وزارة الطاقة
MINISTRY OF ENERGY

جمعيـــة اقتصاديـــات الطاقـــة
Saudi Association for Energy Economics

المملكة العربية السعودية
KINGDOM OF SAUDI ARABIA

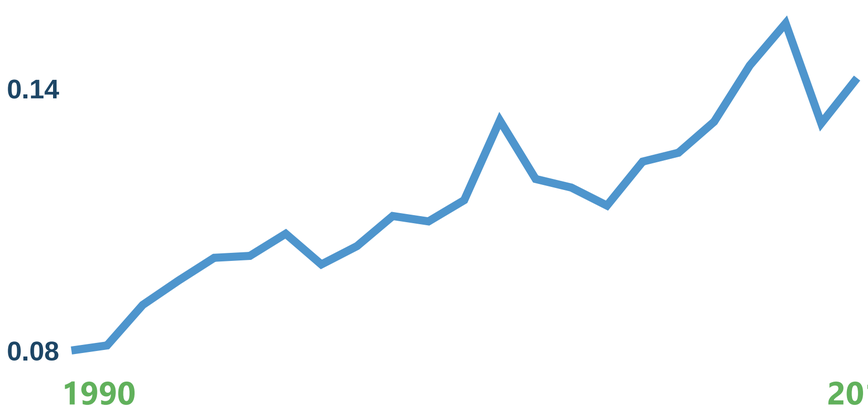
The Impact of the Global Energy Transition on Oil Producing States

KSA's Energy Transition Journey: Got Energy?

www.moenergy.gov.sa

24 Jun 2021

The Kingdom's Energy Transition Journey… Thus Far

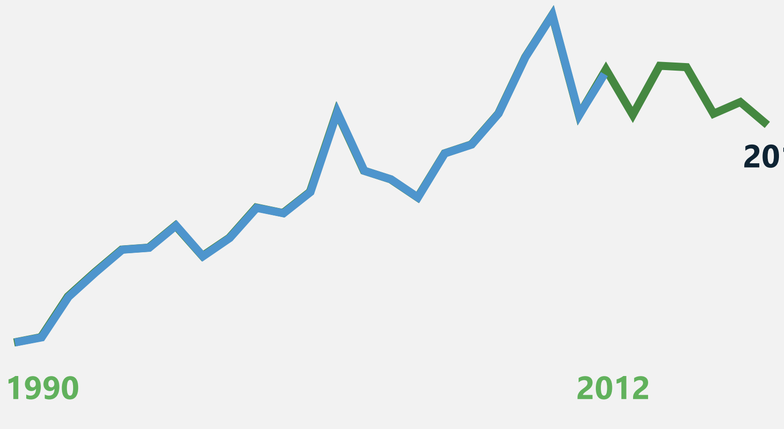


Energy intensity of GDP at constant purchasing power parity (koe/$2015p)

Saudi Arabia

'90 – '12

65%	Saudi Arabia
-16%	Japan
-27%	US
-34%	World
-37%	Germany



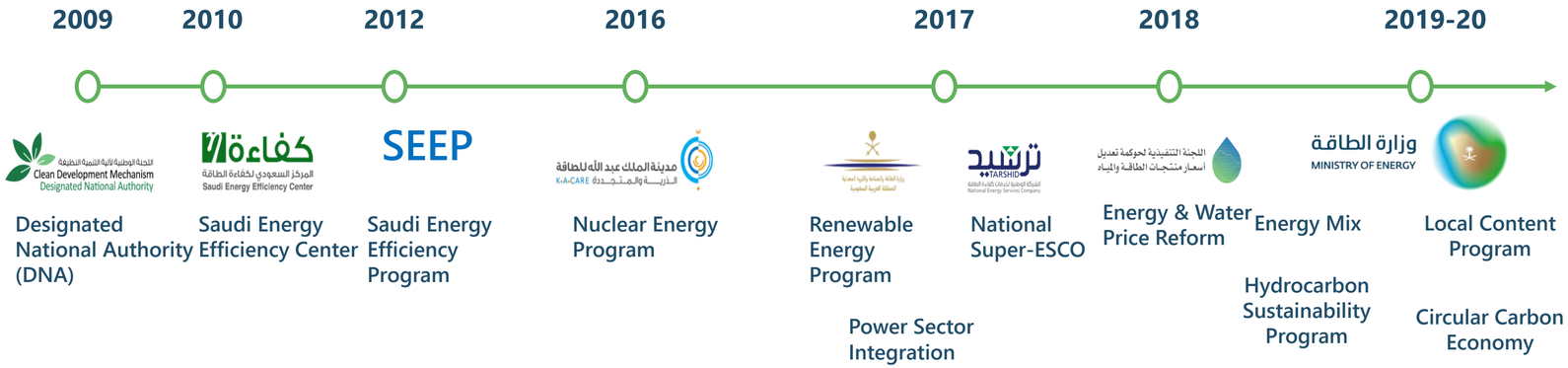
Energy intensity of GDP at constant purchasing power parity (koe/$2015p)

Saudi Arabia

'12 – '18

-8%	Saudi Arabia
-8%	US
-12%	World
-13%	Japan
-13%	Germany

Creation of energy programs and entities



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Note: Koe - Kilograms of oil equivalent
Source: Enerdata

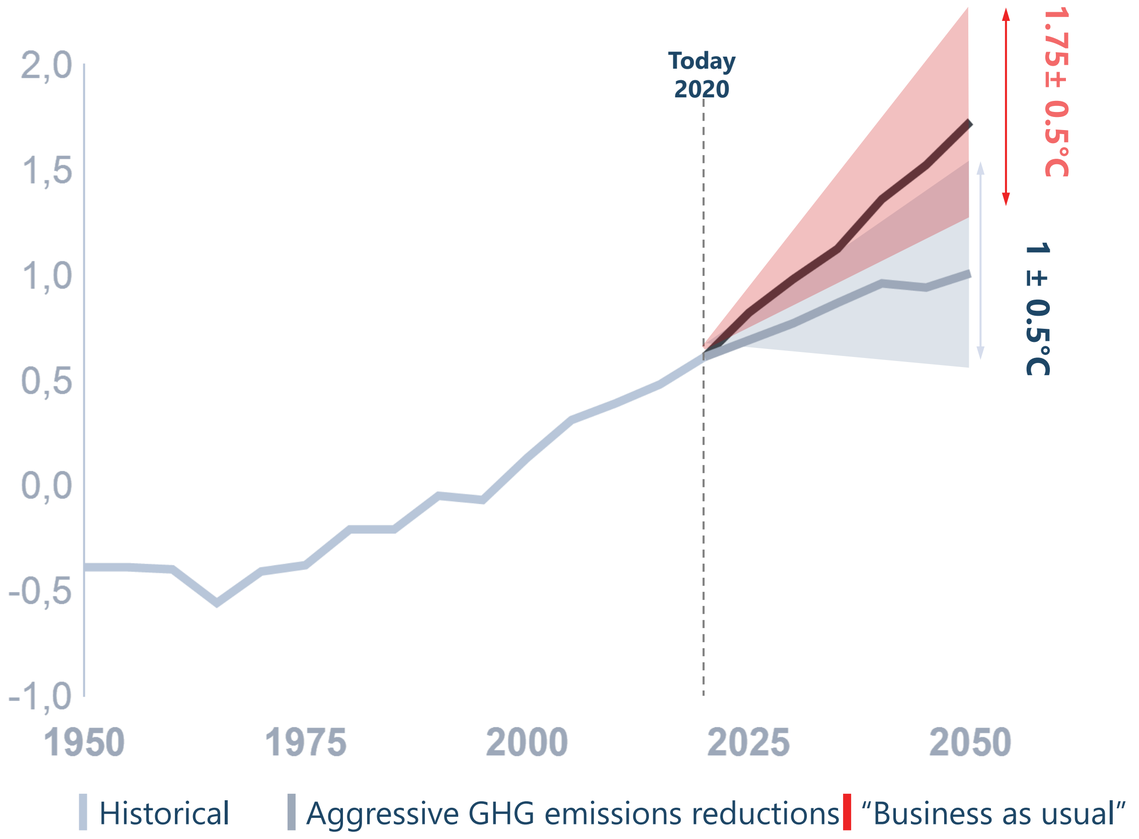
The Burning Platform… Emissions Causing Environmental Impact

Temperatures have risen ~1°C since mid-20th century

Scientific community has declared **major threats if aggressive emission reductions are not taken**

Global leaders committed to **limiting global warming to 2°C** above pre-industrial levels as part of Paris Agreement

Global average surface temperature change (°C)[1]



A transition in the energy sector is required to address the challenge

What is Energy Transition?

*The process of changing or **conditioning** from one state to another*

power derived from the utilization of physical or chemical resources, to provide light and heat or to work machines

Zero-Carbon

- Narrow
- Cookie-cutter
- Myopic

The global energy sector's shift from fossil-based systems of energy production and consumption to renewable energy sources

The global energy sector's shift towards a more sustainable and environmentally friendly production and consumption of all energy sources

- Pragmatic
- Inclusive
- Wholistic

Circular

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Carbon is integral to our existence… should be managed rather then demonized

Carbon is chemistry and life as we know it is based on carbon

Nature already has an efficient "carbon cycle" that converts CO_2 to living tissue

Nature currently has a capacity to hold 200 Giga tons of CO_2 across our forests, mangroves etc.

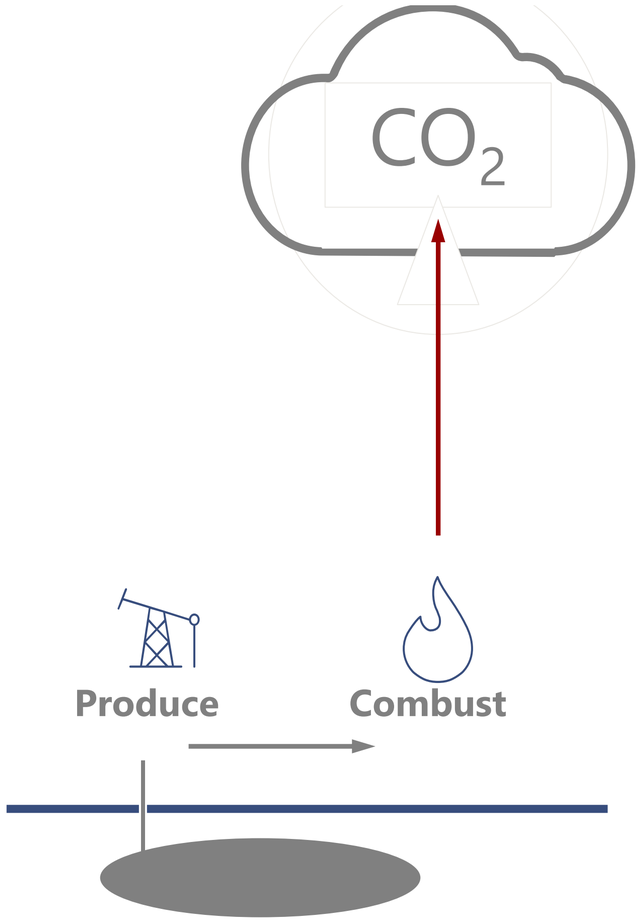
Carbon is not the enemy!

As a result Saudi Arabia developed the Circular Carbon Economy Framework

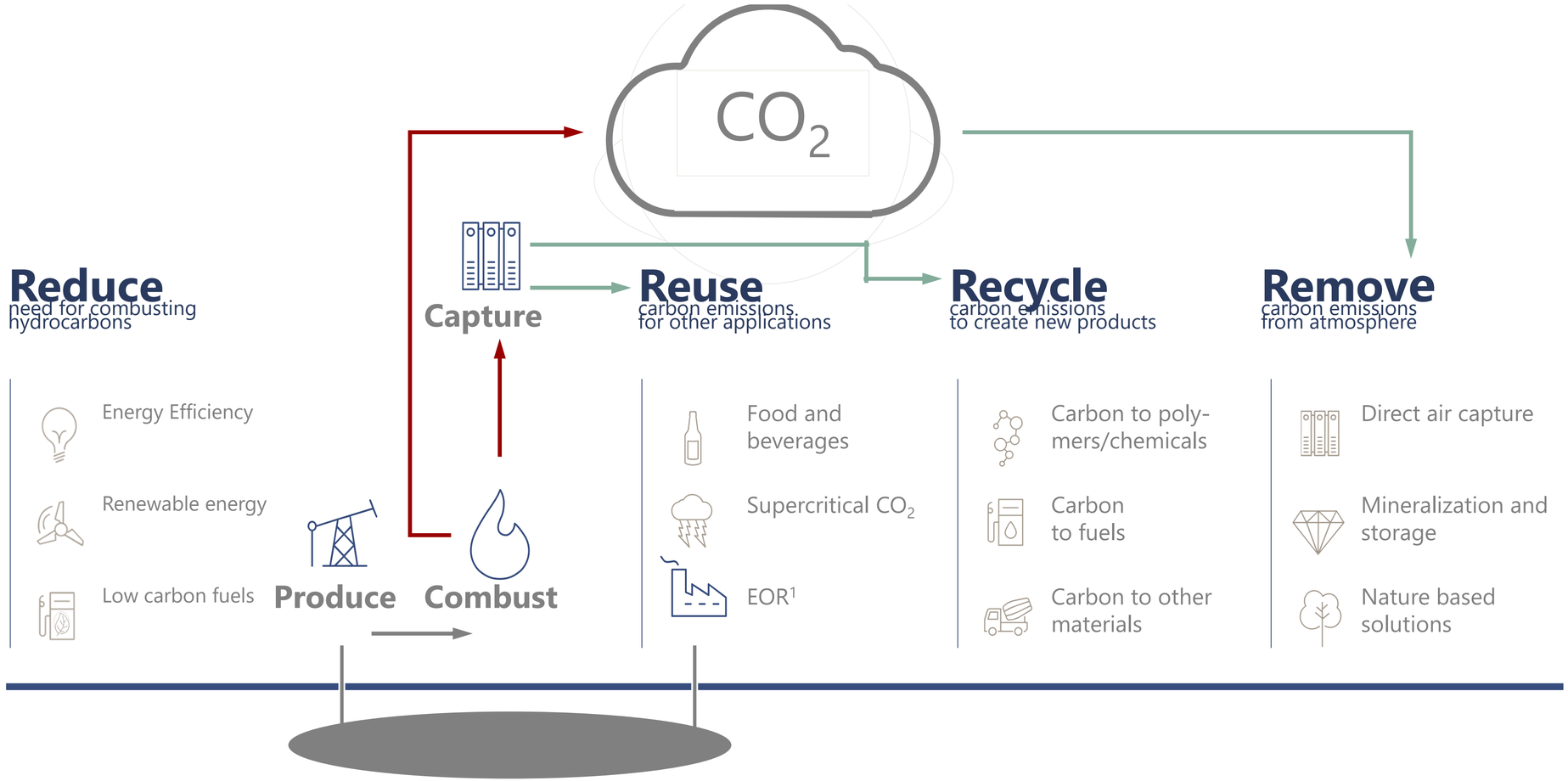
Circular Carbon Economy

Zero-Carbon ***Circular***

From a **linear carbon economy…**



… to a **Circular Carbon Economy (4 Rs)**



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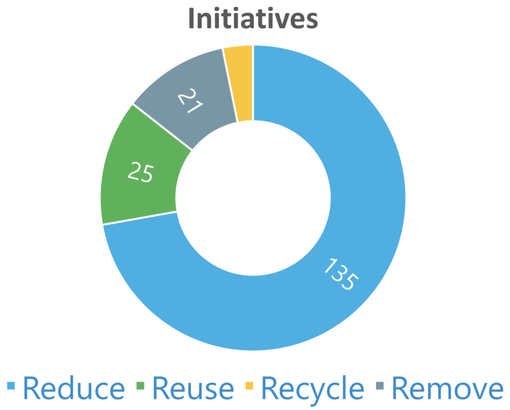
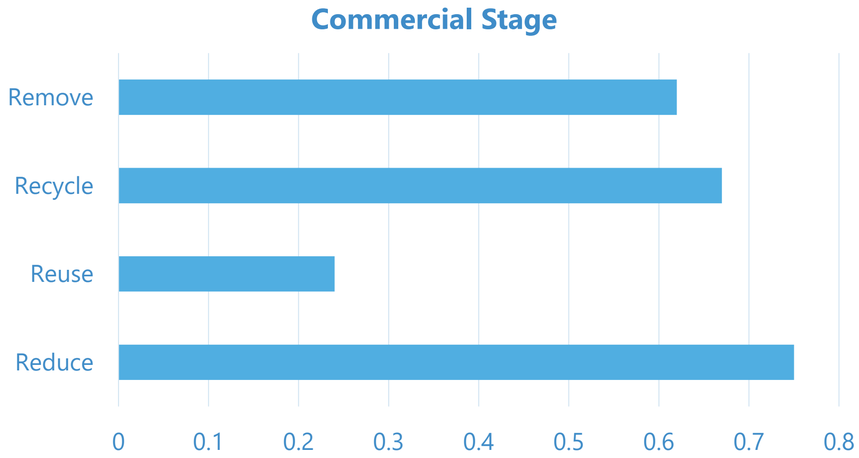
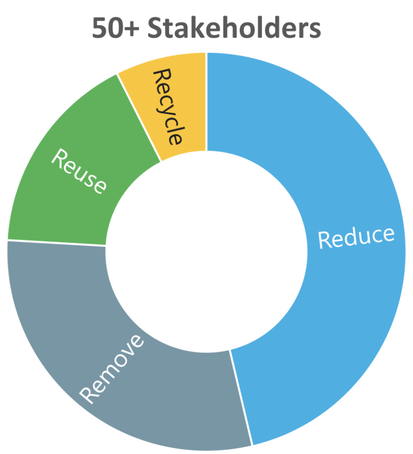
Note: [1] EOR: Enhanced Oil Recovery

Currently, there are 180+ ongoing and planned initiatives







Sample program and initiatives

Renewable Energy Program

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Energy Efficiency Program

كفاءة
المركز السعودي لكفاءة الطاقة
Saudi Energy Efficiency Center

Carbon sequestration project

Eastern Province (Uthmaniyah)
Capture & store
~ 800,000 t of CO_2 per year

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CO_2 Capture & Utilization

500,000t of CO_2 per year

سابك
sabic

CO_2 to olefins

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سابك
sabic

CO_2 conversion Electrochemical and photochemical

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Conversion of CO_2 into high value end products

(e.g. Novomer polyols)

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Reforestation Project

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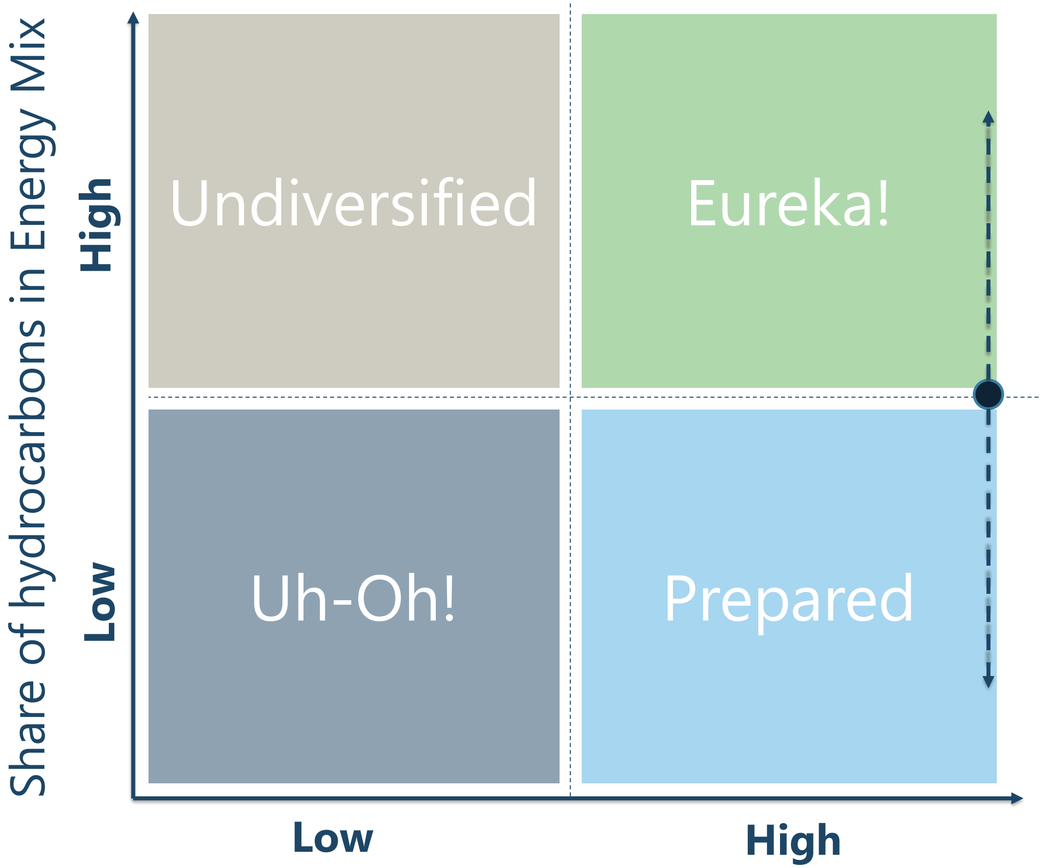
Carbon adaptation

King Abdullah University of Science and Technology

Source: CCE-NP initiatives database, Team Analysis

… the next two decades… a simple approach



Determinants

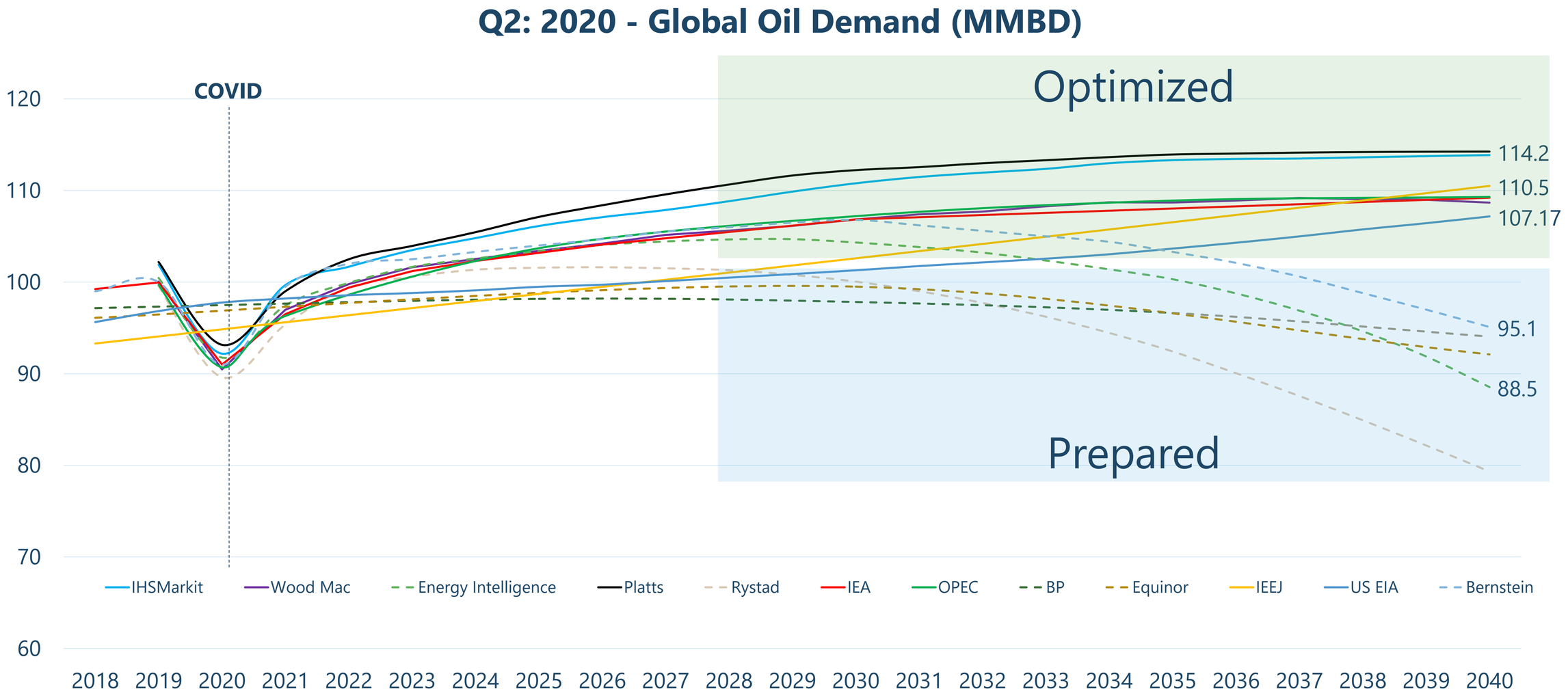
Share of hydrocarbons in Energy Mix
(Speed Triggers)

- Economic impact i.e. COVID
- Technology cost curves
- International Policies and advocacy
- New demand centers
- Carbon management

Technological Diversification
(Influence/Control)

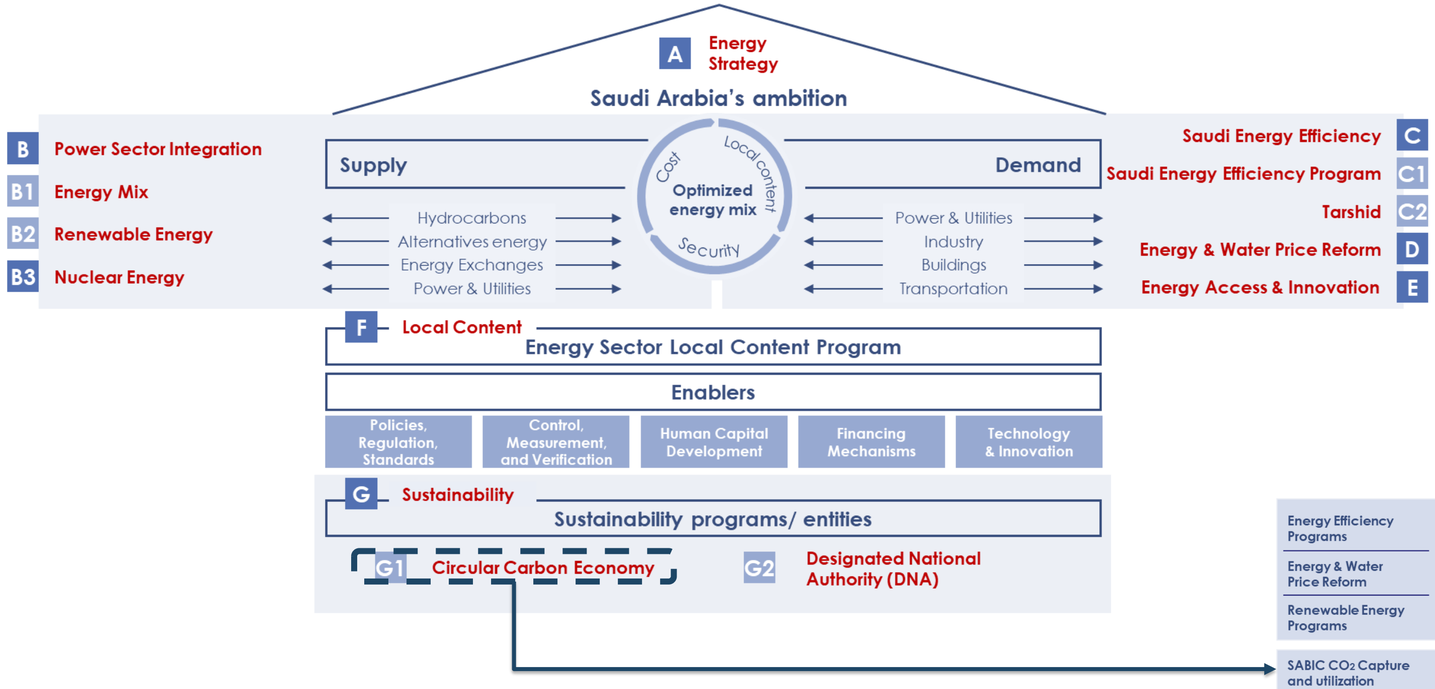
- Investments ‘all of the above’ approach
- Infrastructure and enablers
- Domestic policies and efficiency
- Local content/Localization

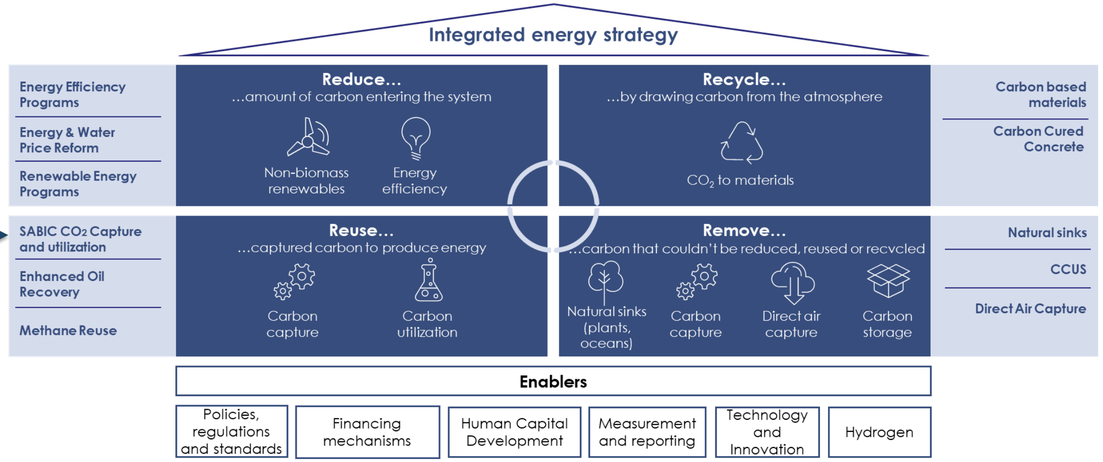
Forecasts from various firms (including extreme cases)… 75% forecast growth



The Kingdom's Initiatives across the energy space.. For a sustainable future

Got Energy?





Adaptability and versatility of the CCE framework allows for pragmatism

From a plan to achieve 7 SDG targets… to a proposal that achieves 3 SDGs?!

17 SDGs

169 Targets

Energy-Climate Nexus

2 SDGs

10 Targets

Energy Access, Affordability & Environmental Sustainability

Globally Optimal Pathway

19

169 Targets

Nationally optimal pathways

- Resilience to economic shocks
- Technology endowment
- Economic prosperity
- Access to capital: funding gaps[1]
- Natural resources endowment

Net-zero[2]

2070: IEA SDS 2020	Practical and moderate investment in clean energy	Achieves **7** SDG targets
2050: IEA NZE 2021	Massive investment in clean energy (in excess of $130 tr.)	Achieves **3** SDG targets

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1) Developing economies SDG funding gap: $2.5 Trillion / year
2) Both scenarios achieve one health related SDG target

La La Land (the sequel)…the plot and the moral

Act now, leverage existing clean tech (solar and wind in particular) and increase R&D investments in tech[1] for hard-to-abate sectors

Explicit call against new fossil energy investments immediately (no greenfield investment required)

- More of a zero than circular carbon approach
- Critical minerals required to manufacture clean energy technology, geographical concentration and price volatility risk
- $150-$200 / tCO2e is required to fund the pathway (BofA)
- More Q's fewer answers, contradictions!

- Who will drive growth? Developing vs. developed?
- What about affordability, energy poverty?
- Taxing the economy? Optimizing tradeoffs?
- Hydrocarbon market stability?

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1. e.g., CO2 pipelines and hydrogen infrastructure

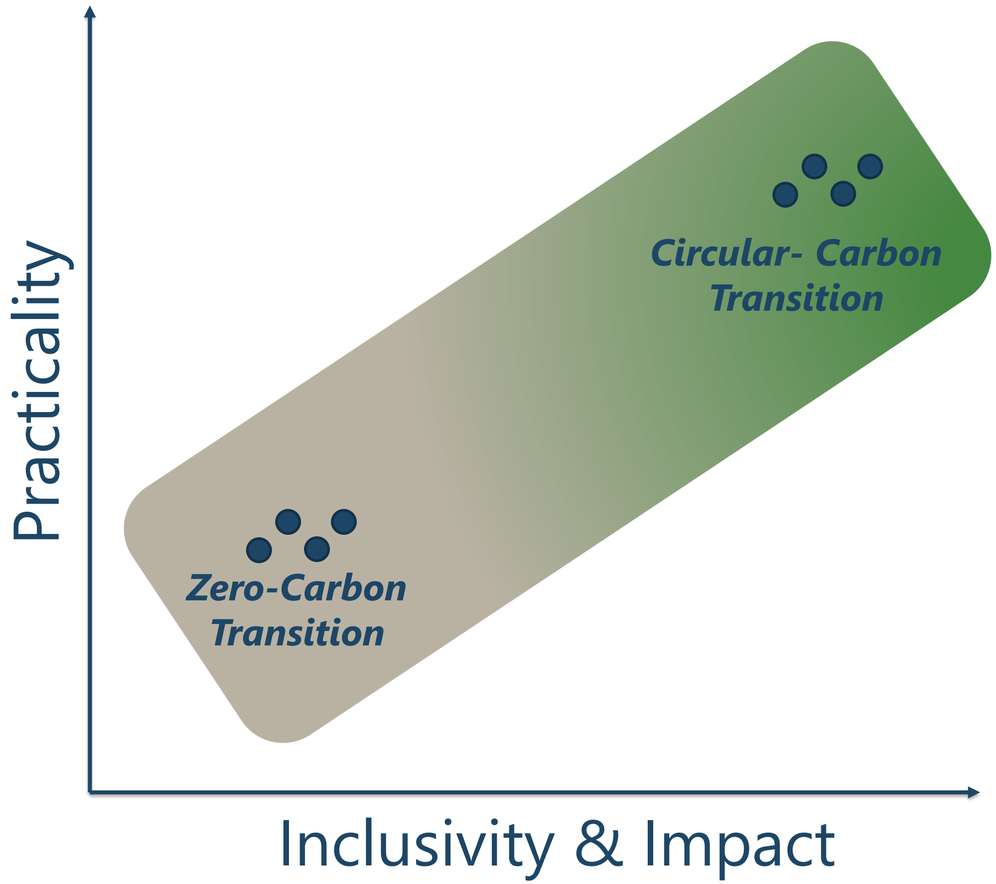
Key Take-A-Ways

1- Circular Carbon or Zero Carbon

2- Pragmatic Solution or Idealistic Solution

The Kingdom pragmatism will enable it to maintain the lowest cost, most efficient, and reliable energy supplier in the world

How inclusive do we want energy transitions to be?



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Thank you

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