

أرامكو السعودية  
saudi aramco

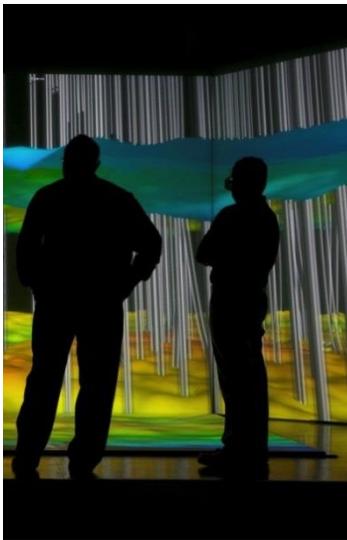


# Transforming Saudi Aramco technology

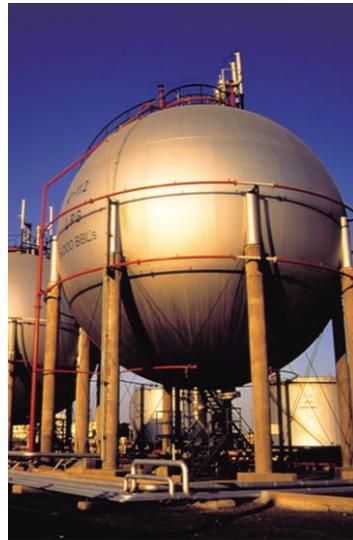
where energy is opportunity™

# Our strength continues

**261.1**  
billion  
barrels of oil  
reserves



**294**  
trillion  
scf of gas  
reserves



**1 in 8**  
barrels of the  
world's total  
crude oil  
production



**5.4**  
million  
bpd global  
refining capacity



# We've defined a bold vision for the future

*In 2020, Saudi Aramco is the world's **leading integrated energy and chemicals company**, focused on **maximizing value creation** across the hydrocarbon chain, facilitating the **sustainable expansion of the Kingdom's economy**, and enabling a **vibrant Saudi energy sector**.*

# Our strategic objectives

The world's leading integrated energy and chemicals company by 2020

*Oil and Gas Preeminence*

*HC Value Chain Integration*

*Technology Leader*

*Employer of Choice*

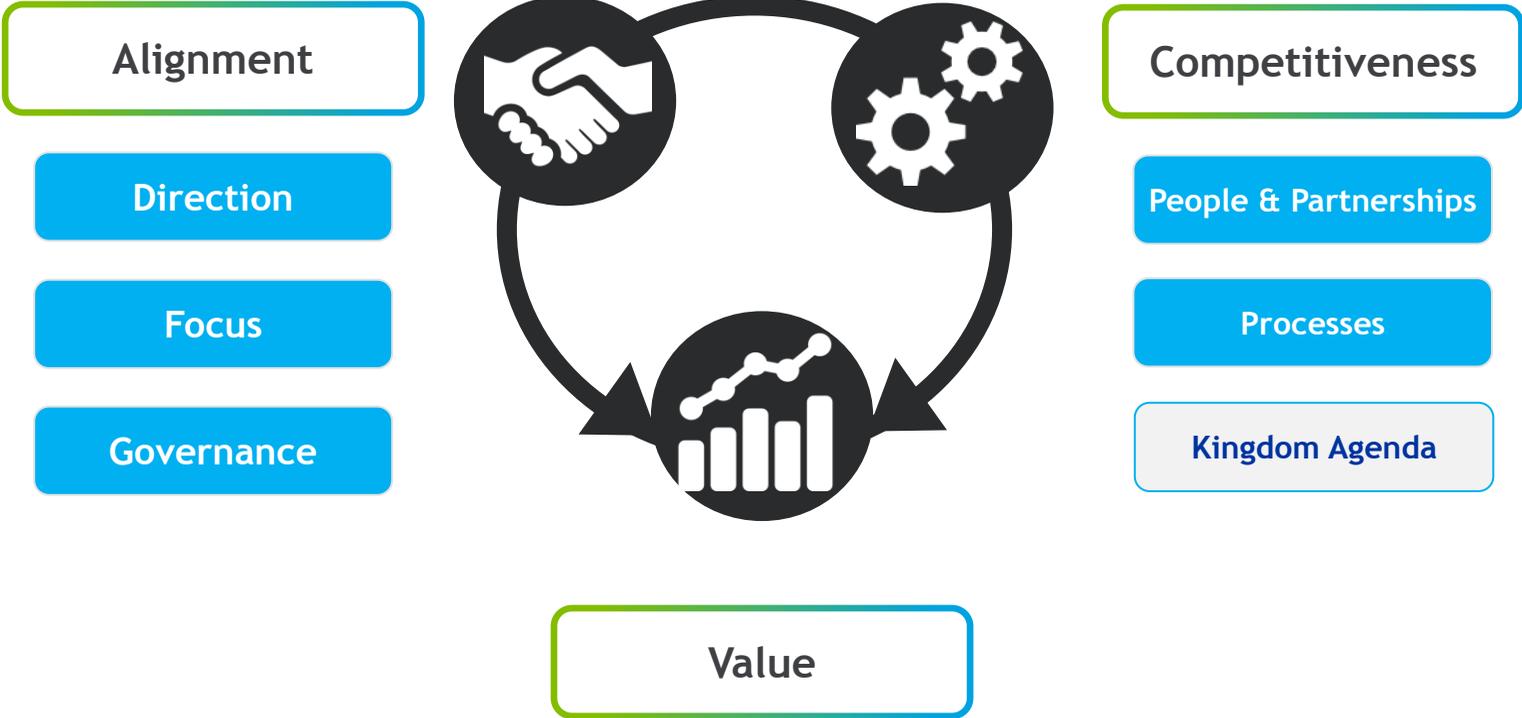
*Adaptive Organization*

*Kingdom Development*



# Saudi Aramco technology

Technology development & innovation goals



# Saudi Aramco technology

Strategic technology direction

## Vision

Global leadership in energy-related technology and supporting the creation of a flourishing knowledge economy in the Kingdom

## Mission

To deliver **commercially viable technology** options for Saudi Aramco which provide a **sustainable competitive advantage** and **attain recognition as a leader** in the development of **energy and chemicals technology**

# Saudi Aramco technology

A focused, business-aligned research portfolio



# Saudi Aramco technology

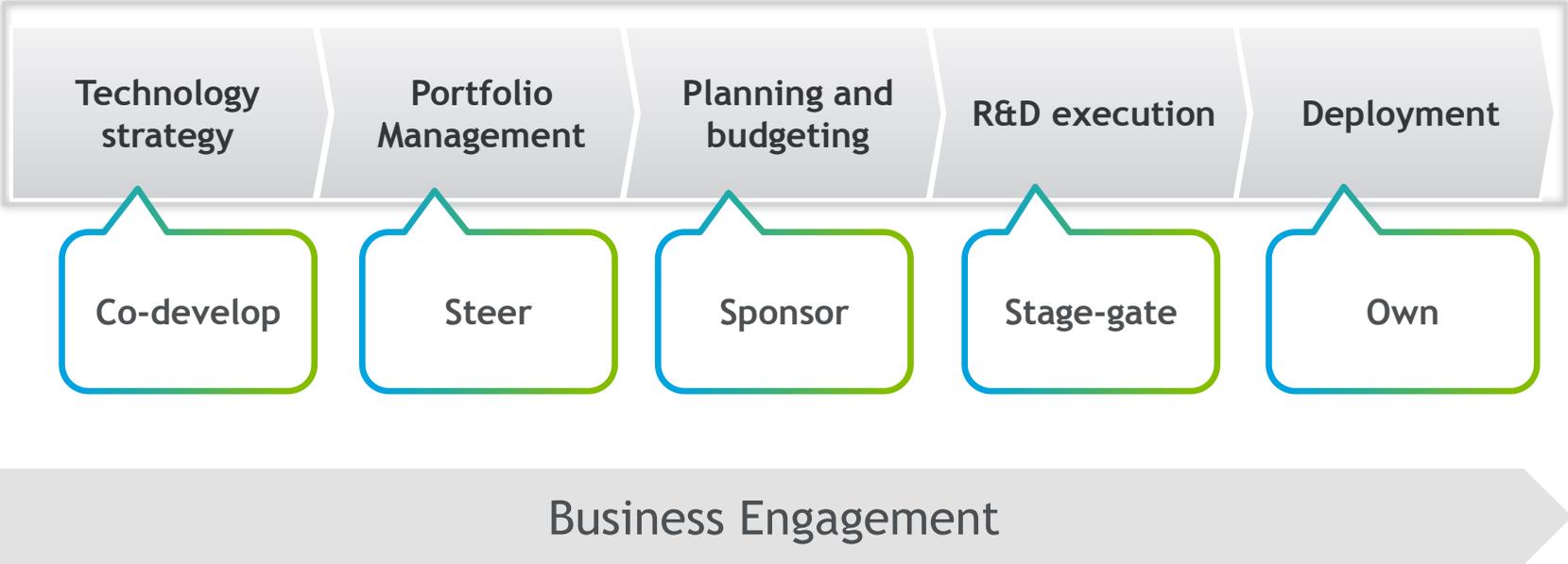
Ensuring technology alignment with business needs



# Saudi Aramco technology

Alignment across the technology lifecycle

## Technology Lifecycle



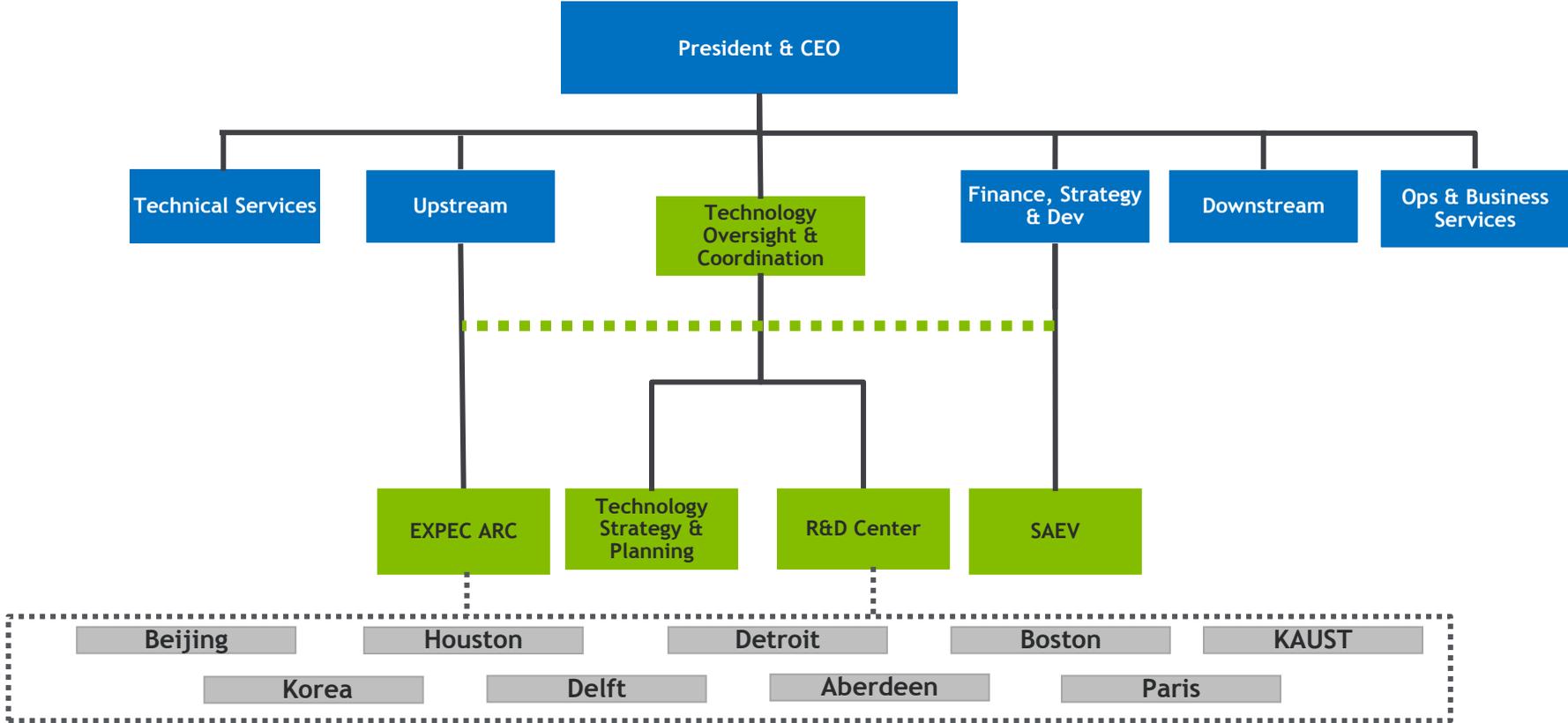
# Saudi Aramco technology

Enhancing technology organization competitiveness



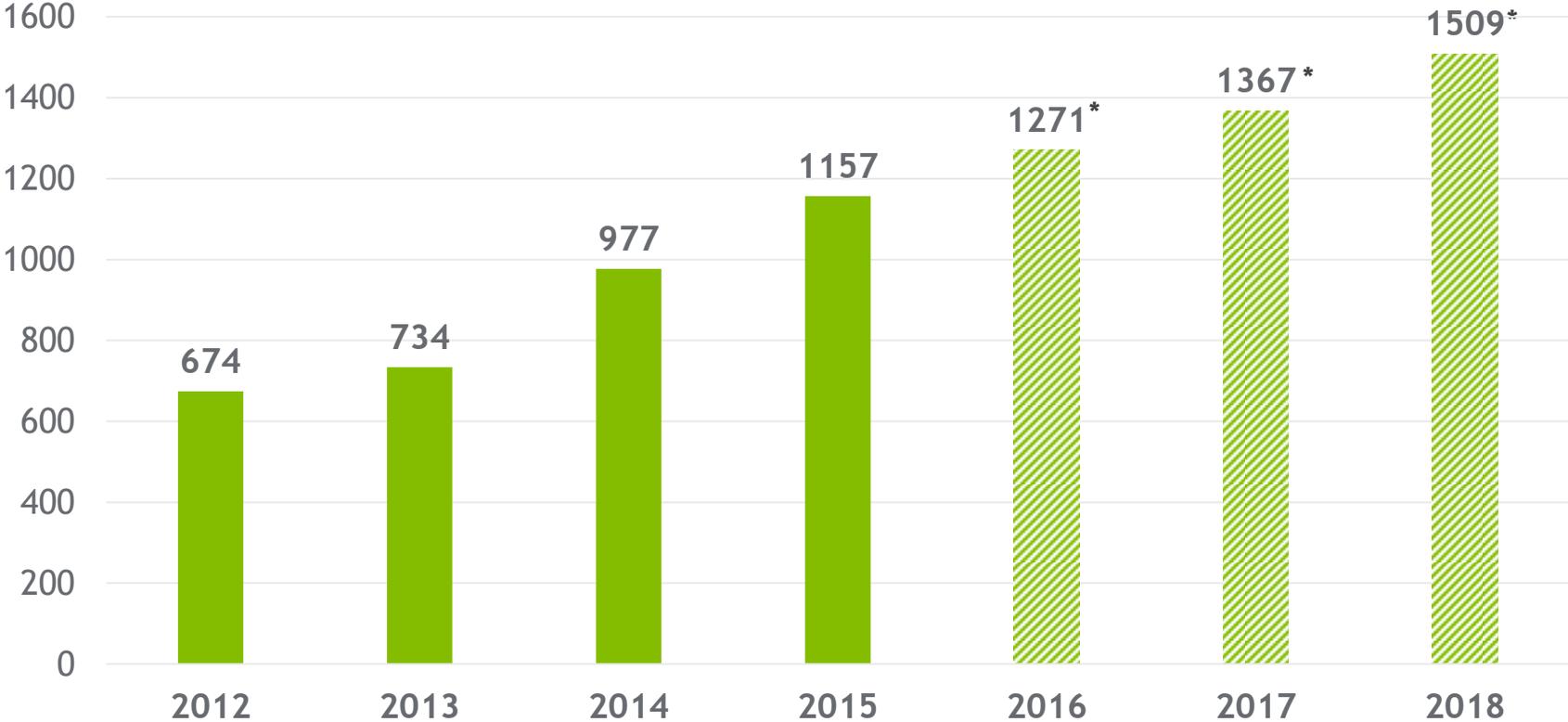
# Saudi Aramco technology

## Governance



# Saudi Aramco technology

People | continued growth



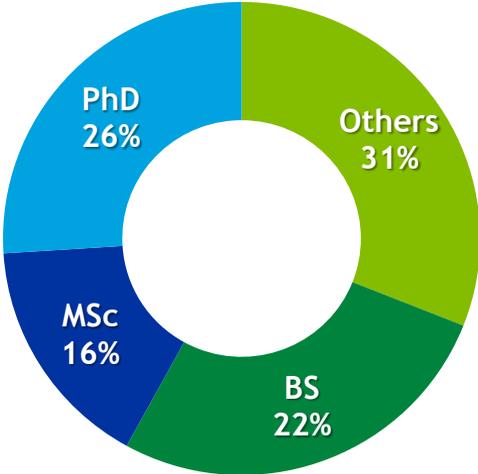
\*Estimated

Source: Saudi Aramco's R&DC Planning Group

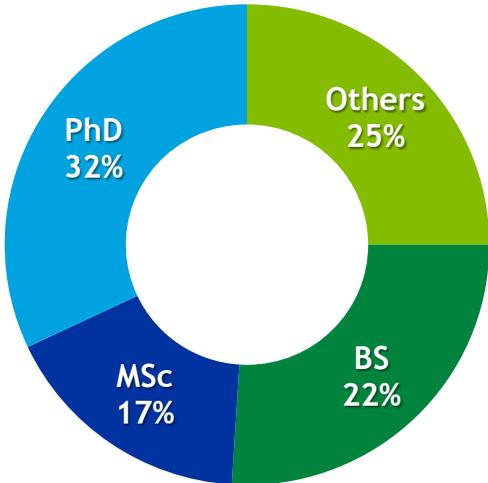
# Saudi Aramco technology

People | competencies and demographics

### 2012 Education Profile



### 2015 Education Profile



Number of PhD's have doubled in the last 3 years (173 to 343)

# Saudi Aramco technology

People | recognition

Our people continue to be recognized both internally and internationally

scientist appointed  
visiting lecturer at oxford

Saudi Aramco's Gautam Kalghatgi has been conferred the title of visiting professor in Engineering at the University of Oxford in the U.K.



## Company's First Fellow



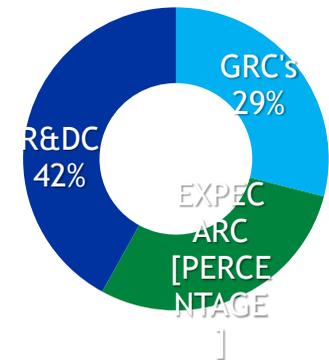
# Saudi Aramco technology

People | developing technology leaders

- Chief Technologist position expanded across R&D
- Research Fellow position introduced
- Established a dedicated Talent Development Group for Technology
- Implemented a global R&D leadership development program to transform our Research Leaders to 'Business Scientists'

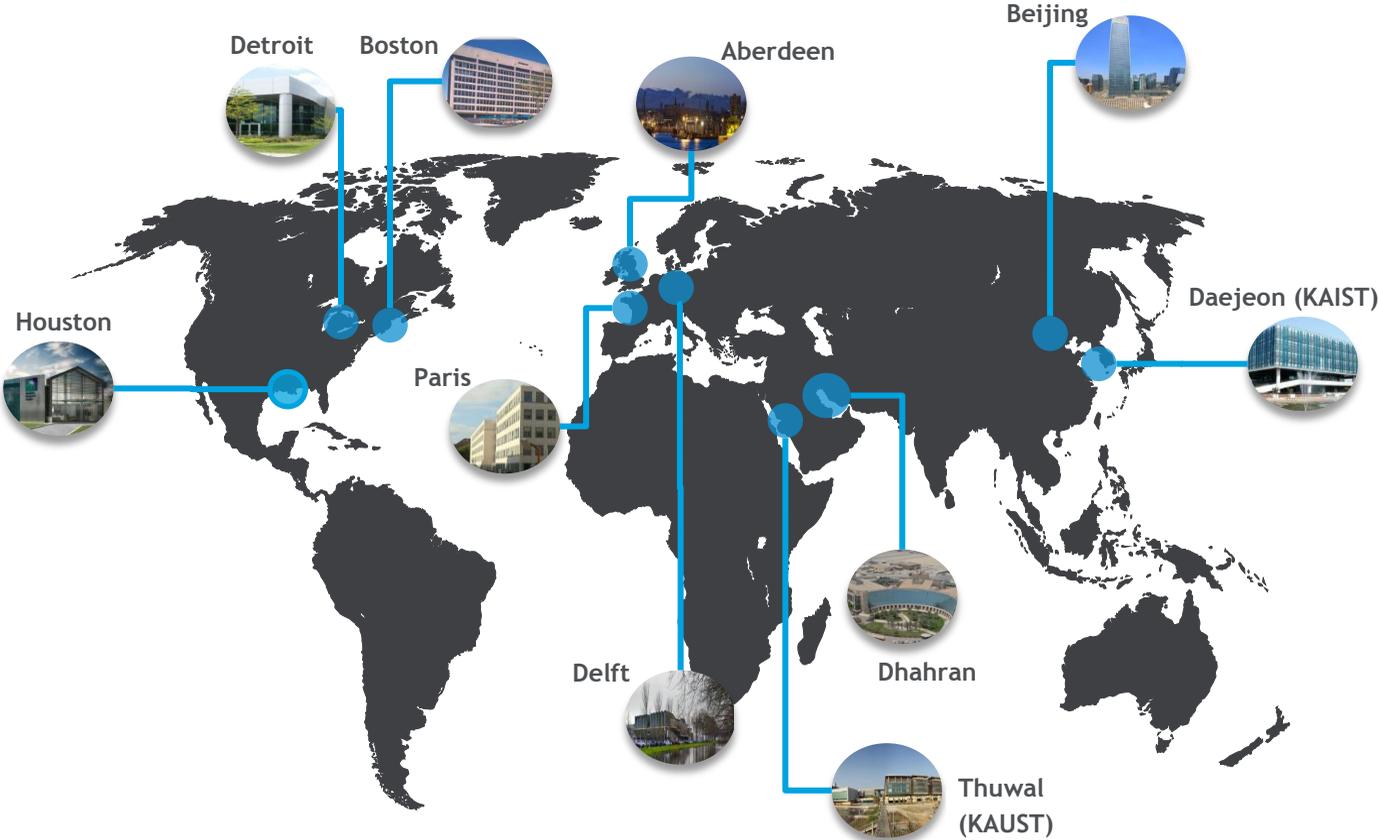


Program  
Participants from  
Across the Global  
Network



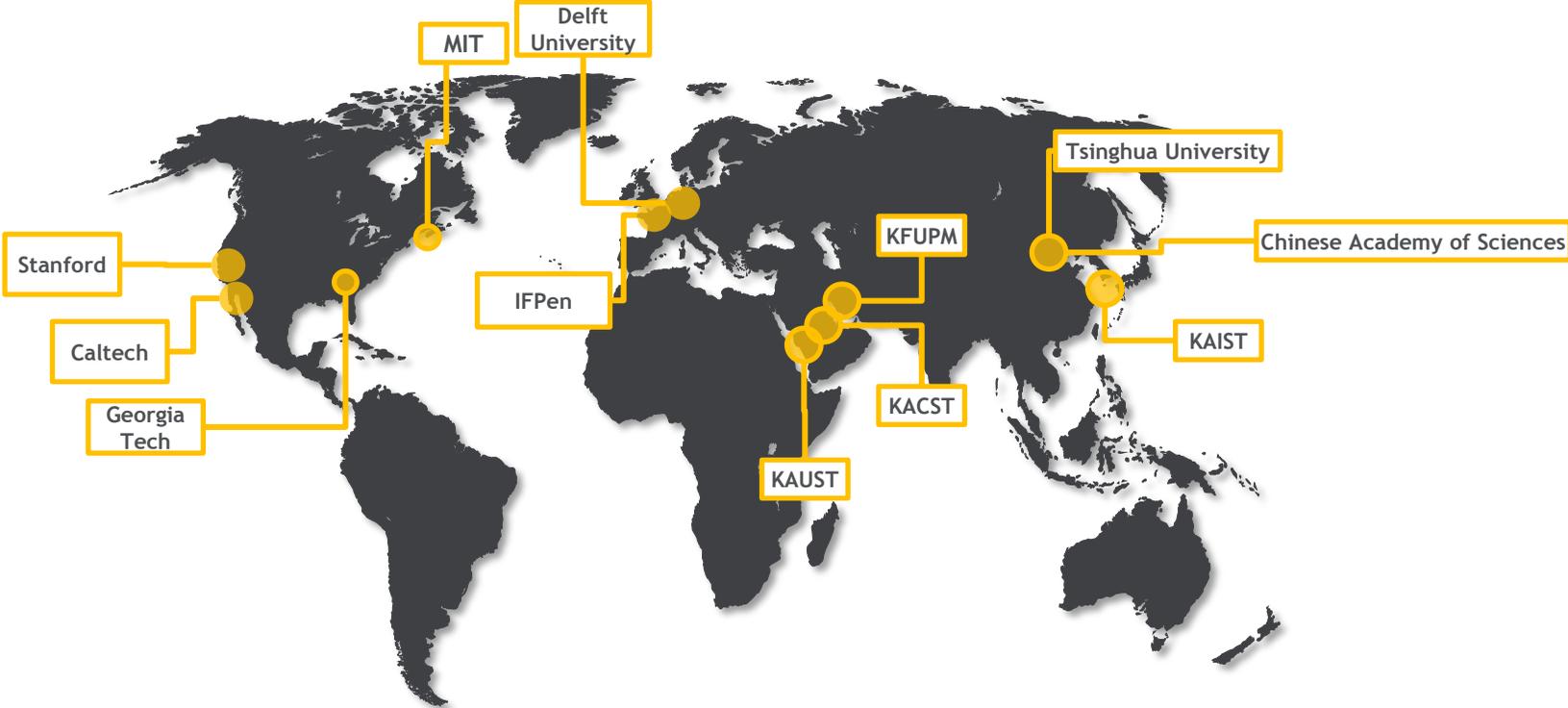
# Saudi Aramco technology

Global research network | accessing global talent & innovation hubs



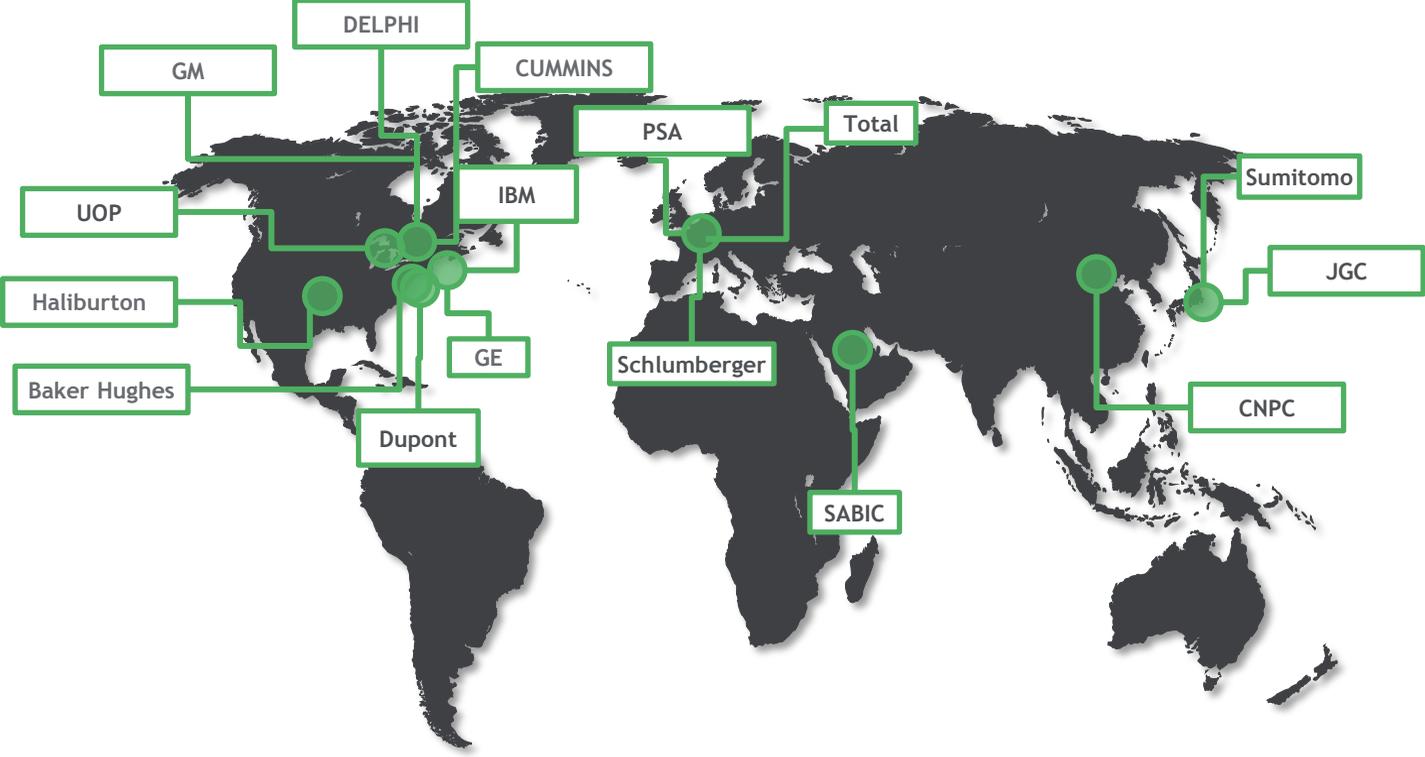
# Saudi Aramco technology

Global research network | academic partners



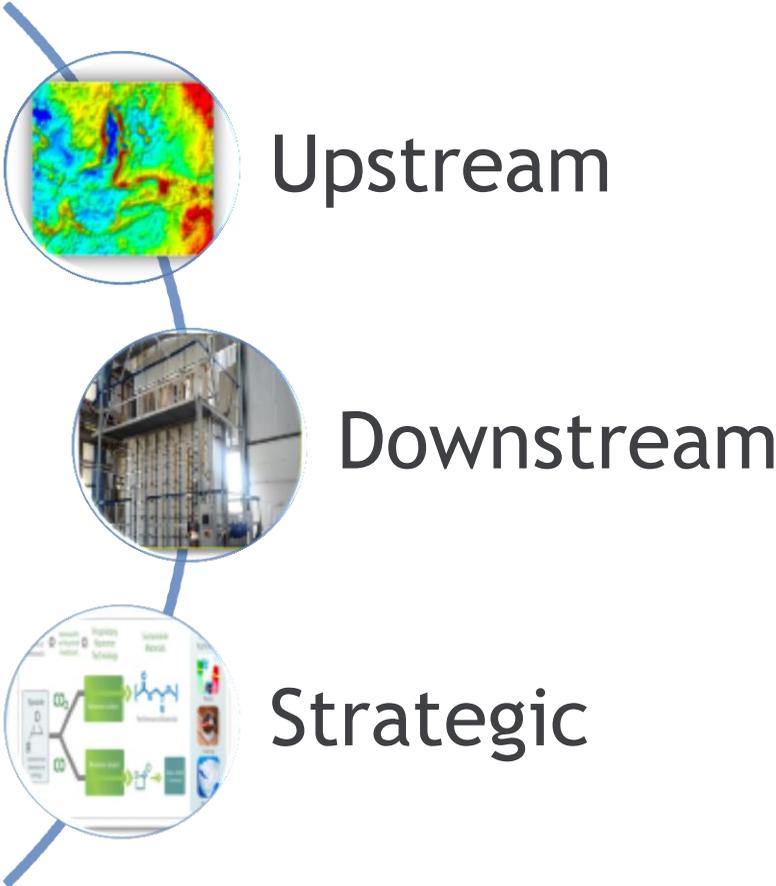
# Saudi Aramco technology

Global research network | industrial partners



# Saudi Aramco technology

Delivery value



# Saudi Aramco technology

Upstream domains | discovery and recovery



# Saudi Aramco technology

Upstream domains | discovery and recovery



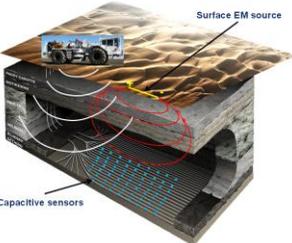
SpiceRack



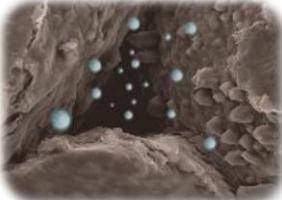
Extreme Reservoir Contact



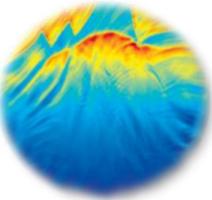
SmartWater Flooding



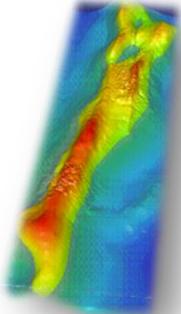
Borehole Electromagnetic Tool



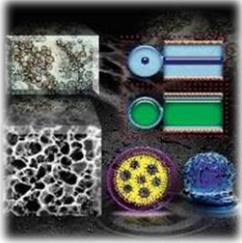
Reservoir Nano-Agents



Full Waveform Inversion



GigaPOWERS Multi-Billion Cells Simulation

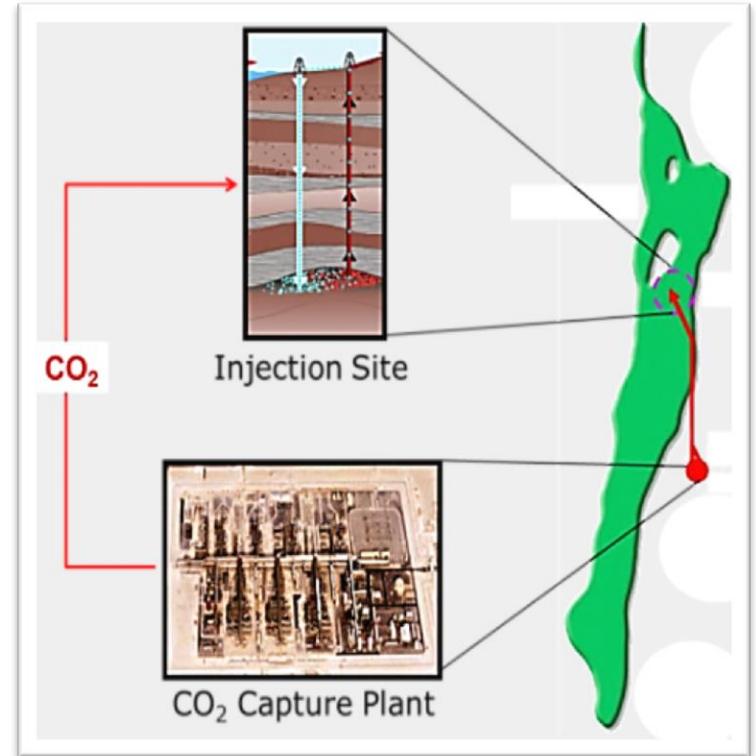


Smart Fluids

# Reservoir engineering technology

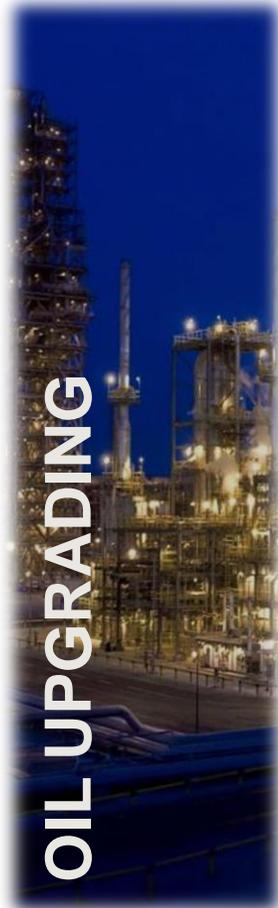
## CO<sub>2</sub> enhanced oil recovery project

- CO<sub>2</sub> injection facilities construction completed with first injection slated in 2015
- 40 MMSCFD of CO<sub>2</sub> will be captured from Hawiyah NGL plant, piped 85 kms
- Baseline production testing without CO<sub>2</sub> completed
- Innovative monitoring & surveillance system



# Saudi Aramco technology

Downstream domains | maximizing value



# Saudi Aramco technology

Downstream domains | maximizing value



Supercritical Water Upgrading



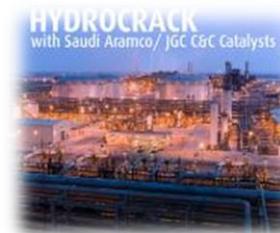
Saudi Aramco Inspection Robot (SAIR)



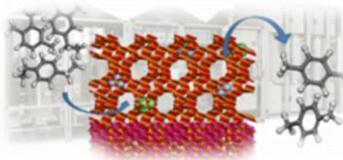
Shallow Water Inspection & Monitoring Robot (SWIM-R)



Membrane technology for NG Upgrading



Demetallized Oil Hydrocracking catalyst



Heavy Reformates to Xylenes



SuperButol™

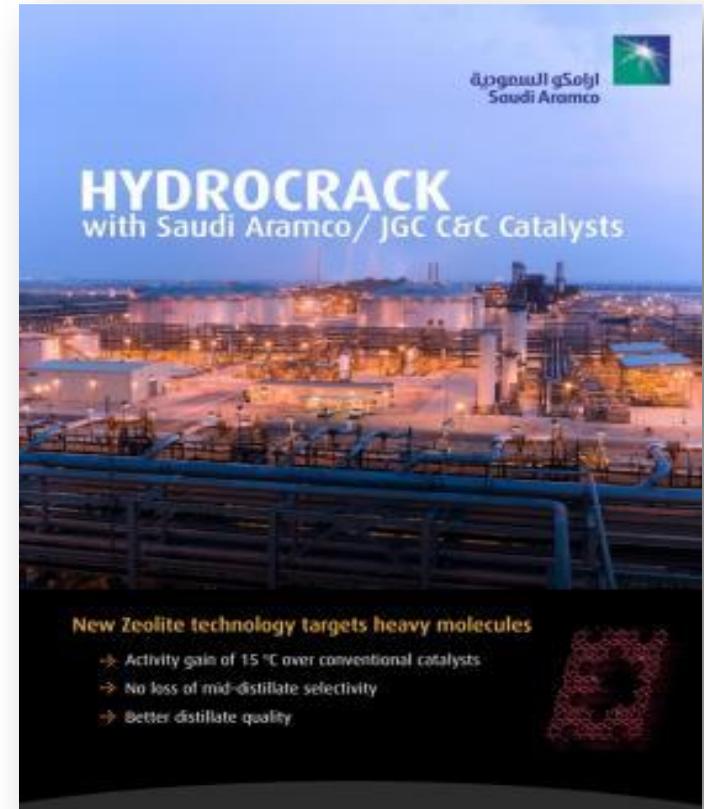


Crude to Chemicals

# Oil upgrading technology

## CAN-15 Hydrocracking Catalyst

- Jointly developed hydrocracking catalyst capable of increased diesel and liquid products yields
- Successful 7% loading demonstration in Riyadh Refinery Hydrocracker Unit in 2014/2015
- Deployment at Riyadh Refinery planned for 2016



# Chemicals technology

## High severity fluidized catalytic cracking technology

- Jointly developed by Saudi Aramco, KFUPM and JX Nippon Oil & Energy- licensed through Axens
- Successful demonstrated at 3000 BPD in 2011 (Mizushima, Japan)
- 76 MBD S-Oil HS-FCC unit commercial operations expected in 2018-Q2



3000 BPD semi commercial HS-FCC unit at Mizushima, Japan

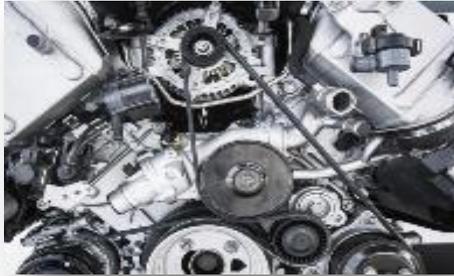
# Saudi Aramco technology

Strategic domains | sustainability



# Saudi Aramco technology

Strategic domains | sustainability



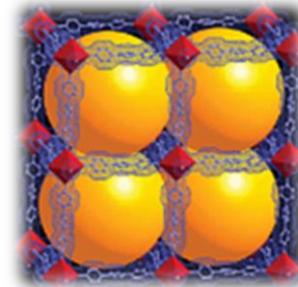
Gasoline Combustion Ignition (GCI)



Mobile Carbon Capture



Oxycombustion



Carbon Capture MOF's

# Saudi Aramco technology

Contributing to the Kingdom agenda

## Saudi Arabia Advanced Research Alliance (SAARA)

- Promotion of intellectual property commercialization and technology deployment in the Kingdom

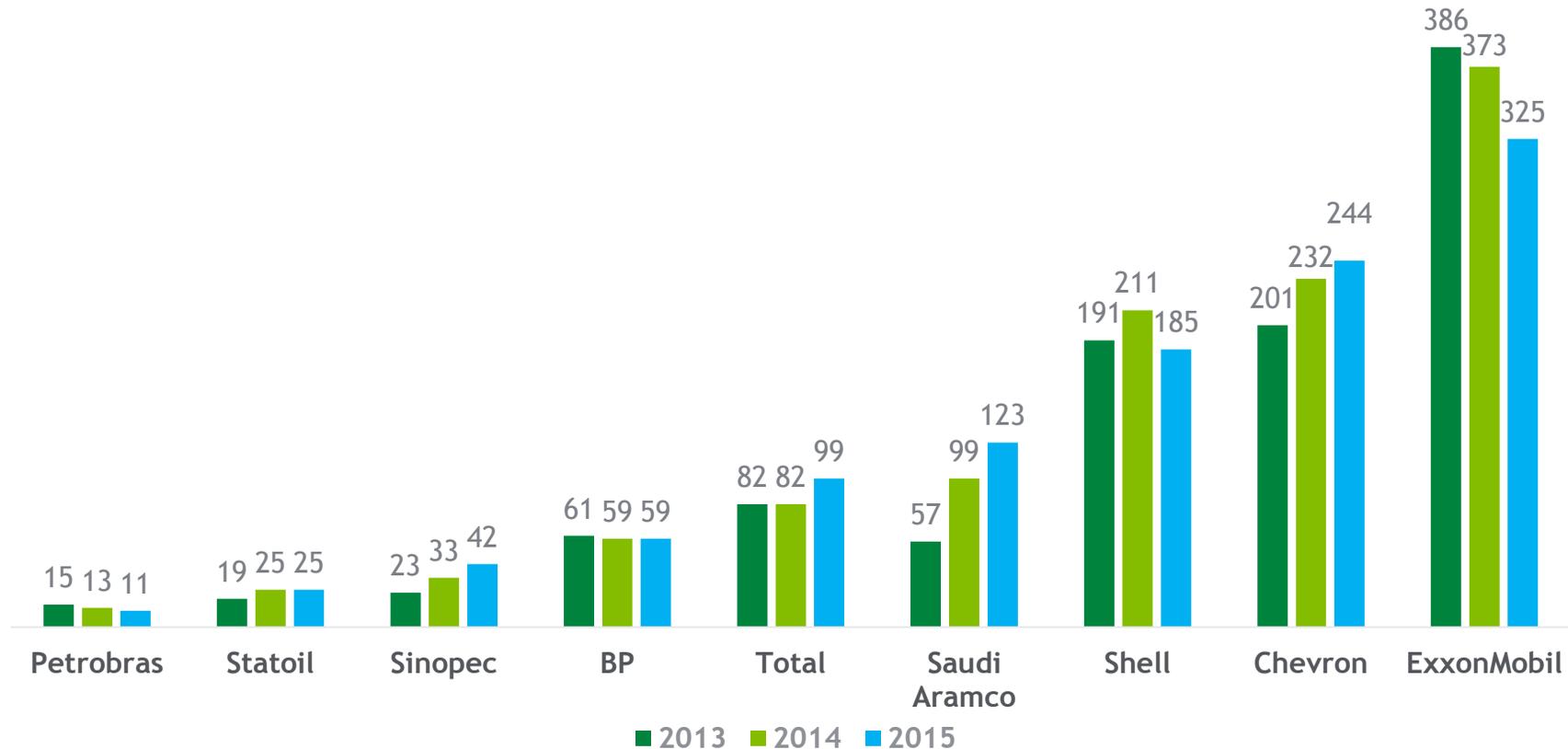
## Saudi Company for Research Elements (SARE)

- Supply chain management services, procuring research materials and equipment for both public sector and industry

# Saudi Aramco technology

Innovation | Our competitive edge in a rapidly changing world

## US Patent & Trademark Office Top Assignees - Oil & Gas



# Conclusion

## Alignment

- Focused mission & vision
- Clear structure
- Business engagement



## Competitiveness

- Growth of talent & partnerships
- Process streamlining
- Kingdom's knowledge ecosystem

## Value

- Timely R&D execution
- Effective deployment

# Bringing technology to life