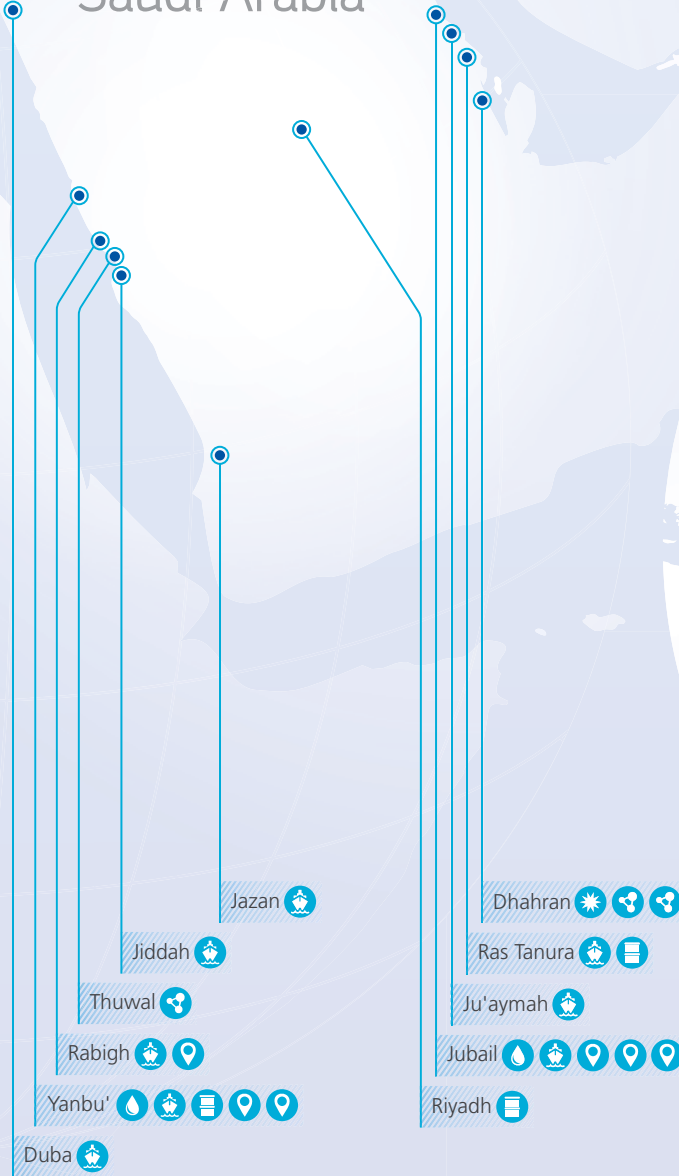
## United States



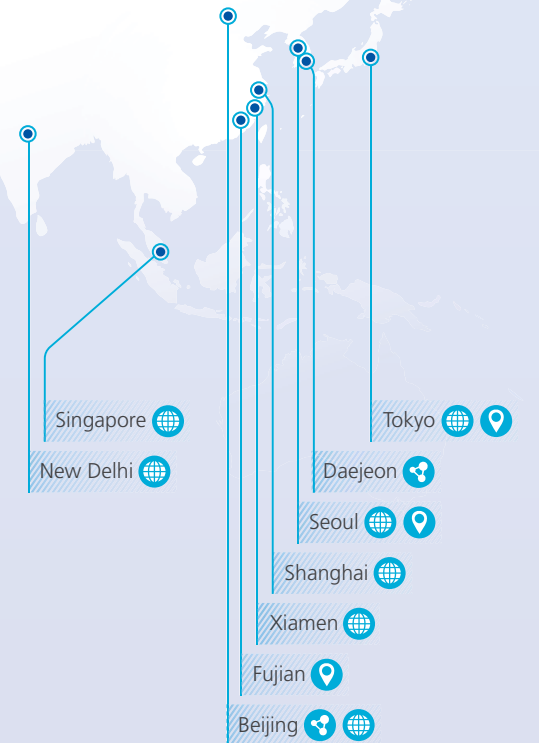
## Europe



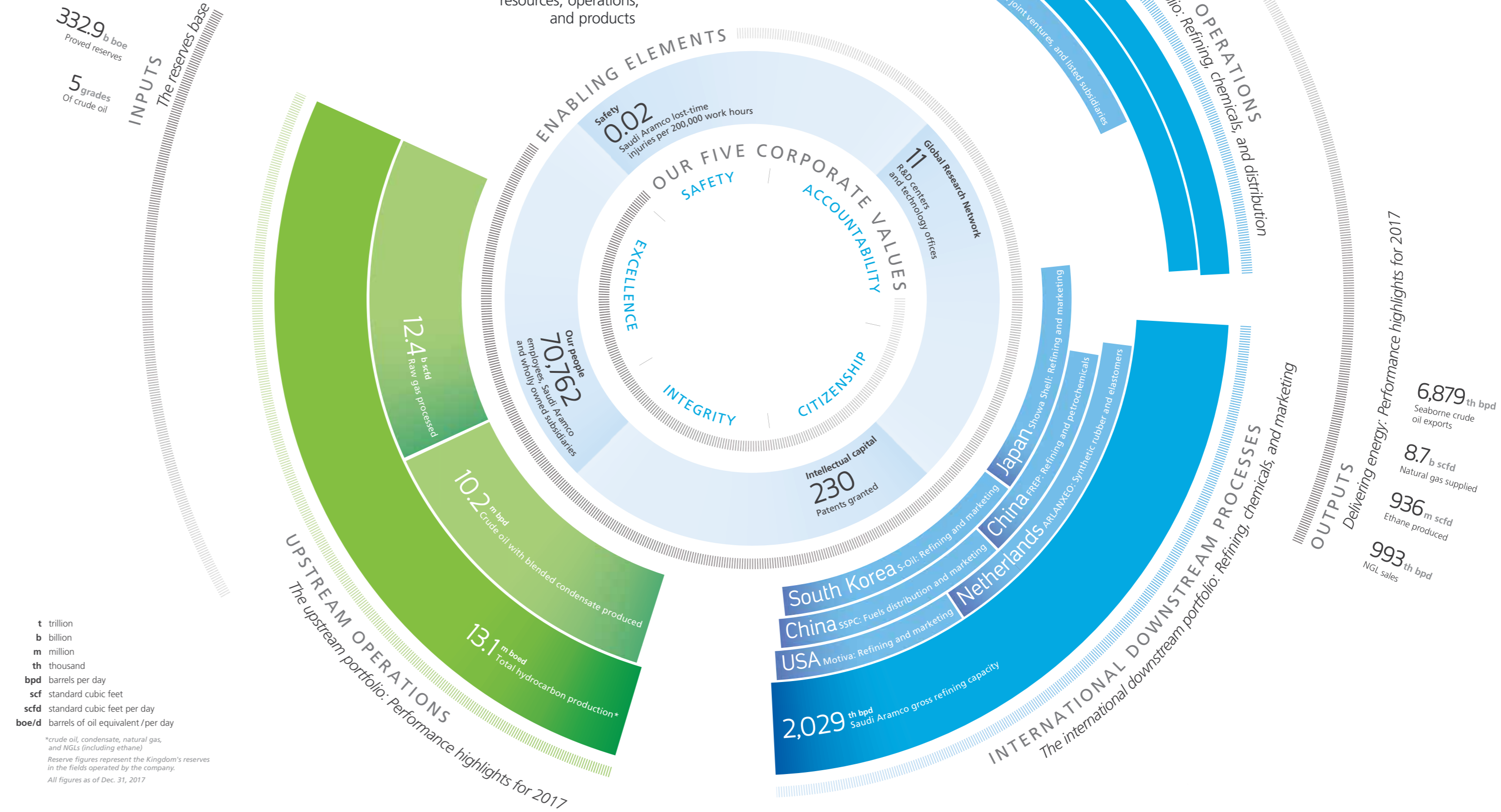
## Saudi Arabia



## Asia



our business  
resources, operations,  
and products



t trillion  
b billion  
m million  
th thousand  
bpd barrels per day  
scf standard cubic feet  
scfd standard cubic feet per day  
boe/d barrels of oil equivalent / per day

\*crude oil, condensate, natural gas, and NGLs (including ethane)  
Reserve figures represent the Kingdom's reserves in the fields operated by the company.  
All figures as of Dec. 31, 2017



## our business

We are the world's largest integrated oil and gas company.



### We are the world's largest integrated oil and gas company.

Our vision is to be the world's leading integrated energy and chemicals producer, operating in a safe, sustainable, and reliable manner.

Our performance is made possible through the power and ingenuity of our people, combined with cutting-edge technology and the steadfast execution of our long-term reservoir management strategy.

To achieve our vision, we continue to make progress on our journey to grow additional value and strengthen our resilience to crude oil market volatility through the strategic integration of our downstream operations and the development of our chemicals business.

Our commitment to research and development underpins our vision. The development and deployment of advanced technology is critical to the execution of our strategy and is embedded in our operational model. We focus on innovative ideas and technologies that will make our resources more accessible, useful, sustainable, and

## our company

competitive — helping ensure global energy security.

The scale of our upstream and downstream operations, and our expertise across the hydrocarbon value chain, position us to identify and capitalize on new opportunities and enter new markets. Equally important is our commitment to be a safe, responsible, and reliable provider of petroleum — one of the world's most important sources of energy — enabling the progress of people, communities, and countries around the globe.

### Our strategic objectives

At Saudi Aramco, our planning, decision making, and projects are guided by, and seek to fulfill, our strategic business objectives:

- Reinforce our preeminent position as the world's leading crude oil producer by production volume
  - Capture value from strategic integration
  - Expand natural gas activities
- We have identified four strategic enablers to help us meet these objectives:
- Maintain capital discipline and financial prudence, and manage risk

- Lead in technology development and innovation
- Be an employer of choice
- Promote sustainability, citizenship, and a robust domestic energy sector

### Governance

Our behavior is what defines us — as a company, as employees, and as people. We are dedicated to building and maintaining trusted relationships.

Our corporate governance structure defines our strategic direction and seeks to promote our industry leadership. It shapes who we are and how we are seen by the world — including by our customers, suppliers, and new and existing business partners. Our Board of Directors (the "Board"), which encompasses a wealth of diverse experience and a future-oriented mindset, sets standards for integrity and ethical behavior.

The Board oversees our regular reporting and independent auditing practices. The audit process, endorsed and monitored by the Board, is intended to ensure an independent, confidential, and robust review of company operations and provide a clear and transparent reporting channel from the auditors to the Board.

### Our business

Headquartered in Dhahran, Saudi Arabia, we manage the Kingdom's proved reserves of 332.9 billion barrels of oil equivalent. To supply global markets, major export shipping terminals are located at ports on the Arabian Gulf and the Red Sea, while domestic demand is served through a Kingdomwide network of strategically situated refineries and an extensive natural gas pipeline system.

### Domestic and global operations

Our operations in Saudi Arabia include exploration, the production and

processing of crude oil and natural gas, refining, gas fractionation, the production of petrochemicals, and distributing petroleum products and gas to domestic customers. We own and operate three domestic refineries, with a fourth under construction, to supply gasoline, diesel, and other products to local customers and consumers. In addition, we participate in five refineries with international partners in the Kingdom, four of which have integrated chemicals manufacturing capability.

Internationally, we are represented in the three major global energy markets of Asia, North America, and Europe. Our Global Research Network, which includes satellite offices in these same strategic regions, is dedicated to addressing global energy challenges through technology solutions.

We hold stakes in refining and marketing businesses in China, the Republic of Korea, and Japan. In the United States, through the full acquisition of Motiva Enterprises LLC, we retained the Motiva name and assumed sole ownership of North America's largest single-site crude oil refinery.

In total, our domestic and international downstream operations have a gross refining capacity of 4.9 million barrels per day.

Our chemical manufacturing capability is achieved with leading industry players through our joint ventures and listed subsidiaries in Saudi Arabia, China, Japan, South Korea, and the Netherlands. Through these ventures, we produce commodity chemicals as well as differentiated products.

We continue to pursue opportunities to further increase our chemicals and refining capacities in key strategic markets to enable sustainable growth and greater value creation.

key figures

oil equivalent reserves  
**332.9**  
billion barrels

crude oil with blended condensate produced  
**10.2**  
million bpd

raw gas processed  
**12.4**  
billion scfd

natural gas supplied  
**8.7**  
billion scfd

# upstream operations

For 85 years, we have been entrusted with the stewardship of the Kingdom's oil and gas reserves.



un matched

## Our upstream strategy: Leveraging advantages to maximize value

Designed to maximize long-term value, our upstream strategy focuses on leveraging our competitive advantages in production and scale. By tempering production from mature fields, accelerating younger fields and secondary reservoirs, and developing fresh reserves from new increments, we plan to create and sustain value for generations to come. To maintain our standing in the upstream sector, we seek to:

- Maintain our position as the world's leading crude oil producer by production volume, and provide consistent, reliable, and competitive crude oil supply to customers
- Further diversify operations to capture value from strategic integration
- Expand natural gas activities to supply the Kingdom's natural gas market

For 85 years, we have been entrusted with the stewardship of the Kingdom's oil and gas reserves.

In this time, we have grown to become the world's leading producer of crude oil and condensate.

Over the decades, we have matured our understanding of the Kingdom's geology and built an integrated network of oil and gas production and processing facilities. By combining technologies developed in-house with leading industry practices, we enhance our reserves base and optimize production from Saudi Arabia's reservoirs.

### Exploration: Adding to our resource base

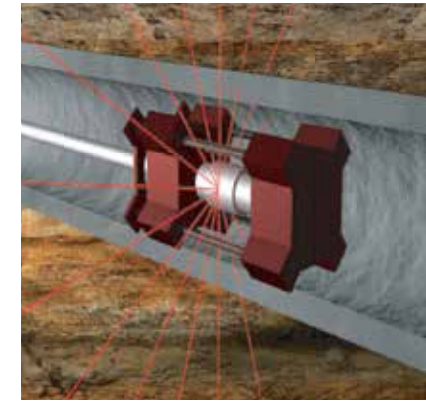
Exploration has been the cornerstone of Saudi Aramco since the Kingdom first granted a concession to our predecessor, Standard Oil of California, in 1933. Decades of onshore and offshore exploration in Saudi Arabia have resulted in an extensive portfolio of oil and gas fields that includes the world's largest onshore and offshore oil fields (Ghawar and Safaniyah, respectively). This accumulated knowledge and expertise

enables us to replace reserves through new discoveries, the delineation and reassessment of existing fields, and revisions of reserve estimates in producing reservoirs and fields.

Throughout 2017, we remained committed to discovering new conventional and unconventional hydrocarbon resources across the Kingdom, aided by the development and deployment of data acquisition and processing technologies.

Our unconventional gas exploration program targeted three areas: Northern Arabia, the South Ghawar area, and the Jafurah Basin east of Ghawar.

In the Red Sea, using an autonomous system that deploys seismic nodes on the seabed via reinforced armored rope, we reduced the costs of 3-D seismic data acquisition in our survey of two blocks measuring 800 square kilometers (km) and 900 square km. The choice of locations for the 3-D seismic survey was informed by a large-scale hydrographic survey — a first for these waters. We anticipate the results of the survey will help optimize field operations and facilities, including rig movements, laying of pipelines, and supply vessel routes.



This laser technology tool, developed in-house, is designed to be multifunctional — able to drill, frac, and perforate wells.



We are developing laser technologies conceived to perform perforation, waterless fracturing initiation, descaling, and other tasks to solve production challenges.

The Kingdom ended 2017 with proved reserves in the fields we operate of 332.9 billion barrels of oil equivalent.

### New discoveries

Crude oil and gas exploration activities during 2017 resulted in the discovery of two new oil fields and one new gas reservoir. The new oil fields discovered in 2017 were: **Sakab**, southeast of Haradh, and **Zumul**, in the Rub' al-Khali. The new gas reservoir discovered in 2017 was **Jauf**, in the Sahba field.

### Oil production: Investing to meet demand

The International Energy Agency's (IEA) *World Energy Outlook 2017* New Policies Scenario estimates that global energy needs will expand by 30% between today and 2040. With petroleum energy resources expected to form a key component of the world's energy mix for the foreseeable future, we continue to invest in our capability to meet current and projected future demand.

We have consistently produced five grades of Arabian crude oil. These grades, and the wide range of blends that can



In support of our drive to sustain value from the Kingdom's resource base for generations to come, we are working to increase the production capacity of our Khurais facility.

be produced using them, are compatible with most refineries around the world. This compatibility, combined with our flexible crude oil production capacity, enables us to quickly respond to increases in market demand for crude oil in general and to fluctuations in demand for specific grades.

In 2017, we produced an average of 10.2 million barrels per day (bpd) of crude oil, including blended condensate.

Our production strategy is guided by four interlinked considerations:

- The crude oil grades available
- The long-run value of different crude oil slates
- Our ability to sell the crude oil grades in strategic markets
- The near-term requirements based on a long-term assessment of future performance

To execute our production strategy, we focus on completing technical assessments for producing fields and exploiting potential synergies through the integration of subsurface computational models with surface facility networks. And because our principal oil fields are linked with our extensive network of integrated facilities, we have the flexibility to send crude oil to multiple plants for processing, stabilization, and shipping.

Given the scale of our reserves, even small percentage increases in recovery rates and production efficiency can

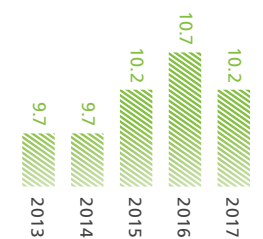
significantly boost long-term supply. In 2017, we pursued a host of initiatives to maximize oil recovery, including advanced well completion technologies, artificial lift optimization, and debottlenecking of production systems.

We continued efforts to develop secondary reservoirs, such as 'Ain Dar and Lower Fadhilli, and to optimize surface facilities. For example, we upgraded offshore platforms, installed new tie-in platforms, and replaced key trunk lines in our Safaniyah field. We also stayed on course to increase the plant capacity of our Khurais facility by 300,000 bpd in 2018.

We completed a major project to de-mothball one of the gas-oil separation plants (GOSPs) at our offshore Zuluf field. Production from GOSP-3 was suspended in 1995. During a six-month program, we inspected, repaired, and installed new equipment and utilities to bring GOSP-3 safely back online to sustain the field production capacity at 800,000 bpd of crude oil.

### Gas processing: Powering growth

The expanding industrialization of Saudi Arabia, and the increasing use of cleaner burning natural gas for power generation and seawater desalination, and as feedstock for the petrochemicals sector, provide opportunities for us to create significant additional value beyond crude oil.



Crude oil production (million bpd)

*We are the sole supplier of natural gas in the Kingdom, the seventh largest natural gas market in the world.*

This year, we made progress on several new gas processing plants. Designed to boost supplies of natural gas, the plants are expected to enable increased exports of higher value liquids, provide feedstock to the petrochemical industry, and reduce domestic reliance on liquid fuels for power generation. Additionally, the increased use of gas is expected to help lower greenhouse gas emissions and improve air quality.

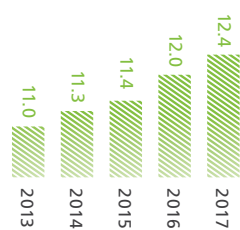
In 2017, we processed an average of 12.4 billion standard cubic feet per day (scfd) of raw gas and supplied 8.7 billion scfd of natural gas with an energy content of 1,080 Btu per standard cubic feet (scf).

**Improving production, expanding capacity**

In 2017, we readied our Midyan nonassociated gas field in northwestern Saudi Arabia. The facilities in the field are designed to produce 75 million scfd of natural gas and 4,500 bpd of condensate. This gas will be used to displace liquid fuels for power generation.

We completed wells toward the development of the Hasbah-Khursaniyah increment designed to feed the Fadhili Gas Plant, which is designed to process 2.5 billion scfd of raw gas. The gas from the Khursaniyah field is planned to feed the specially designed cogeneration plant that can handle low Btu gas.

We made significant commitments to improve production from existing gas fields and expand gas processing capacity, including:



Raw gas processed  
(billion scfd)

- Expansion of the gas processing capacity of our Hawiyah Gas Plant by 1.1 billion scfd. The new gas processing facilities, expected to be on-stream in 2021, are anticipated to raise total production capacity of the plant to approximately 3.6 billion scfd, making it one of the largest gas processing facilities in the world.
- Commencement of engineering, procurement, and construction of a natural gas liquids (NGL) deep recovery train at our 'Uthmaniyah Gas Plant to recover ethane and other NGLs from the natural gas produced from the 'Uthmaniyah plant and from the Hawiyah Gas Plant expansion.

In 2017, we achieved the following in our three unconventional gas exploration focus areas:

- In northern Arabia, we achieved raw gas production while reducing drilling costs through optimized well design and drilling practices, and made available 55 million scfd of natural gas to the Wa'ad al-Shamal Industrial Complex.
- In South Ghawar, we completed wells that showed high gas and condensate flows while also reducing drilling costs through well design optimization and the application of fit-for-purpose technologies.
- In the Jafurah Basin, we completed a number of wells and reduced drilling costs through improved well design and execution.



A massive dehydration unit rolls into our Fadhili Gas Plant. The unit improves the efficiency of the gas treatment process and helps ensure the purity of gas for distribution to customers.

### Upstream R&D highlights: Enhancing discovery, boosting recovery

At Saudi Aramco, we are dedicated to achieving technology breakthroughs that enable us to meet the needs of our customers more efficiently and cost-effectively while helping to minimize the environmental impact of our activities.

We are harnessing the power of the Fourth Industrial Revolution through our use of Big Data and supercomputing, and through ongoing investigations into nanotechnology applications.

Our upstream R&D addresses key oil and gas challenges: Improving seismic processing and analysis, increasing the effectiveness and efficiency of gas exploration, optimizing enhanced crude oil recovery methods, raising crude oil recovery rates, enhancing oil well productivity, and lowering production costs.

Our upstream research activities are primarily performed in-house, with support from our Global Research Network research centers in Houston, Boston, and Beijing, and from our technology offices in Aberdeen,



—  
Researchers at our Houston R&D Center explore the use of seawater as a fracturing fluid to minimize the use of freshwater, a scarce commodity in the Kingdom.

## *“Advanced technology will continue to play a pivotal role in helping us improve oil well productivity, increase recovery, and deliver better cost efficiency.”*

*Mohammed Y. Al-Qahtani, Senior Vice President, Upstream*

Scotland and Delft, the Netherlands.

Highlights from our upstream R&D programs in 2017 include the following:

#### Enhancing discovery

We continued to increase the power and speed of **GigaPOWERS**, our parallel oil and water enhanced reservoir simulator, and **TeraPOWERS**, our next-generation reservoir and basin simulator, to improve our computational modeling. These enhancements improve the resolution of the models, giving our petroleum engineers a better understanding of reservoir mechanics to enable maximum recovery and sustainable production for the long term.

We developed **GeoDRIVE**, our next-generation, integrated seismic imaging platform that enables ultra-high resolution subsurface mapping and characterization, and tested the platform in collaboration with the King Abdullah University of Science and Technology (KAUST). Our geophysical expertise, integrated with the power of Shaheen II, a KAUST supercomputer, successfully produced a 3-D image of subsurface geologic layers at a record resolution of 7.5 meters. This capability will enhance our understanding of challenging subsurface environments and help optimize drilling for exploration and production.

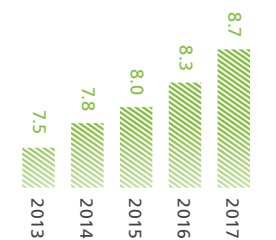
#### Boosting recovery

We continued monitoring the performance of our multi-well

demonstration project in 'Uthmaniyah, with the goals of sequestering carbon dioxide (CO<sub>2</sub>), developing related technologies, and **enhancing oil recovery**. To assess the effectiveness of the field pilot, the migration of the subsurface plume from the injected CO<sub>2</sub> is being tracked through 4-D geophysical monitoring, interwell tracer tests, geochemical sampling, and time-lapse logging. The crude oil production response due to CO<sub>2</sub> injection continued to show positive results.

Our state-of-the-art **Advanced Geosteering Center** in Dhahran enables real-time monitoring of drilling rigs hundreds of kilometers away to achieve precise, optimal well placement. Live drilling and downhole data is transmitted by satellite from rigs to the Advanced Geosteering Center where teams of experts analyze the data to make real-time decisions. Geosteering allows us to position wells for maximum reservoir contact, resulting in enhanced well productivity and reduced development costs. In 2017, our Geosteering program achieved 93% reservoir contact efficiency.

**Smart Flood** uses injected seawater with ionic compositions that have been optimized to enhance the "sweep" of oil in carbonate reservoirs and improve recovery rates. In 2017, we completed tie-in activities and commissioned multiphase flow meters at our 'Uthmaniyah Smart Flood demonstration project.



Natural gas supplied  
(billion scfd)



**At a glance:**  
Oil and gas  
mega-projects

Maintaining our reputation as a reliable producer of crude oil, and as a leading producer of natural gas, requires ongoing investment in our production capacity. In 2017, we continued to plan and execute a slate of mega-projects:

- Khurais field: Planned increase of crude oil production capacity by 300,000 bpd in 2018
- Fazran field: Planned increase of crude oil production capacity by 75,000 bpd in 2020
- Dammam field: Expected start up of 25,000 bpd in 2021, increasing to 75,000 bpd in 2026
- Fadhili Gas Plant: Designed to process up to 2.5 billion scfd of gas, with start up planned in 2019
- Hawiyah Gas Plant: Planned processing capacity expansion of 1.1 billion scfd

We are exploring the use of **seawater for fracturing** operations to minimize the use of freshwater resources. We completed a field trial in Haradh and three more field trials are planned for 2018.

Targeting improved well site safety, as well as significantly reduced field operation costs and downtime, we continued our field trials of a **cable deployed electric submersible pump**

(ESP). This technique enables the rapid deployment of ESPs using the pump's power cable, rather than a workover rig. In 2017, we completed two installations, with a third planned for 2018. We also progressed preparations for a field trial of a slimmer version of the technology.

To improve recovery rates and long-term reservoir management, we are conducting a suite of **nanotechnology**

**research** projects. Nanotechnology shows the potential to enable the monitoring and analysis of reservoir performance — and possibly intervention — directly from within the reservoir. In 2017, we identified scalable formulations of surface nanoparticles, which we plan to use in a single well chemical tracer field test in 2018.

Using cameras and sensors to document geological features, our GeoDrone solution improves safety and the accuracy of field data while also reducing costs, since geologists can conduct virtual field trips from their desktops.



key figures

seaborne crude oil exports  
**6,879**  
thousand bpd

NGL produced for sale  
**993**  
thousand bpd

refined products production  
**657**  
million barrels

pipeline network  
**21,000+**  
km

# downstream operations

Our downstream business is one of the company's engines for growth and diversification.







**Our downstream strategy: Integrating to add value**

Our downstream strategy seeks to enhance the value of our resource base by targeting increased horizontal and vertical integration across the hydrocarbon value chain. The successful execution of our strategy would deliver a world leading, strategically integrated downstream network — one that maximizes the worth of the hydrocarbon molecules we

produce — and a robust portfolio that is more resilient to market turbulence. To achieve our strategic objectives in the downstream business, we continued to pursue the following key goals:

- Optimally meet the Kingdom's refined product needs, while building a world-scale global refining system

- Create a top-tier, globally integrated chemicals business
- Increase integration of downstream facilities
- Implement our crude oil placement strategy
- Maximize value creation from power and cogeneration integration opportunities

Our downstream business is one of the company's engines for growth and diversification.

We started building our first pipelines and shipping facilities in 1938, loaded the first tanker to ship Saudi Arabian crude oil in 1939, and commenced refining operations at our original Ras Tanura refinery in 1941.

Since then, we have built an extensive global downstream network that is designed to provide a diversified portfolio of non-crude oil revenue streams, create resilience in times of crude oil price volatility, secure dedicated outlets for our crude oil in strategic growth markets, and allow us to maximize value across the entire supply chain — from the wellhead to customers.

**Adding value through integration**

In Saudi Arabia, our downstream operations encompass wholly owned and joint venture refineries and chemicals plants, and a Kingdomwide distribution network. The close integration of our upstream operations with our downstream system enables us to respond safely, reliably, and efficiently to

meet the needs of our growing domestic and international customer base.

Our global downstream network supplies a diverse and expanding range of products. We are a major refiner and among the global leaders in base oils. Chemicals is the fastest growing demand sector for crude oil, and our ventures in this sector position us for future growth and long-term value creation.

We also seek innovative new routes to value. For example, our proprietary CONVERGE® technology transforms emissions by using captured CO<sub>2</sub> to make an array of high performance polyols with a broad range of applications.

**In-Kingdom downstream: Expanding opportunities**

In Saudi Arabia, we manage a downstream network that encompasses gas fractionation, refining, distribution, and power generation that efficiently supports our operations. Within this system are the Sadara chemicals joint venture and Petro Rabigh (an integrated refining and chemicals company), eight refineries (three wholly owned), 23 bulk plants, two international airport refueling sites, more than 21,000 km of pipelines,

Our global downstream portfolio spans the hydrocarbon value chain and includes chemicals manufacturing, trading, refining, and marketing — creating greater value from our resource base.



and 20 export berths at six marine ports, including the Port of Ras Tanura — the world's largest group of crude oil export terminals.

We partner with world leading refining and chemicals companies in Saudi Arabia to produce a slate of products for

fractionation plants. The MGS collects all associated and nonassociated gas produced in the Kingdom and connects key gas production sites with demand centers in the Kingdom.

To accommodate growing domestic demand, we are expanding the capacity

domestic and international customers, generating greater value from our resource base and expanding market opportunities for our products with conversion industries and manufacturers. We are the sole supplier of refined products to the large and growing domestic market. And because our upstream operations supply crude oil directly to our domestic refining system through our extensive pipeline network, we optimize supply costs.

Our fourth wholly owned refinery, expected to be on-stream in 2018, is located in **Jazan** in the Kingdom's southwest region, and is designed to add 400,000 bpd of capacity to our domestic network.

**Optimizing supply and distribution**

Our distribution system spans the Kingdom, cost-effectively connecting oil and gas facilities with refineries and terminals, and delivering fuel and feedstocks to industrial customers. From our **Operations Coordination Center** in Dhahran, operators can monitor and control our entire hydrocarbon production and distribution system, ensuring the safe, efficient, and reliable delivery of energy to Saudi Arabia and the world.

We own and operate the **Master Gas System** (MGS), an extensive linked network of pipelines, gas processing plants, and NGL recovery and

of the MGS. The expanded system should deliver the twin benefits of reducing the use of liquids for power generation and enabling opportunities in energy consuming industries. Phase I of the expansion project was completed in January 2018, adding 1 billion scfd of capacity, raising the total capacity of the MGS to 9.6 billion scfd. The expanded system delivers increased supplies of natural gas to customers in the King Abdullah Economic City and the Rabigh area in the Western region.

Phase II of the expansion project — designed to raise capacity to 12.5 billion scfd — is in the engineering, procurement, and construction stage and is expected to be completed in late 2019. When complete, Phases I and II are planned to add more than 1,600 km of pipelines to the system, further enabling the growth of the high demand utility and industrial sectors in the Central and Western regions.

Work continued to de-mothball and integrate the **Yanbu' South Terminal** with the Yanbu' Crude Oil Terminal, with commissioning of the facility anticipated to begin in 2019. The additional capacity enables crude oil deliveries to the YASREF (Yanbu Aramco Sinopec Refining Company) and Jazan refineries while maintaining our West Coast export capability.

In support of our strategy to optimize supply and distribution of petroleum products in the Western region, we began a project to convert the industrial complex that includes our wholly owned **Jiddah Refinery** into a petroleum products distribution center, without

owned subsidiary, **Aramco Chemicals Company**, to consolidate and manage the marketing of certain chemical products.

Our chemicals expansion strategy is supported by our expectation that the petrochemicals industry will be

refining operations. The conversion project also seeks to enhance safety and environmental performance. And the loss of the relatively low refining capacity of the 50-year-old Jiddah Refinery — 77,000 bpd — will be more than offset by our YASREF and SATORP (Saudi Aramco Total Refining and Petrochemical Co.) joint ventures in Yanbu' and Jubail, respectively, and by the start up of our Jazan Refinery.

**Toward a top-tier chemicals business**

Our chemicals operations span the sector from the production of basic chemicals such as aromatics, olefins, and polyolefins, to more complex products, including polyols, elastomers, and advanced synthetic rubber.

In Saudi Arabia, our operations supply all of the feedstock required by our chemicals facilities and all of our domestic chemicals joint ventures. Most of our international joint ventures are integrated with refineries, providing production flexibility, and opportunities for cost competitiveness.

Our aspiration is to become a top-tier, globally integrated chemicals business. We are pursuing three routes to fulfill this aspiration: Leveraging existing assets, developing a global business platform, and seeking selective organic and inorganic growth. In 2017, we began work to launch a wholly

the fastest growing sector for crude oil, accounting for 15% of all crude oil demand by 2040. By increasing our participation in this market, we seek to create greater long-term value from our resource base and enhance our resilience to oil market fluctuations.

**Completing chemicals mega-projects: Sadara and Petro Rabigh**

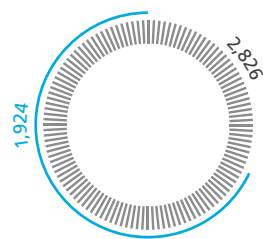
**Sadara**, our joint venture with The Dow Chemical Co. in Jubail Industrial City, began full operation of the last of its 26 plants during the year. The facility achieved reliable operations at full design feed capacity of 85 million scfd of ethane and 53,000 bpd of naphtha.

At our **Petro Rabigh** venture with Sumitomo Chemical on the Red Sea Coast, we achieved mechanical completion of the Rabigh Phase II project, which includes a new aromatics complex, an expanded cracking facility, and differentiated polymer units. Commissioning and start up of all units is expected in 2018.

**Transforming power**

Our investments in power, which primarily support our upstream and downstream operations, seek to achieve economies of scale by considering adjacent demand centers and capturing opportunities for advantaged fuels. In addition, our strategy is to identify

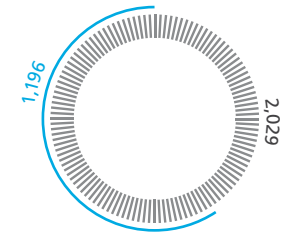
We monitor and control our entire hydrocarbon production and distribution system from our Operations Coordination Center in Dhahran, ensuring the reliable delivery of energy to Saudi Arabia and the world.



Domestic refining capacity

(thousands of bpd)

Total capacity  
Saudi Aramco share



International refining capacity

(thousands of bpd)

Total capacity  
Saudi Aramco share



opportunistic growth in the domestic power market.

We continued to transform our power business from dependency on third parties to self-sufficiency in electricity and cogenerated steam, while maintaining a steadfast concentration on safety, reliability, and energy efficiency. In 2017, we maintained self-sufficiency in power generation, with excess power exported to the national grid under a commercial agreement. Company power efficiency reached 67% by year-end, an improvement of 1% over the previous year.

In 2017, we created **Aramco Power**. Its establishment advances the transformation of the company's power

business to a sustainable commercial business through the generation of service and trading revenues.

The joint venture power cogeneration facilities at our Hawiyah Gas Plant, Abqaiq Plants, and Ras Tanura Refinery were operational in 2017. In addition, the construction progress on the cogeneration facility integrated with our Fadhili Gas Plant reached 51% at year-end.

#### Global downstream: Expanding integration

Worldwide, we participate in refining and marketing ventures in China, Japan, and South Korea, and are sole owners of the Motiva refining and marketing company

in the United States. We also participate in a joint venture specialty chemicals company, ARLANXEO, headquartered in the Netherlands.

In 2017, we continued to evaluate and pursue opportunities to increase our refining and chemicals capacities in key strategic markets. We also explored opportunities to integrate chemicals manufacturing with potential joint venture refineries, and to develop or expand chemicals production facilities at existing joint ventures.

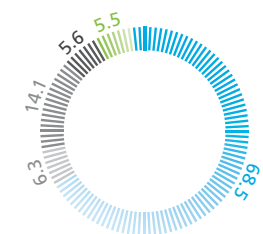
In **Malaysia**, we executed Share Purchase Agreements with Petronas to participate in a grassroots full conversion refinery and integrated chemical cracker to be located in Johor Bahru, Malaysia. The project, known as RAPID (Refinery and Petrochemical Integrated Development), includes a 300,000 bpd refinery, 3 million tons per annum of olefins capacity, and downstream chemicals manufacturing units. Situated adjacent to Singapore, the refined trading products hub for Asia, the venture is planned to increase

placement of our crude oil in the region, and add to our refining and chemicals manufacturing, and marketing capacity in strategic markets.

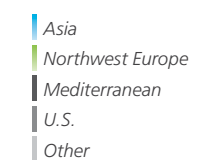
In **China**, we signed a Memorandum of Understanding with China North Industries Group Corp. (Norinco) to participate in its planned refinery expansion and a 300,000 bpd greenfield refinery in Panjin in Liaoning Province. Also in China, we marked the 10-year anniversary of our Fujian Refining and Petrochemical Company joint venture. Over the past decade, with our partners the Fujian Provincial government, Sinopec, and ExxonMobil, we have tripled the facility's crude oil production capacity, increased the capacity of its ethylene cracker, and added a new ethylene oxide/ethylene glycol unit.

In **Indonesia**, following the joint venture development agreement signed with Pertamina in 2016, we completed basic engineering for the upgrade and expansion of the Cilacap Refinery in Central Java.

The world calls for energy at the Ju'aymah offshore terminal on the Arabian Gulf, where a supertanker loads crude oil from a single-point mooring.



2017 crude oil exports  
by market  
(percent)



*In 2017, we continued to pursue opportunities to increase our refining and chemicals capacities in key strategic markets.*

In New Delhi, **India**, we opened a new office for our Aramco Asia-India affiliate. The office will strengthen our presence in the country and potentially enable broader opportunities between Saudi Aramco and leading Indian entities.

In the **United States**, the dissolution of the 18-year-long Motiva joint venture was finalized during the first half of the year. Saudi Aramco retained the Motiva name and assumed sole ownership of North America's largest single-site crude oil refinery, located in Port Arthur, Texas. In addition, Saudi Aramco retained 24 terminals and an exclusive license to sell fuel under the Shell brand in Texas and much of the U.S. Midwest and Southeast.

In the **Netherlands**, ARLANXEO is our specialty chemicals joint venture that produces, markets, and distributes synthetic rubber and elastomers. In 2017, we began design of a project to utilize crude C4 from Sadara to produce butadiene and related coproducts such as MTBE and high purity isobutylene as feedstock for

ARLANXEO for a planned elastomers plant to be located in Saudi Arabia.

### Growing sales and marketing

In our drive to grow our base oils business, in 2017 we marked a number of milestones, including establishing a global interchangeable slate of Saudi Aramco branded base oils among our LUBEREF, S-Oil, and Motiva affiliates, and launching the brand at three major base oil and lubricants conferences. We also commenced domestic sales of aramcoDURA® and aramcoPRIMA® base oils. With the completion of the LUBEREF expansion project in Yanbu', we are aiming to become a leading supplier of global base oils, with gross production capacity of 4.7 million tons per year.

**Saudi Aramco Products Trading Company (ATC)** is our wholly owned subsidiary based in Dhahran, with a branch in Singapore. ATC is Saudi Aramco's trading arm and conducts trading activities in refined products, liquid chemicals, and polymers. ATC is



In pursuit of our aim to become a leading supplier of global base oils, we launched sales of our aramcoDURA® and aramcoPRIMA® base oils.

## *“We capture value by integrating at the operational and geographical level — connecting oil and gas supply, refining, chemicals, and base oils in regions of high growth potential.”*

*Abdulaziz M. Al-Judaimi, Senior Vice President, Downstream*

also involved in chartering activities to deliver products to clients, and is the largest charterer in the Middle East region. In 2017, ATC continued to expand its market presence by entering new markets.

### Downstream R&D highlights: Leveraging technology to add value

Our investments in downstream R&D seek to maximize the value of our resource base through process improvement and enhanced production efficiencies while supporting integration across the hydrocarbon value chain. Our research includes the following key priorities:

- Oil and gas treatment: Crude oil separation and gas separation technologies
- Oil upgrading and refining: Supercritical upgrading of heavy oil, and production of novel catalysts for cracking low value refinery streams
- Chemicals: Converting lower value feedstocks and increasing the share of crude oil in chemicals production
- Oil and gas network integrity: Advanced sensing, prediction, and monitoring technologies

### Improving efficiency and performance: Oil and gas treatment

Technologies to upgrade and enhance oil and gas treatment show potential to improve production performance,

increase the value of lower quality gas, and save water.

The use of **membrane-based technology** potentially offers a cost-effective approach to upgrade low Btu gas for use in cogeneration electrical power plants, helping minimize the use of liquids for power generation. In 2017, progress was made on the removal of acid gases through specialized membranes. We also completed a study that confirmed the capability of membranes to recover high levels of helium with a high enrichment factor, which could become a potential commercial opportunity.

### Upgrading oil, enhancing refining

We are investigating the feasibility of **upgrading heavy oil** for refining, petrochemical, and power generation applications. This research program could result in more flexibility in processing heavy crude oil grades and residue fractions of crude oil to create greater value. One focus area is our proprietary supercritical fluid technology for upgrading low value refining streams to distillates and chemicals. In addition, a number of evaluations were completed in 2017, including a process economy evaluation for lube oil and low-sulfur marine fuel oil.

Commercially available refining catalysts are designed for generic feedstock, and conversion processes can negatively impact product yields and quality. We are conducting research into specific catalyst formulations and processes

un matched

## At a glance: Downstream projects

In 2017, we continued to make progress on projects across the hydrocarbon value chain to enhance our performance in the downstream sector. These projects include:

- Jazan Refinery, southwest Saudi Arabia: Continued progress on a 400,000 bpd grassroots refinery, terminal, and integrated gasification combined cycle power plant. Construction of the refinery

was nearly 90% complete at year-end

- Sadara, Jubail, Saudi Arabia: Start up of all remaining plants achieved in first half of 2017
- Motiva, United States of America: Assumed sole ownership of North America's largest single-site crude oil refinery, retained 24 terminals, and an exclusive

license to sell fuel at more than 5,000 service stations

- S-Oil, South Korea: Three refinery upgrade packages completed at the Ulsan refinery to improve refinery efficiency and productivity
- RAPID, Johor, Malaysia: Refining and chemicals joint ventures formed with Petronas

to enhance the performance of our refining conversion processes such as hydrocracking, fluid catalytic cracking, and hydrotreating. Key objectives of the research include increasing product yields and producing high quality feedstocks for production of propylene or base oils from heavier feedstocks. In 2017, we developed 15 new catalysts based on zeolite minerals, and completed pilot plant testing of 16 catalyst systems.

### Transforming the resource base

The conversion of advantaged liquid feedstock to chemical building blocks and the enhancement of lower value streams from refinery and petrochemical sources have the potential to create greater value from our resource base and strengthen our diversification and resilience as a business.

With our partner Sumitomo Chemical of Japan, we increased the throughput of our Petro Rabigh 1-Butene plant through the development of a **novel anti-fouling additive technology (AFA)**.

Our **CAN-FCC** catalyst offers a high tolerance for heavy oil streams in fluid catalytic cracking processes and increases the yield of various distillates and chemicals. In 2017, we demonstrated an additional propylene yield improvement with this catalyst over the existing catalyst used in one of our joint venture refineries.

Our **SuperButol** technology targets the conversion of mixed low-value butenes streams for use as a gasoline blending component to improve fuel combustion

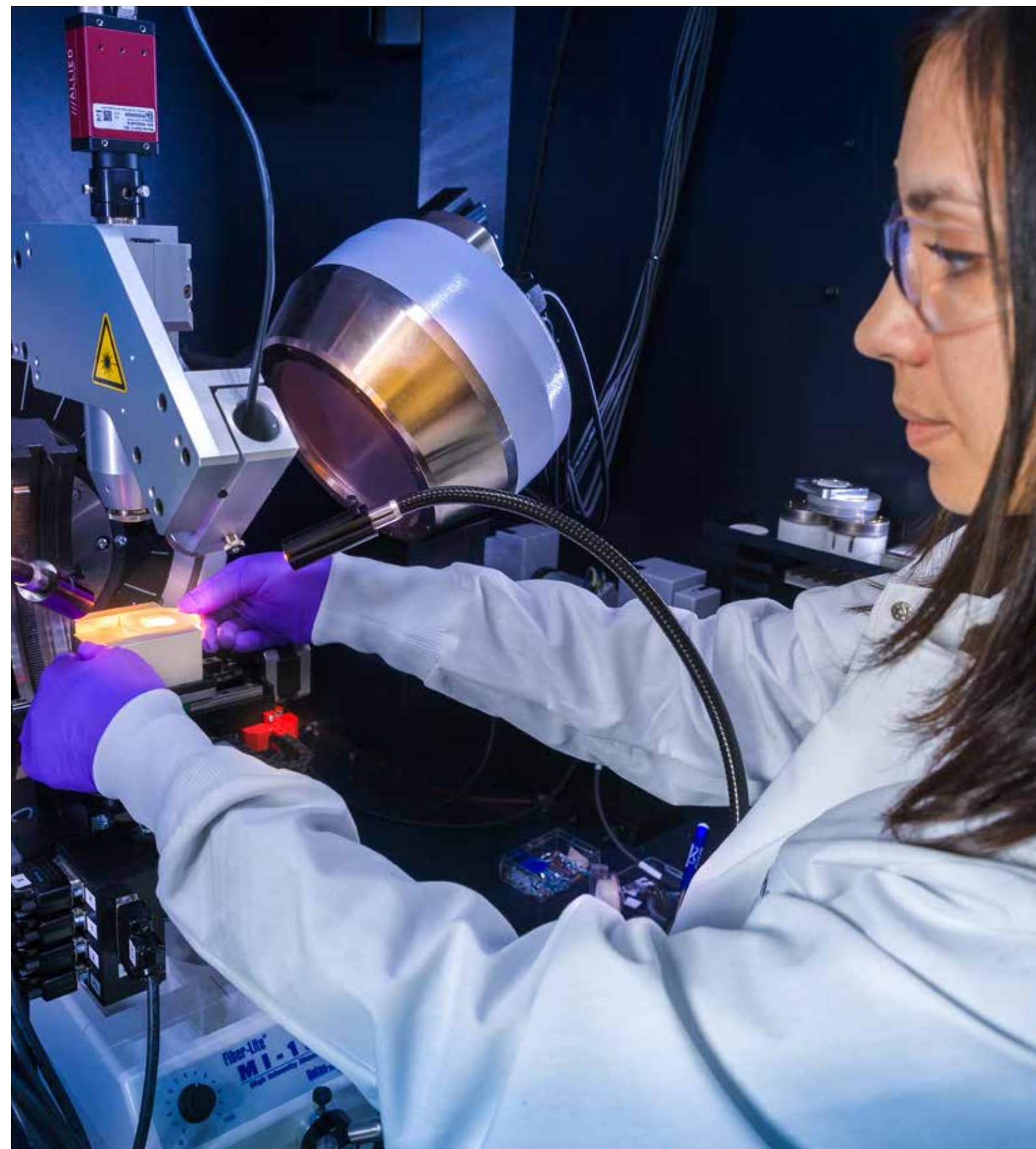
and increase octane. In 2017, the technology was successfully scaled up and demonstrated, and the basic engineering package study was completed for potential commercial deployment.

### Maintaining reliability through network integrity

The safe and reliable delivery of our products to customers is paramount. With an emphasis on corrosion and materials, our R&D efforts seek to protect and enhance the integrity and performance of our oil and gas network. Our goals are to significantly reduce the annual cost of inspection and monitoring, and ultimately the cost of corrosion, through the use of autonomous robots and advanced sensing and prediction capabilities.

To achieve our goals, we are developing cost-effective **robotic sensing and inspection tools** to monitor shallow water and onshore pipelines. Additionally, we developed and released a storage tank calibration robot, improving inspection quality and reducing calibration time from 16 hours to four hours. To create additional value and enable greater opportunities for domestic businesses, a number of these technologies are being commercialized for local, regional, and global deployment.

An advanced materials researcher at our Boston R&D Center uses X-ray diffraction to determine properties critical for research programs ranging from corrosion to catalysts.



key figures

< 1%  
flaring intensity

230  
patents granted by  
the U.S. Patent and  
Trademark Office

11.5  
million boe  
of high value  
liquids displaced  
with nonassociated  
gas during peak  
summer demand



# securing the future

At Saudi Aramco, sustainability is an ethos that infuses all aspects of our company — in Saudi Arabia and wherever we do business around the world.



**At a glance:**  
Key achievements in sustainability

- Demonstrated CO<sub>2</sub> emissions reduction in a vehicle with a fully integrated octane on demand system
- Aramco Performance Materials sold its first consignment of CONVERGE® products — high performance polyols created, in part, from CO<sub>2</sub>
- Began construction of a new research center at KAUST to support innovation in upstream and downstream domains and in environmental protection
- Completed the installation of multiple flare gas recovery systems

At Saudi Aramco, sustainability is an ethos that infuses all aspects of our company — in Saudi Arabia and wherever we do business around the world.

For us, sustainability means improving our environmental performance, and the positive social impacts of our operations, while increasing our efficient use of resources, assets, and capital. Our commitment to sustainable practices governs our corporate and professional behavior and guides us to conduct our business dealings and interactions in accordance with legal and ethical standards.

Sustainability steers our future outlook, spurring us to develop and implement meaningful solutions to global energy and climate challenges by pushing the limits of innovation and technology — all while being a steadfast contributor to the world’s energy needs.

**Working responsibly and ethically**

Our continued commercial success is dependent upon meeting the highest standards of business practices. By doing so, we seek to ensure the continuation

and growth of our business, foster new partnerships, and maintain the trust of the communities that host our operations.

Our corporate values underpin all our operations and guide our business conduct. They are the basis for a suite of policies, codes, and guidelines that govern our employees as they implement the company’s business strategy. These same components shape our Compliance Program that serves as the benchmark against which we measure our performance and that of our partners — contractors, consultants, suppliers, affiliates, and joint ventures within the Kingdom of Saudi Arabia, and globally.

We have a dedicated Corporate Compliance office charged with monitoring and supporting our Compliance Program, and with tracking external legal and regulatory developments.

Our employees are required to review our Conflict of Interest and Business Ethics Policies on a regular basis. Any ethics concerns from our employees or third parties can be clarified through our established communication and reporting channels. For example, our General Auditor Hotline provides

a secure method for anyone to report suspected fraud, unethical conduct, and business irregularities related to Saudi Aramco business.

Additionally, our Supplier Code of Conduct promotes our values and extends and maintains our ethical standards across our supplier network, helping enable long-term, mutually beneficial partnerships.

**Securing a sustainable future with technology**

At Saudi Aramco, we believe that continued investments in further reducing the greenhouse gas intensity of crude oil and its derivatives will reap benefits for energy producers and consumers alike.

Our R&D programs address four areas of strategic importance: Sustaining low carbon intensity crude oil, growing non-fuel applications for crude oil, advancing sustainable transport, and driving high-impact solutions. And to address these areas we are harnessing the power of the Fourth Industrial Revolution with technologies that include big data, advanced analytics, and artificial intelligence. For example, our Engineering Solutions Center combines operational data, advanced analytics, and in-house technologies and expertise to monitor company energy consumption and achieve near zero flaring intensity.

**Sustaining low carbon intensity crude oil**

A study conducted in 2017 and published in early 2018 in *Nature Energy* examined the well-to-refinery carbon intensity of all crude oil grades supplied to the Chinese

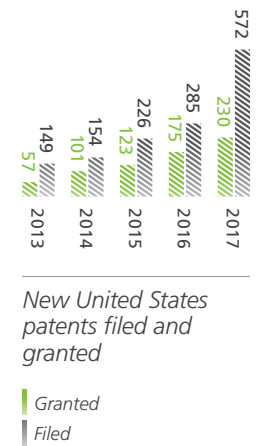
market, including those imported or produced locally. In crude oil production and processing, carbon intensity is a measure of the greenhouse gas emissions associated with producing a barrel of oil from the well to the refinery. The study examined crude oil grades supplied from over 100 oil fields in 20 countries and concluded that Saudi Arabian crude oils have the lowest carbon intensity.

The low carbon intensity advantage of Saudi Arabian crude oil is a result of multiple factors, including our long-standing practices in well completion, reservoir management, and flare minimization. For example, technologies such as mobility geosteering, multilateral wells with smart completions, and peripheral water flooding, have led to low water production per barrel (or water cut) relative to the depletion stage of the reservoir, which directly translates to lower energy requirements to process and recycle water, and consequently reduces our greenhouse gas emissions in oil production and processing.

**Growing non-fuel applications**

We are pursuing non-fuel uses for crude oil to unlock greater value, create more economic opportunities, and reduce greenhouse gas emissions.

We are collaborating with SABIC, the Saudi-based global chemicals company, on a crude oil to chemicals project. In 2017, we signed a Memorandum of Understanding to pursue the next phase. The project — the first between Saudi Aramco and SABIC, two of the largest economic entities in the Kingdom — is anticipated to process 400,000 bpd of crude oil to produce approximately



*At Saudi Aramco, we believe that continued investments in further reducing the greenhouse gas intensity of crude oil and its derivatives will reap benefits for energy producers and consumers alike.*

9 million tons of chemicals and base oils annually in addition to transport fuels.

Our own **crude oil to chemicals** technology program aims to expand petrochemicals manufacturing by eliminating intermediate refining steps and converting crude oil directly to chemicals. In 2017, we successfully piloted a thermal crude oil to chemicals technology (TC2C) that resulted in higher chemicals yield than previously achievable. We also established a strategic partnership with leading technology providers, Chicago Bridge & Iron and Chevron Lummus Global, to de-risk and scale up this technology.

We continued to expand the use of innovative **nonmetallic materials**, including the deployment of more than 2,300 km of nonmetallic pipes, resulting in significant life cycle cost avoidance across company operations. Expanding applications for nonmetallic materials, including for the automotive, building and construction, packaging, and renewable energy sectors could create additional markets for our crude oil and enable potential opportunities for local manufacturers.

#### Advancing sustainable transport

In collaboration with engine technology developers and major automakers, we are advancing new engine and fuel technologies to reduce exhaust emissions and improve fuel economy — twin goals that help address the global climate challenge and contribute to continued mobility and economic growth.

A key research area for us is the development of efficient and affordable

fuel engine systems that achieve high efficiencies with very low emissions. For example, our researchers are working on novel technologies that can use **low octane gasoline fuels** in light-duty vehicles, potentially achieving an estimated efficiency improvement of 25%.

Our **octane on demand** technology program, which uses two fuels to attain the necessary anti-knock quality, strives for an estimated efficiency improvement of 8% compared to gasoline engines. In 2017, we completed a vehicle demonstration at our Paris research center with a fully integrated octane on demand system that reduced CO<sub>2</sub> emissions.

We are also seeing promising opportunities to significantly increase efficiency in heavy-duty vehicles. At our Detroit research center, we are developing and demonstrating efficient and affordable fuel engine systems that can use low octane gasoline fuels such as **Gasoline Compression Ignition (GCI)** technology with the potential to lower CO<sub>2</sub> emissions.

#### Driving high-impact solutions

Our carbon management programs help support our efforts to address climate challenges, contribute to global energy supply, and enable the sustainable growth of our business. To achieve these aspirations, we are investigating cost-effective and efficient low-carbon footprint technologies, including carbon capture, utilization, and storage, and improved energy efficiency and energy mix diversification.

Our intent to contribute to reducing

***“We are committed to reducing greenhouse gas emissions by focusing our research, development, and funding on high-impact technologies that reduce cost and create significant environmental advantages.”***

*Amin H. Nasser, President and CEO, Saudi Aramco*

At our Boston R&D Center, materials are prepared for nanoscale analysis via a scanning electron microscope, which helps inform the development of advanced materials for corrosion prevention and mitigation.



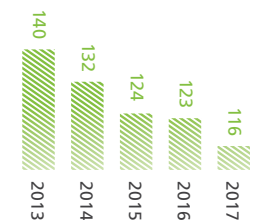
greenhouse gas emissions while helping provide the energy the world needs is illustrated by our founding membership of the **Oil and Gas Climate Initiative (OGCI)**. Together, the 10 OGCI members produce more than one-fifth of oil and gas globally, and our collective efforts have the potential to reduce greenhouse gas emissions on a significant scale.

In 2016, the OGCI announced an investment of \$1 billion over the next 10 years through OGCI Climate Investments to develop and accelerate the commercial deployment of innovative low emissions technologies. OGCI Climate Investments announced its first three investments in 2017. These investments deliver on the organization's commitments to concrete action to spur the growth of promising low-emission technologies. The investments include:

- A company that is developing innovative, high efficiency opposed piston engines with the potential to substantially reduce the greenhouse gas emissions produced by vehicles — a technology Saudi Aramco showcased at the North American International Auto Show in Detroit in early 2018
- A cement and concrete production company that uses CO<sub>2</sub> to produce cement and cure concrete, with the potential to lower CO<sub>2</sub> emissions in concrete production up to 70%, and water consumption by 80%
- A project to design the first commercial scale gas power plant with carbon capture and storage capability

#### Creating value from emissions

We see CO<sub>2</sub> not just as an emission to be controlled, but as an opportunity



Energy intensity required to produce one barrel of oil equivalent  
(thousands of Btu)



*“Improving the internal combustion engine remains the most cost-effective and timely means to reduce greenhouse gas emissions from the transport sector — and those improvements can yield dramatic results.”*

Ahmad O. Al-Khowaiter, Chief Technology Officer

to create additional value. Our CONVERGE® polyols technology converts CO<sub>2</sub> into cost competitive and sustainable polyols used in a broad range of high performance applications from automobile seating to insulation. Containing up to 50% CO<sub>2</sub>, CONVERGE® polyols have a significantly reduced carbon and energy footprint when compared to conventional petroleum-based polyols.

Our Aramco Performance Materials affiliate in the U.S. commenced commercial operations in 2017, selling its first consignment of CONVERGE® products in the first quarter of 2017.

### **Driving energy efficiency, reducing emissions**

Our energy efficiency efforts seek to reduce energy consumption at company facilities, design new facilities to be energy efficient, increase overall energy efficiency, and influence and promote energy efficiency at the national level.

In 2017, Saudi Aramco flaring intensity remained at less than 1% of annual gas production and we continued progress toward our eventual goal of zero routine flaring. As part of our **Flaring Minimization Program**, we completed the installation of multiple flare gas recovery systems, including at our onshore Safaniyah facilities.

In line with our efforts to boost energy efficiency, our **Energy-to-the-Kingdom (E2K)** initiative contributed to the

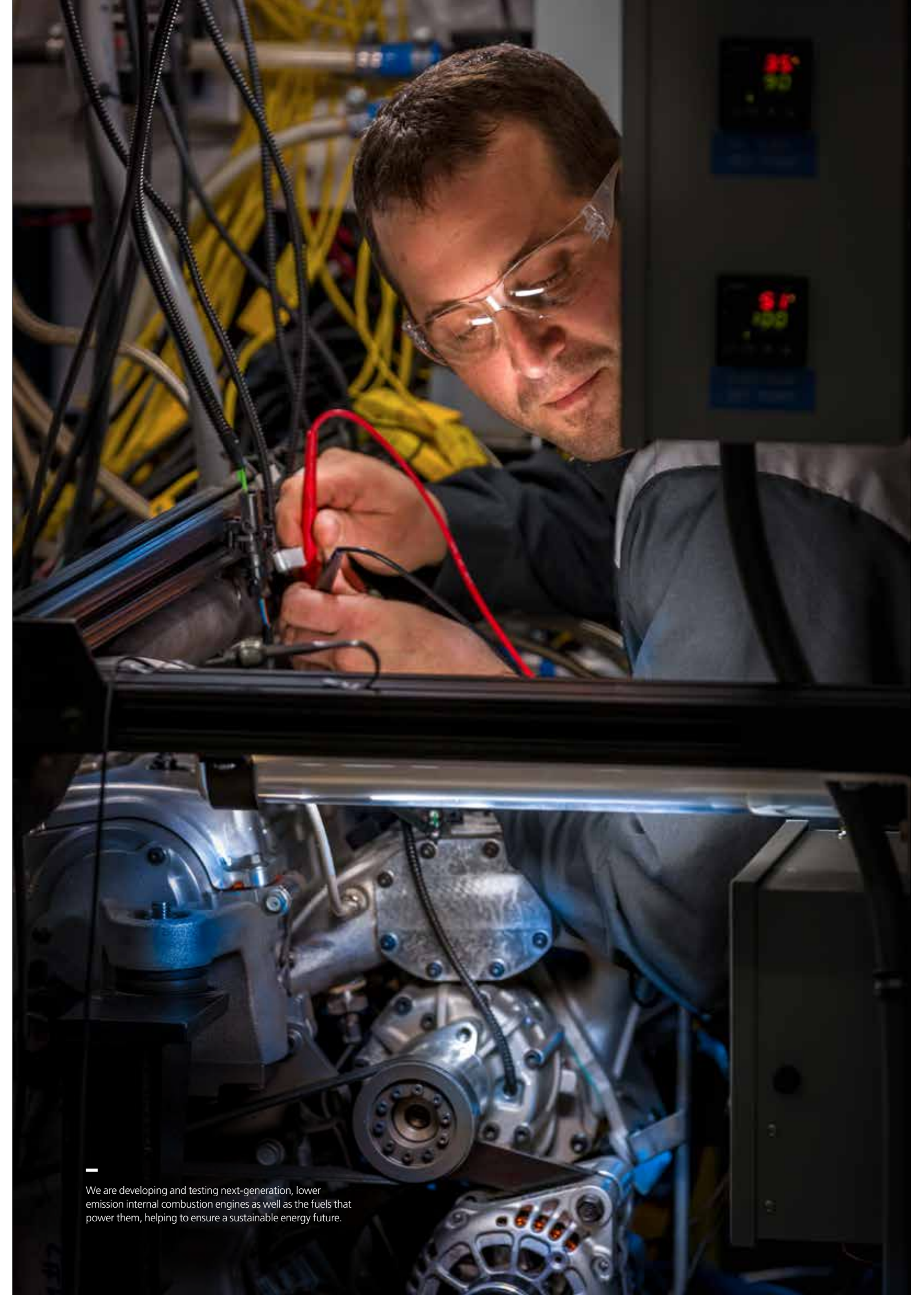
Kingdom raising its utility sector efficiency to 37.9% by year-end, an improvement of nearly 6 percentage points since 2013.

Our **Peak Summer Production Program** provided additional volumes of nonassociated gas to reduce the use of liquids in power generation during the summer. In 2017, we displaced 11.5 million barrels of crude oil equivalent, freeing up higher value liquids while reducing emissions. We also continued our collaboration with the Saudi Energy Efficiency Program to promote energy efficiency practices through awareness campaigns.

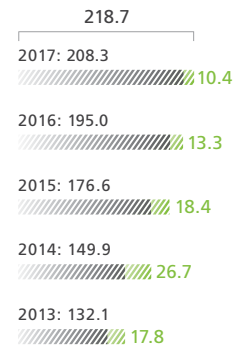
### **Leading by Example**

Our Lead by Example Program, established in 2012, strives to achieve a 35% reduction by 2020 in non-industrial energy consumption in company buildings, transportation, and communities. Phase two of the program to replace 60,000 fluorescent lights in office buildings and facilities with more efficient LED lighting was nearly complete at year-end. In addition, motion sensor switches were installed in closed office spaces, resulting in a 60% reduction in power usage from office lighting, and 16 power meters were installed in office facilities during the year to monitor consumption.

In transportation, we have replaced more than 4,000 company vehicles with more efficient six cylinder models and affected the conversion of nearly 3,000 hydrocarbon tankers operated by



We are developing and testing next-generation, lower emission internal combustion engines as well as the fuels that power them, helping to ensure a sustainable energy future.



**Energy conservation savings in company operations**

(thousands of boe per day)

■ Year's increment  
■ Carry-over from previous years

All figures revised based on further data reconciliation.

contractors from steel to lighter weight aluminum to reduce fuel consumption.

**Accelerating innovation through collaboration**

In a challenging environment, no one player is able to succeed on its own. Collaboration enhances our competitiveness and further enables the expansion and strategic integration of our global business. And as our business has grown into new markets and products, so too has our collaborative network expanded, encompassing other energy producers, engineering companies, service providers, equipment manufacturers, R&D institutions, and universities.

In the Kingdom, we engage and participate with key national stakeholders, including the King Abdulaziz City for Science and Technology (KACST), King Fahd University of Petroleum and Minerals (KFUPM), and KAUST in the pursuit of high-impact research and technology initiatives of strategic importance to our business. Our participation centers on initiatives aimed at advancing nascent

technologies, accelerating the Kingdom's ability to conduct advanced scientific research, and promoting entrepreneurship and the development of new technology enabled businesses.

In a separate project with KFUPM, we are working to establish a world-class Petroleum Engineering and Geosciences College. In 2017, we completed retrofitting a building and the construction of two new buildings to house state-of-the-art laboratories on the KFUPM campus and at the Dhahran Techno Valley Science Park.

In our local region, we signed Memoranda of Understanding with the Abu Dhabi National Oil Company (ADNOC) and with Masdar, a renewable energy and sustainable urban development company based in Abu Dhabi, UAE. With ADNOC, we plan to collaborate to identify technologies that could deliver improved performance and efficiency across the oil and gas value chain. The agreement with Masdar enables collaboration on sustainable and renewable energy development to yield advancements in clean electricity generation and carbon capture.



We seek to advance sustainable transport by developing ultra-clean fuel engine systems at our Detroit R&D Center, and by converting CO<sub>2</sub> into cost competitive and sustainable polyols through our CONVERGE® technology.

**“As energy demand continues to rise, Saudi Aramco will encourage the adoption of energy efficient technologies as we move toward reduced energy intensity, a more diversified energy mix, and a smaller environmental footprint.”**

Ahmad A. Al Sa’adi, Senior Vice President, Technical Services

Internationally, we collaborate with a network of academic and industry research partners, including the Massachusetts Institute of Technology, Stanford University, Imperial College, Tsinghua University, KAIST (the Korean Advanced Institute of Science and Technology), and IFPEN on topics related to the global challenge of a sustainable energy future.

**Exploring energy solutions through our Global Research Network**

Our Global Research Network enables innovative research in high-impact, long-term, value-creating domains. Comprised of three in-Kingdom research centers and eight satellite research centers and technology offices in strategic international locations, the network is dedicated to addressing global energy and sustainability challenges and creating substantial competitive advantage for our business.

In 2017, we started construction to expand our Exploration and Petroleum Engineering Advanced Research Center (EXPEC ARC) in Dhahran. The expansion project includes laboratories and offices for 850 professionals and support staff. We also launched construction of our new R&D center at KAUST.

**Investing in energy**

Saudi Aramco Energy Ventures (SAEV), our technology and energy venture

capital affiliate, continued its mission to appraise promising opportunities and invest globally in startup and high growth technology companies of strategic interest to us. In 2017, SAEV made six new investments and piloted five technologies from its portfolio companies.

**Conserving water resources**

We continued to implement our water conservation strategy to conserve the Kingdom's nonrenewable groundwater resources and serve as a role model for water conservation practices. We completed a slate of water conservation strategies, including using wastewater in a variety of applications, assessing conservation opportunities, implementing best practices, and promoting water conservation awareness. Significant savings were achieved at industrial facilities and in communities by applying best practices and water saving technologies.

## key figures

Saudi Aramco and wholly owned subsidiaries

**70,762**  
employees

Saudi Aramco lost-time injury rate

**0.02**  
per 200,000 work hours

more than **22,000**  
professional development training participants



# enabling excellence

Our success as a business rests on our attention to safety and the development of our people. To enable increasingly efficient operations, we support endeavors to enhance the domestic energy sector and diversify the economy.



At a glance:  
Enabling excellence  
highlights

- Our STEMania Program reached nearly 3,000 female students across the Kingdom
- ARO Drilling and SANAD drilling joint ventures commenced operations
- The King Salman International Complex for Maritime Industries and Services targets construction of vessels and offshore drilling rigs
- In-Kingdom joint venture with Jacobs Engineering Group for professional program and construction management services
- Established centers of engineering excellence at five local offices
- Began planning Phase I of the King Salman Energy Park

Our success as a business rests on our attention to safety and the development of our people. To enable increasingly efficient operations, we support endeavors to enhance the domestic energy sector and diversify the economy.

A robust supply chain, innovative energy and technology entrepreneurs, and a globally competitive workforce are in our strategic interest and play an important role in improving our commercial performance.

By supporting capacity building in the Kingdom's energy sector, fostering small- to medium-sized enterprises, and establishing national training centers, we plan to enhance the reliability of our supply chain, improve the efficiency of our operations, and build our workforce of the future. Together, we believe these programs will accelerate growth and create new value for our company, as well as for the Kingdom.

**Our safety performance**

The lost-time injury (LTI) rate for Saudi Aramco employees at year-end was 0.02 per 200,000 work hours, a significant improvement compared to

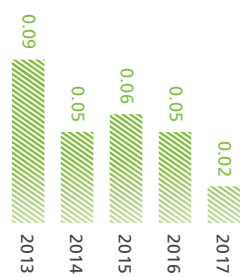
the 2016 LTI rate of 0.05. There were no on-the-job fatalities for Saudi Aramco employees. Our ongoing efforts to embed safety awareness through on-the-job training was key to our improved performance.

Understanding that off-the-job traffic accidents in Saudi Arabia are a critical safety concern, we proactively manage driver performance through monitoring devices. At year-end, 79% of the company's in-Kingdom fleet had the monitors installed. Overall, our **Traffic Safety Signature Program** has contributed to a 30% reduction in motor vehicle accidents for Saudi Aramco employees.

Our efforts to improve driver safety were recognized by the American Society of Safety Engineers, which gave its 2017 **Safety Innovation Award** to our driver safety system. The system measures patterns in biometric signals and incorporates safety engineering principles and behavior change to help reduce traffic accidents.

**Caring for contractors**

The safety, health, and well-being of our contractor workforce is of paramount



Saudi Aramco lost-time injury rate (per 200,000 work hours)

concern to us. To help ensure standards and practices are met, in 2017 we conducted more than 2,400 audits and inspections of contractor communities. Our Loss Prevention organization communicated their findings to proponent organizations to implement improvements.

We supported the Qyadati driver safety program, an online multi-language driver awareness program. Now mandatory for all supplemental manpower and project management contractors, 19,000 driving certificates were issued in 2017.

More than 3,000 contractor employees in our Southern Area Oil Operations organization benefited from an innovative safety campaign. The "Our Safety is You" campaign featured a number of educational platforms specially designed to encourage participation and promote

the awareness of common safety concerns — on- and off-the-job.

**Embedding a performance culture**

Our Operational Excellence (OE) initiative provides a framework for managers and describes how they can implement the system to fulfill their safety and loss prevention obligations. It drives our efforts to cost-effectively achieve leading performance in safety, reliability, and efficiency.

Working to integrate our day-to-day work into the OE structure, a dedicated OE organization provides consultation, training, and certifying of OE implementers and assessors. In 2017, we conducted 51 OE integrated assessments, yielding significant opportunities for improved performance. We remained



Every day, our team works together to unlock the full potential of the Kingdom's resources.

on track to assess all Saudi Aramco departments by the end of 2019.

**Enhancing capability**

To become the world's leading integrated energy and chemicals producer, we need people with best-in-class capabilities. Accordingly, we deliver continuous development and skill building opportunities to our workforce. Tailored to meet the growing responsibilities of our evolving business, we offer a wealth of online and classroom courses, specialized training centers, internships, and mentorship programs.

Our suite of development programs range from equipping entry-level employees with the right skills to sponsoring employees for advanced degrees at international universities.

**Accelerating skills development**

Our future success is dependent upon the progressive development of our upstream professionals, especially as our workforce trends younger: Nearly 60% of Saudi Aramco's workforce is 35 or younger. Our **Upstream Professional Development Center (UPDC)** is designed to provide accelerated skills building and knowledge transfer to young men and women entering the exploration and petroleum engineering fields.

UPDC offers immersive and interactive learning environments, including cutting-edge drilling simulators and a 4-D facility that enables the visualization of the subsurface and the modeling of production strategies. In 2017, 5,700 participants attended more than 350 training sessions.

Our **Hosted University Program** expands advanced degree opportunities for our employees. This cost-effective

approach brings the knowledge and expertise of leading global universities and institutions to the Kingdom to deliver customized, business centered academic degrees. In 2017, we initiated a specialized and accelerated master's degree program in geophysics from the University of Leeds in the U.K. Since the program's inception in 2009, more than 10 international universities have participated and more than 400 employees have earned degrees.

**Developing leaders**

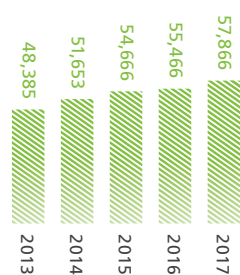
The achievement of our strategic vision requires new skills at every level. Nowhere is this more relevant than among our leadership.

In 2017, we delivered a suite of professional training programs designed to build capabilities to support our strategic vision and our entry into new industry sectors to more than 22,000 participants from various levels of professional employees and management.

We also commenced our **Emerging Women in Leadership Program** to identify women with outstanding leadership and professional career potential. Selected employees attended the **Advanced Women in Leadership Program** conducted by Wharton University of the Pennsylvania Institute of Executive Management.

**Preparing the next generation**

In addition to supporting our incumbent workforce, we prepare new generations to be "job ready." Our **Industrial Sponsorship Program** prepares Saudi high school graduates and vocational college students for jobs in administration, operations, security, fabrication, and maintenance. In 2017, more than 3,200



Saudi Aramco: Saudi employees

***“Saudi Aramco’s efforts to support a culture of innovation have yielded positive results: The number of granted patents has increased from nine in 2009 to 230 in 2017.”***

*Muhammad M. Al Saggaf, Senior Vice President of Operations and Business Services*

In the Core Room of our Upstream Professional Development Center, young engineers and geoscientists enhance their knowledge through hands-on, immersive instruction.



apprentices graduated from the program and joined the workforce.

To ensure we maintain a steady stream of entry-level Saudi professionals, we offer the **College Degree Program for Non-Employees (CDPNE)**, a highly selective scholarship program for male and female Saudi high school graduates. Participants who successfully complete the 10-month College Preparatory Program in Dhahran are sponsored to study for a bachelor's degree at KFUPM or at an international university in a discipline aligned with our strategic needs. In 2017, 308 CDPNE graduates joined the workforce.

Overall, nearly 2,500 company sponsored students were enrolled at colleges and universities in North America, Europe, Asia, and Australia in 2017. These program graduates, and employees returning from internships with global companies, bring with them new ideas and a broader understanding of international business, benefiting our company and the Kingdom.

### Building sustainable communities

The health and well-being of our employees and their families are essential enabling factors for our people to perform at their best. We continued progress in 2017 on several large-scale planned communities, each of which is designed to model leading sustainability practices.

Our largest project is the **South Dhahran Home Ownership Program (Ajyal)**, Arabic for "generations", which is planned to provide 8,500 residential units. We completed 180 houses in 2017. In our East Dammam I project, we distributed 228 villas, and in East Dammam II, we distributed 764 lots ready for owners to begin home construction. Since 1951, our Home Ownership Program has financed more than 68,000 new homes for Saudi families.

In addition, we developed a slate of new housing in existing communities, including the completion of 360



Modeling leading sustainability practices, our new community housing projects provide a high quality of life for our employees and their families.

## *In 2017, 2,000 trainees graduated from company supported national training centers.*

housing units for occupancy in our main community of Dhahran.

### Enabling a skilled workforce

As we enter new markets and businesses, helping build skills and capacity in the Saudi workforce is aligned with our long-term needs. It also benefits the Kingdom's efforts to diversify the economy. In 2017, we continued our support for **national training academies** whose goal is to create a globally competitive workforce. In 2017, 2,000 trainees graduated from 15 active training centers. Highlights from selected academies include:

- The National Construction Training Center: Expected to train and certify 2,000 Saudis over the next three years, the center commenced operations at a facility in Nariyah with an enrollment of more than 400 trainees
- The Maritime Academy: With a target enrollment of 1,450 trainees, the academy is planned to support the operation of the King Salman International Complex for Maritime Industries and Services
- The Saudi Arabian Drilling Academy: More than 200 trainees are enrolled in the core program and the first class of 94 is expected to graduate in mid-2018
- The National Power Academy: Developed in collaboration with the Saudi Electricity Company, KFUPM, and the Technical and Vocational Training Corporation (TVTC), the academy, with a capacity for 1,200

students, will confer specialized certifications and professional degrees for personnel to work in the energy sector

- The National Information Technology Academy: Designed to accommodate 1,000 trainees studying mobility, data analytics, and cloud computing, the academy is scheduled for a soft launch in 2018 with an initial enrollment of 100 students
- The Aviation Academy: With a capacity for 400, the academy opened with an initial enrollment of 150 trainees

Our **STEMania Program** aims to increase the interest of female students in the STEM fields. In 2017, the program reached nearly 3,000 students from across the Kingdom.

We also continued our initiative to deliver seminars to help senior female university students prepare for their transition into the workplace. In 2017, we delivered 10 seminars for approximately 4,000 students. Overall, since the program's inception in 2015, approximately 16,000 students have benefited from these seminars.

### Developing a globally competitive energy sector

To secure our long-term future, we are always seeking ways to optimize costs, enhance the reliability of our supply chain, and identify greater efficiencies in our operations. Nowhere is this more important than in our home base of



Saudi Arabia. Opportunities to realize these improvements coincide with Vision 2030, the Kingdom's strategy to attain greater levels of sustained economic growth and diversification.

Launched in 2015, **iktva** is our global supply chain efficiency initiative that will help facilitate the further development of a diverse, sustainable, and competitive energy sector ecosystem in the Kingdom. Our **iktva** measurement continued to improve, with a goal to localize 70% of expenditures for goods and services by 2021. To support further growth to reach our 2021 target, we hosted the **iktva** Small- and Medium-Sized Enterprises Forum and Exhibition at the Dhahran Expo that illustrated to 1,000 enterprises the breadth of opportunities Saudi Aramco offers.

By investing in the domestic oil and gas ecosystem, we plan to enhance

the reliability of our supply chain and optimize operational costs and inventories, which strengthen our ability to meet our commitments to customers around the globe. As the base of small- and medium-sized enterprises expands, and as national leaders in the oil and gas ecosystem advance to become regional and international players, economic growth and job creation will be accelerated. This transition will enhance the business climate in the Kingdom and generate new opportunities for us to operate even more efficiently and achieve significant cost savings.

In 2017, we pursued a number of initiatives in the domestic energy sector consistent with our localization strategy, including forming two joint ventures to help optimize drilling costs: **Saudi Aramco Nabors Drilling (SANAD)**,

with **Nabors Industries Ltd.** for onshore rigs, and **Aramco Rowan Offshore Drilling (ARO)**, with **Rowan Companies plc** for offshore rigs. The ventures, which own and operate the rigs, commenced operations in 2017 and are expected to deliver approximately 5,000 local jobs.

#### Engineering opportunities and partnerships

Engineering and construction are potential high growth sectors closely tied to our business objectives. In pursuit of opportunities to reduce costs, strengthen our supply chain, and spur job creation, we marked a pair of milestones toward our ambition of executing 80% of our engineering work in-Kingdom.

First, we entered an in-Kingdom joint venture with **Jacobs Engineering Group**, which aims to provide professional program and construction management

services for social infrastructure projects, including government projects, on an arm's length basis within Saudi Arabia. The joint venture will help build capacity in the Kingdom and create opportunities for other players in this sector, with the potential to deliver approximately 3,000 jobs. Second, we established centers of engineering excellence at five local contractor offices.

We signed a number of other Memoranda of Understanding with international companies aligned with our strategic objectives. Each of the agreements is designed to enable greater efficiency and improved performance in our operations, along with the added benefits of creating high value jobs for Saudis and furthering the Kingdom's economic diversification. These agreements cover areas such as digitization initiatives, gas turbine

Together with leading industrial partners, we are advancing the development of a sustainable and competitive Saudi Arabian energy sector.

maintenance and repair, human capital development, and oil field goods and services.

#### Localizing our supply chain

The **King Salman International Complex for Maritime Industries and Services** is envisioned to become a world-class maritime complex and a hub for regional maritime engineering, construction, and related expertise. The complex, which is expected to generate more than 80,000 jobs by 2030, targets localizing essential links of our supply chain related to offshore drilling and shipping activities. Expected benefits include reduced response times, improved agility, and cost optimization.

Plans for the maritime complex include facilities to construct vessels and offshore drilling rigs and platforms; associated capabilities for maintenance, repair, and overhaul; an engine manufacturing plant; a maritime academy; and offshore engineering, procurement, construction, and installation capabilities.

In 2017, we established **International Maritime Industries**, a joint venture with Dubai-based engineering firm Lamprell plc, the National Shipping Co. of Saudi Arabia (Bahri), and Hyundai Heavy Industries in South Korea for the maritime yard. Major operations are expected to commence in 2019, with full production capacity of the facility reached in 2022.

With McDermott International Inc., we signed a binding Memorandum of Understanding for the construction of facilities at the complex, including fabrication for offshore oil and gas developments at Ras al-Khair. We also awarded the engineering, procurement, and construction contract for dredging and reclamation.

#### A park for energy

A major component of the expanding in-Kingdom energy ecosystem is the **King Salman Energy Park**. In 2017, we began planning for development of Phase I of the park. Located in the Eastern Province, the project is expected to attract international third-party

manufacturers and suppliers of goods to the energy sector to locate their facilities in the Kingdom.

Completion of Phase I of the park in 2021 is designed to deliver the infrastructure and services needed to attract investments by energy-related manufacturing and services companies — many of which are the company's supply chain partners. After full development is complete in 2035, King Salman Energy Park is anticipated to create an estimated 100,000 direct and indirect jobs.

#### Fostering entrepreneurs and new businesses

Small- to medium-sized enterprises are key components of economic growth. Our support for Saudi entrepreneurs is designed to nurture new technologies and businesses of potential value to our business as well as strengthen the health of the Kingdom's innovation ecosystem. In 2017, our wholly owned subsidiary, the **Saudi Aramco Entrepreneurship Center (Wa'ed)**, screened 238 new loan and equity applications. A new advisory program was launched that provided 15 consulting sessions for 300 potential entrepreneurs in three cities. Since its inception in 2011, Wa'ed has provided support for 100 companies.

In 2016, we helped inaugurate the Kingdom's first all-women business and technology park. In 2017, we and our original partner, Princess Nora bint Abdulrahman University in Riyadh, signed a joint venture agreement with Wipro, a global IT and business process services provider. The park, which provides business support services to leading companies in the Kingdom, including Saudi Aramco, is envisioned to generate greater opportunities for Saudi women to join the workforce, ultimately targeting the creation of up to 20,000 jobs.



Small- and medium-sized domestic enterprises play a growing and important role in our supply chain, and could generate new opportunities for us to operate more efficiently.



key figures

iSpark

52

schools visited

4,792

students reached

71,880

learning hours provided

iDiscover

887

teachers trained

5,869

students reached

135,120

learning hours provided

I Want to Hear

1,000

hearing aids distributed

# citizenship in our communities

We believe in the power of energy to transform lives, lift communities, advance human progress, and sustain our planet.



un matched

## At a glance: Citizenship programs in action

- The King Abdulaziz Center for World Culture, Saudi Arabia: Expected to draw 1.5 million visitors each year
- Shaybah Wildlife Sanctuary, Saudi Arabia: A safe haven for migratory bird species and for plants and animals that occur only in the Arabian Peninsula
- SI Move, worldwide: Studies the movement of life on the planet and enables scientific exchange
- Galveston Bay Foundation, U.S.: Helping to restore oyster reefs as part of the Foundation's larger efforts to preserve and protect the bay
- Earthwatch Institute, Oxford, U.K.: Through educational partnerships, the Institute's CLEAR program allows students to take part in data collection to inspire a love of science and the environment
- Chuncheon Global Water Forum, South Korea: Supporting a study on water-energy-food interconnections and sustainable economic development

We believe in the power of energy to transform lives, lift communities, advance human progress, and sustain our planet.

When we put our energy to work, we enable others to seize opportunities that can change the world.

The quality of our future depends on what we do today. We recognize that education underlies economic and societal progress, and therefore, we concentrate on building STEM competency in the youth of Saudi Arabia and in communities where we operate internationally.

Through our many community outreach programs in Saudi Arabia, we strive to facilitate the successful growth of sustainable micro industries that give people the tools to improve the economic future of their families and their communities. Through targeted donations, we help enable those most in need to attain their full potential.

Domestically, the Kingdom is home to a diversity of unique and ecologically sensitive habitats that require careful stewardship. Internationally, our offices and operations are located in a variety of environments. The protection and

preservation of the natural environment for future generations is vital to our success, and to the continued quality of life for us all.

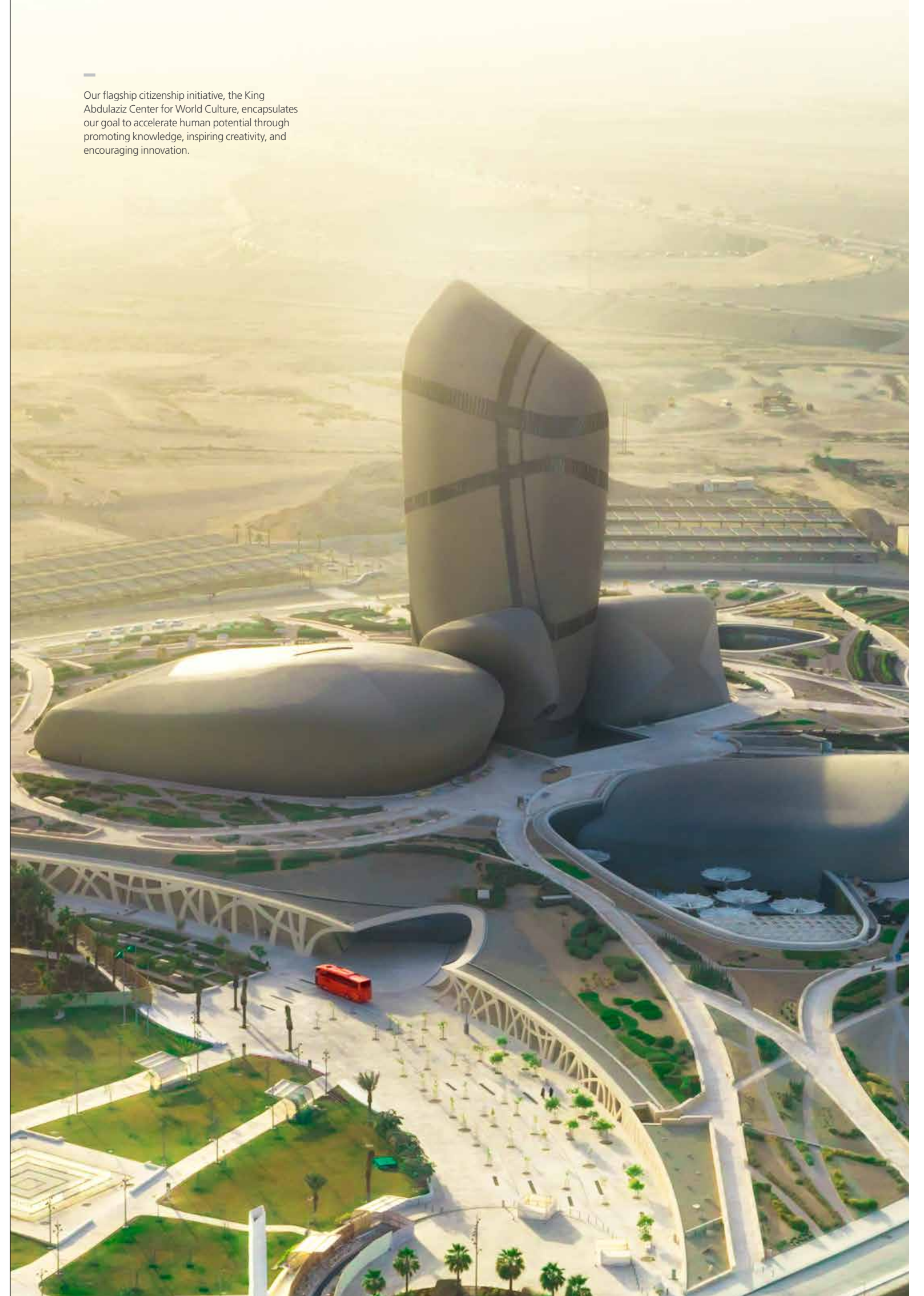
### Accelerating human potential in the Kingdom

Our ability to maximize value from the Kingdom's resource base is dependent upon developing the next generation of highly skilled workers. Our efforts to boost STEM competency in youth spark imaginative and analytical thinking that may one day help us resolve some of the world's most pressing energy challenges.

#### The King Abdulaziz Center for World Culture: Enriching minds, inspiring imaginations

The company's flagship citizenship initiative, the King Abdulaziz Center for World Culture, is positioned to make a tangible, positive impact on the Kingdom's future by inspiring a passion for knowledge, creativity, and cross-cultural engagement. The Center, and the renovated Energy Exhibit, opened in the second half of 2017 and drew more than 44,000 visitors to cultural and educational exhibits and programs.

Our flagship citizenship initiative, the King Abdulaziz Center for World Culture, encapsulates our goal to accelerate human potential through promoting knowledge, inspiring creativity, and encouraging innovation.



During the year, the Center continued to implement programs that enriched knowledge and creativity across the Kingdom. Examples of such programs include **iSpark**, a touring program that delivered scientific, technological, and engineering content to schools in communities along the southern borders of the Kingdom, and **iDiscover**, an educational program that provided new interactive math and science instruction techniques to teachers. Our digital fabrication laboratory, **FABLAB-Dhahran**, guided a project team of 40 participants to design and fabricate a Newtonian Reflector Telescope.

Reflective of our commitment to help preserve and promote the Kingdom's heritage, and in collaboration with the Saudi Commission for Tourism and National Heritage, we sponsored the "**Roads of Arabia**" exhibition tour of China and South Korea. The exhibition,

which showcases the Kingdom as a global crossroads, was on display for three months in Beijing and Seoul, drawing more than 40,000 and 120,000 visitors, respectively.

The international "**Bridges Art Program**," comprised of a series of impactful cultural engagements to embrace common values and positively shape wider relationships, continued to offer compelling cultural events in 2017. More than 50 Saudi artists participated in nine exhibitions, including shows at the Los Angeles County Museum of Art and the Brooklyn Museum, drawing more than 320,000 visitors.

### Accelerating human potential internationally

Around the world, supporting the communities in which we operate is fundamental to our success and part



With programs such as iSpark and iDiscover, we give young people the means to achieve more in their lives as they strive to attain their full potential.

## Through programs and partnerships, we promote STEM skills in Saudi Arabia and in our international locations.

of our commitment as a sustainable business. Wherever we work, we strive to link our support for the needs and priorities of local communities with our strategic objectives and competencies.

Our chosen areas where we can best leverage our expertise and create long-term mutual value are in STEM education, youth development, culture, and social welfare. Examples of how and where we sought to make a positive difference in 2017 include:

### North America

The Houston Museum of Natural Science: Ongoing support for the renovation and expansion of the Wiess Energy Hall in the heart of the energy capital of North America. The museum draws more than 2 million visitors each year.

Michigan Science Center (MiSC): With a mission to inspire curious minds of all ages to discover, explore, and appreciate STEM learning, we supported MiSC with the addition of a new energy module to their "Energy on the Move" traveling exhibit, which reaches more than 300,000 people annually.

### Europe

The Netherlands — Maastricht University: Established support for a Ph.D. program focused on sustainable approaches for bio-based materials, including biomass and bioenergy.

United Kingdom — the Oxford Institute for Energy Studies (OIES): The Saudi

Aramco Fellowship helps support a total of seven Ph.D. fellows in the field of energy studies.

### Asia

South Korea: Provided assistance for the design and construction work for a renewable energy themed playground at the Seoul Energy Dream Center, a museum and educational complex.

Japan: Backed research and development activities, including CO<sub>2</sub> capture and storage, by the Kyoto-based Research Institute of Innovative Technology for the Earth.

Multiple countries: Open to students in China, Malaysia, Singapore, South Korea, and the Philippines, the "Aramco-Enactus Innovative Challenge" inspired students to develop innovative solutions that address issues related to environmental sustainability and energy efficiency in their communities.

### Supporting communities in the Kingdom

#### Enhancing sustainable practices

We aspire to make a positive and lasting difference by equipping the people in our local communities with the skills, resources, and know-how to create self-sustaining enterprises.

We endeavor to support programs that draw upon local resources and traditional crafts. For example, we continued our support to enhance the development of

the beekeeping and honey industry in al-Baha, including training 500 beekeepers, planting 50,000 seedlings to support honey production, and fulfilling ISO certification requirements for the research and training center we previously established.

Similarly, we are assisting coffee farmers in the Jazan region, home to our refinery and terminal project. We provided training in cultivation and production for 560 farmers and enhanced infrastructure at 76 farms.

Additional community programs targeted to create greater economic opportunities and instill sustainable practices include:

- Benefiting 50 families in al-Jawf through an olive tree seedlings plantation project
- Helping 50 fishermen with skills training and new fishing boats in the Red Sea coastal area near Yanbu'
- A sewing center for hearing impaired women in Dammam and a women's sewing center in Qassim, which combined, are providing economic advancement opportunities for 170 women
- We renovated and equipped a Braille printer maintenance center in Madinah and trained 100 vision impaired people in the craft
- The "Made in Makkah" program strives to boost localization of the Hajj and Umrah souvenirs market. We trained 60 women and conducted a market study to direct production to capture more of the demand from the 10 million people who visit the region every year.

#### Helping to hear

As part of our commitment to support communities at home, we identify populations in need where we can make an immediate and positive impact. Our "I Want to Hear" campaign, which completed its second consecutive year in 2017, is one such program. Thousands of employees donated to our program to provide 1,000 hearing aids for people, including hearing assessments and the fitting of the hearing aids.

### Supporting our international communities

In addition to supporting communities in Saudi Arabia, we seek to contribute meaningful assistance to the communities that host our offices and operations around the world. Our efforts include support for a wide range of citizenship activities, including disaster relief, literacy and STEM skills development, and volunteer work by our employees for charitable causes.

#### North America

Our Houston subsidiary is home to our North American office and a number of our affiliates. After the devastating impact of Hurricane Harvey on the city, we assisted with relief efforts, with scores of our employees participating in community volunteer activities. This included helping organize and pack 300,000 meals for at-risk families and contributing to a Habitat for Humanity project to rebuild 176 homes.

For the 13<sup>th</sup> time, our Houston office served as the title sponsor of the Houston Half Marathon, part of the Houston Marathon Weekend. Hundreds of our employees participated as runners or volunteers for the event, which drew 33,000 participants from 42 countries and raised millions of dollars for local charities.

#### Europe

In The Hague, Netherlands, we launched the first ever Aramco Beach Run. With over 1,500 participants, the event raised funds for the Juliana Children's Hospital, one of the country's leading pediatric hospitals.

In the U.K., our employees participated in a cleanup of London's canal network and supported one of the city's food banks.

#### Asia

Through our Aramco Scholarship Program, and in partnership with the charity Community Chest of Korea, we supported 86 disabled university students majoring in science and engineering disciplines.

Through training and resources, we help enhance the honey industry in al-Baha, southwest Saudi Arabia, expanding economic opportunities for the community.





Our people volunteer their skills and time to support their local communities, such as constructing monsoon-proof homes in Bantam, Indonesia, and helping the Houston area in the U.S. recover from Hurricane Harvey.

## *Supporting the communities in which we operate is fundamental to our success.*

Our Singapore office partnered with Habitat for Humanity to support impoverished families in nearby Batam, Indonesia. Through the Batam Build Project, over 2016 and 2017, we built 33 houses able to withstand monsoons.

### **Promoting biodiversity in the Kingdom**

In Saudi Arabia, we are acutely aware that the Kingdom is home to a wide variety of unique and ecologically sensitive habitats that require careful stewardship. With our operations spanning the breadth of the Kingdom's environmental zones, the protection and preservation of our natural environment for future generations is of vital importance. Our activities strive to better understand ecosystems, and to promote and protect biodiversity through educational programs and positive interventions.

### **Monitoring and understanding our environment**

We continued to monitor marine environments in 2017. In partnership with KFUPM and KAUST, we sustained our program to assess the state of the marine and coastal environments in the Arabian Gulf and develop baseline environmental data for the Red Sea.

With the same partners, we also completed a blue carbon study (blue carbon is the carbon stored and sequestered in coastal ecosystems)

to estimate carbon sequestration in company biodiversity areas. The study highlighted that areas such as the Ras Tanura Mangrove Eco-Park and Abu Ali Island are able to store approximately 1.7 million tons of CO<sub>2</sub> over the lifetime of the mangroves.

We reviewed the final report of findings related to the monitoring of the more than 700 artificial reef modules we deployed in the Arabian Gulf. Additional reefs will be deployed depending on the success rate of coral growth.

### **Educating the next generation**

Launched in 2007, our **Environmental Education Program** gives students the tools and understanding to protect the environment and helps build a sense of accountability for their communities. In partnership with the Ministry of Education, this program assists school teachers to develop "Friends of the Environment" clubs. Young people share their newfound skills with their peers in various environmental projects such as flower and tree planting, recycling, conservation, and schoolyard cleaning. Since the program's inception, it has grown to include 1,836 schools and a total of 1,293 Friends of the Environment clubs.

For people of all ages, our Environmental Protection organization developed a new field guide highlighting the remarkable biodiversity of Dhahran, the site of our corporate head office. The richly illustrated guide is designed to inspire



employees and community residents to better understand the wealth of biodiversity in their local area and raise environmental awareness.

#### Protecting ecosystems

Our mangrove plantation initiative to restore lost mangrove habitats in the Kingdom's Eastern Province coastal areas is on track to plant two million mangrove seedlings by the end of 2018. In addition, the **Mangrove Eco-Park** project, currently in the construction stage, intends to preserve ecologically sensitive habitats and raise public awareness of the role mangroves play in providing a habitat for bird and animal species, and as significant carbon sinks.

One of the world's true wildernesses, the Rub' al-Khali hosts numerous native reptile and mammal species, along with an estimated 180 bird species. By establishing the **Shaybah Wildlife**

**Sanctuary** near our facilities, we are helping to preserve this unique ecosystem and protect in situ species. In addition, in partnership with the Saudi Wildlife Authority, we have reintroduced three iconic species that had disappeared from the area: The Arabian oryx, the Arabian sand gazelle, and the ostrich. We are also developing a research station to support national and international researchers to study biodiversity in the Rub' al-Khali to help us better understand and manage this vast landscape, along with a visitor's center to help inspire and inform.

#### Protecting biodiversity internationally

Although we are headquartered in Saudi Arabia, our commitment to biodiversity extends to the communities that are home to our global offices and operations. In collaboration with academic and research institutions and

other organizations, we continue to conduct initiatives that help protect the biodiversity of land, sea, and coastal ecosystems. These efforts include:

#### North America

Smithsonian Institution, SI Move: A groundbreaking initiative, SI Move follows various species of terrestrial, avian, and marine animals with satellite tracking devices to improve the understanding of migration patterns and ecosystems. With our support, the Smithsonian has attached satellite devices to more than 75 animals, representing 10 species around the world. As part of our collaboration with SI Move in Saudi Arabia, Arabian oryx, great cormorants, and black-tipped reef sharks will be tracked.

#### Europe

Sea Alarm Foundation, the European Regional Seas Oiled Wildlife Preparedness

Program: The Foundation seeks to establish coastal oiled wildlife response plans and professional response capabilities worldwide. With our support, the foundation is organizing wildlife training and exercise programs for the Mediterranean, Atlantic/North Sea, and Baltic regions.

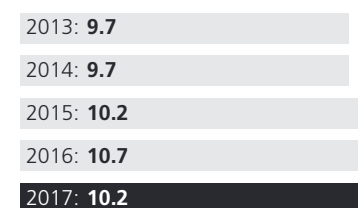
#### Asia

The Collaborative Innovation Center of Chemistry for Energy Materials (iChEM): We have partnered with iChEM, which was established jointly by three Chinese universities, to launch the Energy Environmental Innovation Challenge to support teams of students interested in clean energy, entrepreneurship, and sustainable development.

The Shaybah Wildlife Sanctuary protects a unique ecosystem and supports national and international biodiversity research.

# our performance in 2017

## Daily crude oil production (millions of bpd)

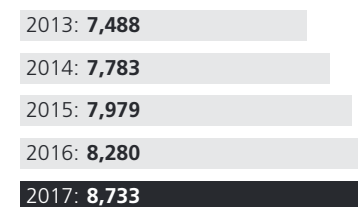


Includes blended condensate and Bahrain's share of the Abu Safah field

## Raw gas processed (millions of scfd)



## Natural gas supplied (millions of scfd)



bpd = barrels per day  
scf = standard cubic feet  
scfd = standard cubic feet per day  
NGL = natural gas liquids

The company has adjusted its methodology for calculating its performance metrics in 2017 to better align with management of its business. These adjustments have been applied retroactively for all years presented.

## Estimates of proved reserves of crude oil, condensate, natural gas, and NGLs

	2017
Crude oil <i>millions of barrels</i>	<b>256,737</b>
Condensate <i>millions of barrels</i>	<b>4,124</b>
Natural gas <i>millions of barrels of oil equivalent</i>	<b>36,939</b>
NGLs <i>millions of barrels</i>	<b>35,097</b>
<b>Total</b> <i>millions of barrels of oil equivalent</i>	<b>332,897</b>

Reserve figures represent the Kingdom's reserves in the fields operated by the company

## Crude oil production and exports

	2016	2017
Crude oil production, millions of barrels		
<i>Includes condensate and Bahrain's share of the Abu Safah field</i>	3,921	3,735
Seaborne crude oil exports, thousands of bpd	7,253	6,879
<i>Includes blended condensate</i>		

## NGL: production from hydrocarbon gases (thousands of bpd)

	2016	2017
Propane	535	524
Butane	347	349
Condensate	228	216
Natural gasoline	250	248
<b>Total NGL production</b>	<b>1,359</b>	<b>1,337</b>

## Ethane produced (millions of scfd)

2013	<b>796</b>
2014	<b>809</b>
2015	<b>794</b>
2016	<b>920</b>
2017	<b>936</b>

## Refined products production and exports

	2016	2017
Refined products production, millions of barrels	664.6	657.4
<i>Includes production from wholly owned refineries and Saudi Aramco's share of production from domestic joint ventures</i>		
Refined products exports, thousands of bpd	809	818
<i>Includes exports from wholly owned refineries and Saudi Aramco's share of exports from domestic joint ventures</i>		

## NGL: sales (thousands of bpd)

	2016	2017
Propane	501	491
Butane	295	291
Condensate	8	20
Natural gasoline	195	192
<b>Total NGL sales</b>	<b>999</b>	<b>993</b>

Excludes sales on behalf of SASREF & SAMREF

## Sulfur recovery (metric tons per day)

2016	16,356
2017	17,984

Includes sulfur from joint ventures

## Sulfur exports (metric tons per day)

2016	9,728
2017	8,175

Excludes sales on behalf of SASREF & SAMREF

### Refining capacity (thousands of bpd)

	Gross capacity	Saudi Aramco or affiliate ownership	Saudi Aramco net capacity
<b>Saudi Arabia</b>			
Ras Tanura	550	100%	550
Riyadh	126	100%	126
Yanbu'	245	100%	245
Petro Rabigh	400	37.5%	150
SAMREF — Yanbu'	400	50%	200
YASREF — Yanbu'	400	62.5%	250
SASREF — Jubail	305	50%	153
SATORP — Jubail	400	62.5%	250
<b>Total Saudi Arabia</b>	<b>2,826</b>		<b>1,924</b>
<b>International</b>			
Motiva — USA	635	100%	635
S-OIL — South Korea	669	63.4%	424
Showa Shell — Japan	445	14.9%	67
FREP — China	280	25%	70
<b>Total international</b>	<b>2,029</b>		<b>1,196</b>
<b>Total Saudi Arabia and international</b>	<b>4,855</b>		<b>3,120</b>

### Chemicals production capacity at Saudi Aramco sites and joint ventures (kilotons per annum)

Product groupings	In-Kingdom	Out-of-Kingdom	Total capacity	Saudi Aramco share*
Ethylene	2,998	1,101	4,099	1,788
Propylene	1,766	1,521	3,287	1,561
Paraxylene (including xylenes)	2,040	3,910	5,950	2,713
Benzene	1,176	1,150	2,326	1,091
Polyolefins	2,800	1,553	4,353	1,741
Synthetic rubber and elastomers	295	1,744	2,039	1,043
Intermediates, derivatives, and others	7,435	1,675	9,110	4,646
<b>Total</b>	<b>18,510</b>	<b>12,654</b>	<b>31,164</b>	<b>14,583</b>

\*Saudi Aramco's share of capacity is based on the percentage allocation of the capacity volumes based on the ownership structure in the respective entities. Production capacity figures for 2017 reflect the start up of Petro Rabigh Phase II and the ownership restructuring of the former Motiva joint venture.

### Principal products manufactured at in-Kingdom refineries (thousands of bpd)

2017	LPG	Naphtha	Gasoline	Jet fuel/ kerosene	Diesel	Fuel oil	Asphalt & misc.	Total
Ras Tanura	10	42	117	27	175	87	17	475
Yanbu'	10	9	33	(1)	96	100	—	247
Riyadh	4	—	26	10	44	—	16	99
Jiddah	1	5	7	—	5	20	12	49
<b>Total in-Kingdom</b>	<b>24</b>	<b>55</b>	<b>183</b>	<b>36</b>	<b>319</b>	<b>206</b>	<b>45</b>	<b>870</b>

#### Saudi Aramco share (thousands of bpd)

2017	LPG	Naphtha	Gasoline	Jet fuel/ kerosene	Diesel	Fuel oil	Asphalt & misc.	Total
SAMREF	(2)	—	70	29	58	39	—	195
SASREF	4	34	6	28	46	38	—	156
Petro Rabigh	3	24	16	13	31	38	—	126
SATORP	4	10	47	37	121	1	—	221
YASREF	—	—	66	—	168	—	—	234
<b>Total share</b>	<b>9</b>	<b>68</b>	<b>204</b>	<b>108</b>	<b>426</b>	<b>116</b>	<b>—</b>	<b>931</b>
<b>Grand total</b>	<b>33</b>	<b>123</b>	<b>387</b>	<b>145</b>	<b>745</b>	<b>323</b>	<b>45</b>	<b>1,801</b>

Negative figures primarily indicate products that were reprocessed into other refined products.

### Principal products manufactured at in-Kingdom refineries (thousands of bpd)

2016	LPG	Naphtha	Gasoline	Jet fuel/ kerosene	Diesel	Fuel oil	Asphalt & misc.	Total
Ras Tanura	13	48	126	32	180	85	15	499
Yanbu'	10	9	30	(1)	96	101	—	245
Riyadh	7	—	34	13	58	—	20	132
Jiddah	2	6	11	—	7	19	15	61
<b>Total in-Kingdom</b>	<b>32</b>	<b>64</b>	<b>202</b>	<b>45</b>	<b>340</b>	<b>205</b>	<b>50</b>	<b>937</b>

#### Saudi Aramco share (thousands of bpd)

2016	LPG	Naphtha	Gasoline	Jet fuel/ kerosene	Diesel	Fuel oil	Asphalt & misc.	Total
SAMREF	(2)	—	66	29	54	39	—	186
SASREF	4	32	6	30	45	34	—	151
Petro Rabigh	2	23	15	14	30	38	—	121
SATORP	1	11	45	29	126	5	—	216
YASREF	—	—	60	—	145	—	—	205
<b>Total share</b>	<b>5</b>	<b>66</b>	<b>192</b>	<b>101</b>	<b>400</b>	<b>116</b>	<b>—</b>	<b>879</b>
<b>Grand total</b>	<b>37</b>	<b>130</b>	<b>393</b>	<b>146</b>	<b>740</b>	<b>321</b>	<b>50</b>	<b>1,816</b>

Negative figures primarily indicate products that were reprocessed into other refined products.

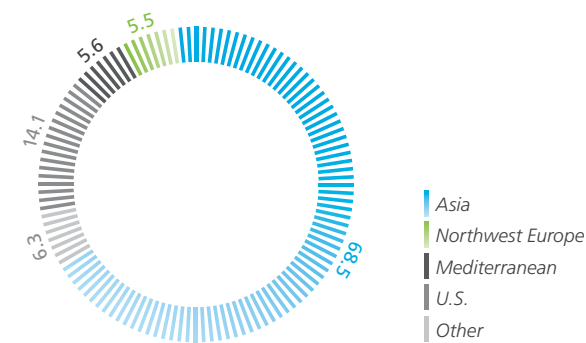


### In-Kingdom product sales by region *(thousands of bpd)*

2017	Central	Eastern	Western	Total	2016	Central	Eastern	Western	Total
LPG	4	21	20	45	LPG	7	22	16	45
Gasoline	208	111	280	599	Gasoline	200	111	256	567
Jet fuel/kerosene	29	9	61	99	Jet fuel/kerosene	28	10	55	93
Diesel	185	140	244	570	Diesel	188	162	331	681
Fuel oil	3	6	469	478	Fuel oil	5	5	415	424
Asphalt	15	19	22	56	Asphalt	19	18	24	61
Naphtha	—	31	—	31	Naphtha	—	5	—	5
<b>Total</b>	<b>444</b>	<b>337</b>	<b>1,096</b>	<b>1,877</b>	<b>Total</b>	<b>446</b>	<b>333</b>	<b>1,097</b>	<b>1,876</b>

### Crude oil exports by market *(percent)*

#### Crude oil



Crude oil exports include seaborne crude oil exports (including blended condensate), and exports to the Bahrain Petroleum Company (BAPCO).

### Ship calls at Saudi Aramco terminals

Ship calls by product type	2017	2016	2015	2014	2013
Crude oil	2,023	2,013	2,210	1,936	2,018
Products	489	1,007	649	1,028	824
LPG	309	259	250	200	198
<b>Total ship calls</b>	<b>2,821</b>	<b>3,279</b>	<b>3,109</b>	<b>3,164</b>	<b>3,040</b>

Exports from Ras Tanura, Ju'aymah and Yanbu' and transfers at Jiddah, Rabigh, Yanbu' and coastal bulk plants.

### Human resources

Employees, Saudi Aramco and wholly owned subsidiaries

70,762

### Saudi development programs *participants enrolled at year-end 2017*

Apprentice Program

3,617

College Degree Programs

1,945

College Degree Program for Non-Employees (CDPNE)

1,493

