IEF-KAPSARC Thought Leaders Roundtable
Riyadh, February 2019

Sustainable and Competitive Energy Supply:
The role of Efficiency and Innovation

Efficiency Drivers and Gains in Hydrocarbon Supply Chains
What are the economic imperatives and constraints that energy markets face today? How will efficiency gains impact the way the oil and gas industry will operate in future?
Efficiency gains in Hydrocarbon Supply Chain: Increased Focus

North America & Europe: lead innovation - consumers or prosumers

**MENA:** DSM, increasing focus on supply-side/Hydrocarbons

Asia: proof of concept at large scale
For almost every form of energy

India & Australia: experiments of decentralized, digital energy, storage

- Focus on Demand-side Management: Efficiency and decarbonization
  - Conservation & Efficiency, Price reforms, Renewables & Electrification
- **Increasing focus on supply-side:** low cost/low carbon Hydrocarbons
  - CCS from power & Industry (e.g. with EOR), O&G sourced hydrogen
  - Longer term, “carbon-free” oil – convert water and CO2, where difficult to electrify
Efficiency gains in Hydrocarbon Supply Chain: 3 Battles

Source: “Global carbon intensity of crude oil production”, Masnadi & al., Science, Aug 2018
Efficiency gains in Hydrocarbon Supply Chain: 3 Battles

**Carbon**

- Avg. Cl (g CO2eq/MJ)
- Algeria
- Venezuela
- Cameroon
- Canada
- Iran
- Turkmenistan
- Indonesia
- Sudan
- Trinidad & Tobago
- Iraq
- Gabon
- Malaysia
- Nigeria
- Pakistan
- Ukraine
- Oman
- USA
- Libya
- Rep. of Congo
- Egypt
- Brazil
- Chad
- Mexico
- Russia
- Kazakhstan
- Ecuador
- Argentina
- Australia
- Vietnam
- India
- Turkey
- Colombia
- Poland
- UK
- Angola
- Romania
- UAE
- China
- Kuwait
- Qatar
- Equ. Guinea
- Azerbaijan
- Italy
- Brunei
- Norway
- Ghana
- Thailand
- Bahrain
- Saudi Arabia
- Denmark

**Cost**

- Total: $360bn
- 38% Oil
- 25% Gas
- 9% Power
- 28% Chemical

**Market share**

- Non-combusted demand: By source
- Source: Committed Investments in MENA 2019-2024, APICORP 2019

**Carbon intensity of crude oil production**

- Source: “Global carbon intensity of crude oil production”, Masnadi & al., Science, Aug 2018

**Final energy consumption in transport: Consumption by fuel**

- Source: BP Energy Outlook 2019
Implications for players

Industry
- De-integration upstream downstream, spin-offs
- Service companies with squeezed margins, technology offering key (AI, machine learning, Big Data) - M&As, consolidations

Governments
- Policy intervention through tax breaks, price signals, funding incentives
- Government-led investments but interdisciplinary private sector key (Local content drive: focus on technology services, associated manufacturing
- Natural gas “advocacy” – gasification or electrification of industry?

Investors
- “Death valley” still an issue for financing innovation
- However, industry involvement key in selecting applications (CCS/EOR, Hydrogen, intelligence, storage)
The role of new technologies to remove/make use of carbon in the value chain. How does policy intervention...
Policy Intervention and Innovation

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Policy Intervention and Innovation

Supply-side
Low cost Hydrocarbons:
Costs, AI, machine learning

Demand-side
Demand Management
Smart meter., Distrib. Gen, MaaS

Taxation

Pricing

Electricity:
Intermittency of RE, Storage

Gasification or electrification?
Networks

Pricing/Valuation

Regulation/Clarity

Innovations at confluence of sectors
Two intertwined value propositions: intelligence/value capturing, flexibility services (e.g. storage) and versatility
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• Government-led investments but interdisciplinary private sector key (Solar for EOR, crypto/RE)
• Natural gas “advocacy” – gasification or electrification of industry?
• Local content drive: focus on technology services, associated manufacturing

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