



Navigating the Energy Transition

Aligning Vision. Accelerating Transformation. Leading with
Purpose.

Saudi Arabia's New Procurement Law Raises Direct Purchase to SAR1 Million

Saudi Arabia's 2026 government procurement law trades faster approvals and wider discretion for new documentation, payment and local-content controls.

Donovan Vanderbilt · Updated September 1, 2026 · 11 min read

SAUDI VISION 2030

ANALYSIS

NDCs: Definition, Drivers and Leadership

What is an NDC?

A Nationally Determined Contribution is a country's climate action plan under the Paris Agreement. It sets national mitigation ambitions and may include adaptation and implementation needs.

Saudi policy leadership

The Ministry of Energy leads energy-sector policy. Vision 2030 and the Saudi Green Initiative drive diversification and climate action through the Circular Carbon Economy approach.

What drives the commitments?

Paris Agreement goals, national circumstances, climate risks and development priorities shape each plan. Countries submit successive NDCs every five years, with increasing ambition.

Saudi coordination: DNA

The Designated National Authority coordinates NDC progress, national measurement, reporting and verification, and UNFCCC reporting. It also serves as the Article 6 focal point.

International framework: UNFCCC

Countries determine and deliver their own commitments. The UNFCCC secretariat maintains the NDC registry; Paris Agreement bodies provide shared reporting and accounting rules.

Saudi delivery and support

SEEC leads energy efficiency; Tarshid delivers retrofits. Public and private entities implement projects across sectors; KAPSARC supports research and technology development.

Leading NDC Examples: 2035 Commitments

United Kingdom

At least 81% lower GHG emissions by 2035 than in 1990. An economy-wide target linked to carbon budgets and the 2050 net-zero pathway; excludes international aviation and shipping.

Australia

62–70% lower net GHG emissions by 2035 than in 2005. Covers all sectors and greenhouse gases, implemented through a 2031–2035 emissions budget and linked to the national Net Zero Plan.

Norway

At least 70–75% lower GHG emissions by 2035 than in 1990. The submitted NDC strengthens the 2030 commitment and provides a clear quantitative benchmark for national climate planning.

Brazil

59–67% lower net GHG emissions by 2035 than in 2005. An economy-wide target combines energy transition with land-use action, including a goal of zero illegal deforestation by 2030.

Switzerland

At least 65% lower GHG emissions by 2035 than in 1990. A 2031–2035 emissions budget corresponds to an average reduction of at least 59%, supporting multi-year accountability.

Japan

60% lower GHG emissions in fiscal year 2035 than in fiscal year 2013, followed by 73% in 2040. The paired milestones define a pathway towards net zero by 2050.

Saudi Arabia's Second NDC: 2040 Ambition

335 million tonnes annually

Aim to reduce, avoid and remove CO2 equivalent emissions by this amount annually by 2040, against a dynamic baseline.

2030–2040 implementation

The NDC implementation period is 2030–2040. The designated base year is 2019.

20.5% progression

The report describes a 20.5% increase in ambition from the updated first NDC.

Three complementary pillars

Economic diversification with mitigation co-benefits; adaptation with mitigation co-benefits; stand-alone adaptation.

National circumstances

Water scarcity, desertification, extreme heat and population growth shape the national pathway.

How to read the ambition

335 million tonnes is a baseline-relative annual mitigation ambition, not a cap on total national emissions.

Economic Diversification and the Carbon Economy

Circular Carbon Economy

The CCE approach links economic growth with emission avoidance, reduction and removal across a portfolio of technologies.

Scenario 1: export-led investment

Hydrocarbon export revenues finance higher-value sectors, renewable energy and efficiency. The NDC ambition is set under this scenario.

Scenario 2: domestic industry

Domestic hydrocarbons support petrochemicals, cement, mining and metals, with suitable emission-abatement technologies.

Why the baseline is dynamic

The allocation of hydrocarbons between exports and domestic use changes territorial emissions and baseline estimates.

Broader sources of growth

Financial and medical services, tourism, education, logistics, technology and material transition support diversification.

Managing external impacts

The report identifies climate-related trade measures as potential barriers to investment and competitiveness. This is the Kingdom's stated assessment.

Electricity Transition: Renewables and Storage

57.5 GW tendered

Reported renewable pipeline: 12.3 GW grid-connected; 10.7 GW under construction; 15.7 GW commercially signed; 18.8 GW in development.

30 GWh storage tendered

The report states 8 GWh is connected to the grid; the remaining tendered storage is at different development stages.

Technology portfolio

Solar, wind and battery storage are being deployed. Other avenues explored include concentrated solar, geothermal, pumped storage and nuclear.

Reported low generation costs

The report cites LCOE records of 1.04 US cents per kWh for solar and 1.57 US cents per kWh for wind; these are not system-wide costs.

Resource measurement

More than 500 solar and wind measurement stations have been installed under the National Geographical Survey Project.

Efficiency and localization

SEEC leads efficiency efforts across utilities, industry, buildings and transport. Tarshid undertakes retrofits; renewable value-chain localization is planned.

Carbon Management and Lower-Carbon Fuels

CCUS: reported operating capture

Current projects are reported to capture 1.3 million tonnes annually, with large-scale hubs being developed in Jubail and Yanbu.

Jubail: 2028 target

The Jubail CCS Hub is set to capture and sequester 9 million tonnes of CO₂ annually by 2028. This is a future target.

Yanbu: carbon utilization

The Yanbu CCU Hub intends to develop utilization pathways, including green methanol and low-carbon urea.

Gas and thermal generation

Upgrade thermal generation; deploy efficient combined-cycle gas plants with CCS readiness; expand the Master Gas System.

Clean hydrogen and aviation

Develop NEOM and Yanbu clean-hydrogen projects. Lower-carbon aviation fuel measures address emissions from jet-fuel production.

Methane management

Gas recovery, leak detection and repair, and near-zero routine flaring support mitigation. Planned work also covers waste, wastewater and agriculture.

Adaptation: Water, Land, Coasts and Cities

Water with mitigation benefits

Around 70% of potable water comes from desalination. Measures include renewable-powered reverse osmosis, efficiency, leak reduction and water reuse.

Land restoration

The NDC references approximately 4 million hectares of restoration and rehabilitation, alongside afforestation and drought-tolerant species.

Marine ecosystems

Restore mangroves, reefs and seagrass. The report includes an ambition to enhance Red Sea coastal biodiversity by 30% by 2040.

Cities and waste

Mass transport, improved municipal services, landfill diversion and resource recovery support resilience and emission co-benefits.

Stand-alone adaptation

Early warnings for extreme weather, food and water security, aquifer recharge, dam capacity and climate-resilient building design.

Marine protection ambition

Expand protected marine areas to cover 30% of coastal marine zones. This protection goal is distinct from the biodiversity ambition.

Implementation: Finance, Technology and Skills

Saudi Green Initiative

Mobilizes society around emissions reduction, afforestation, and land and sea protection.

Finance and partnerships

Attract domestic and international investment, expertise and partnerships. Implementation is not contingent on international financial support.

Green finance

The report cites the first sovereign green bond and the Saudi Green Finance Framework as implementation enablers.

Technology development

A technology-agnostic approach includes CCUS, direct air capture, research, international cooperation and technology transfer.

National capacity

Develop individual and institutional skills, equitable access to opportunities and participation in emerging sectors through human-capability initiatives.

Article 6 cooperation

The report reserves the option of voluntary cooperation. At submission, it states there were no active agreements or discussions for NDC fulfilment.

DNA Oversight: Monitoring and Accountability

National coordinating authority

The Designated National Authority oversees, coordinates and tracks progress toward the Kingdom's NDC and serves as the UNFCCC reporting focal point.

Cross-sector representation

Its committee includes government, semi-government and private entities, providing a perspective on more than 90% of national GHG emissions.

National MRV system

The DNA manages measurement, reporting and verification to support NDC development, progress tracking and subsequent updates.

Accounting and transparency

Project-based accounting uses the 2006 IPCC Guidelines. GHG and non-GHG metrics are addressed through transparency and relevant Article 6 reporting.

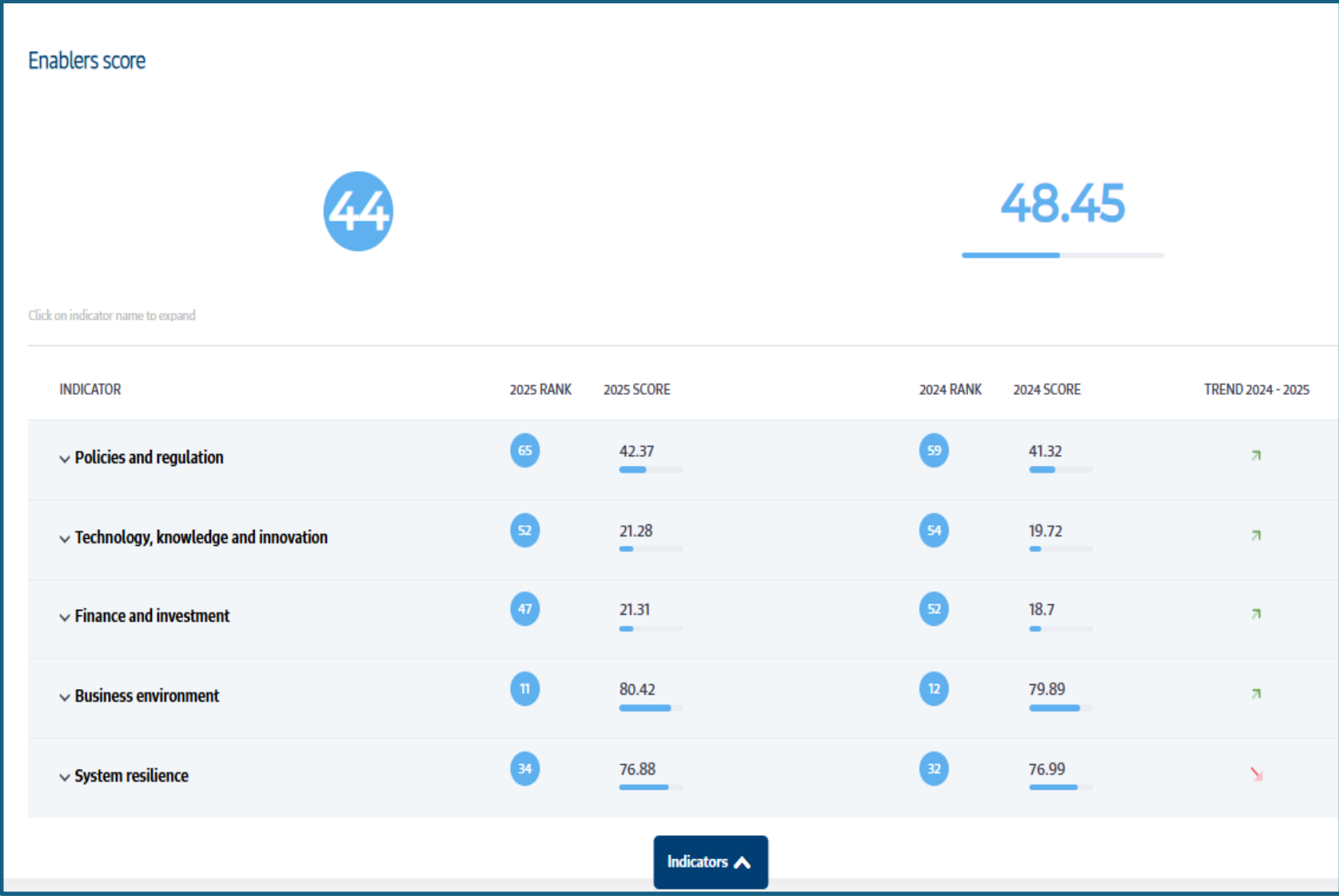
Carbon-market responsibilities

The DNA is the Article 6 focal point, with responsibilities for carbon-management regulation, credit issuance and emission-reduction project approval.

Programme application

Training implication: assign owners, define baselines and evidence, distinguish targets from delivery, and align project reporting with national MRV.

KAPSARC analysis



FEED-IN TARIFFS AND POWER PURCHASE AGREEMENTS

FEED-IN TARIFFS (FIT)

INSTRUMENT DESCRIPTION

Government sets a guaranteed price (per kWh) for eligible renewable electricity supplied to the grid for a defined term. Funding covers the difference between the tariff and the market value of the electricity.

HOW IT WORKS

- Fixed tariff published by government
- Applies to all eligible renewable generators
- Payment for each unit of electricity delivered to the grid
- Long-term revenue certainty

EXAMPLES OF APPLICATION

- Early-stage renewable energy markets
- Small and medium scale projects
- Technologies requiring initial support (e.g., solar, wind, biomass)

POTENTIAL IMPACTS

- Accelerates renewable energy deployment and attracts investment
- Cost support requires transparent funding mechanisms and periodic adjustment to remain cost-effective

POWER PURCHASE AGREEMENTS (PPA)

INSTRUMENT DESCRIPTION

A long-term agreement between a power producer and an off-taker (utility or private buyer) to purchase electricity at an agreed price and volume for a defined period (e.g., 15–25 years).

HOW IT WORKS

- Projects selected through competitive bidding
- Long-term contract negotiated with agreed price and volume
- Off-taker purchases the electricity delivered
- Contracted revenue provides certainty and supports project finance

EXAMPLES OF APPLICATION

- Utility-scale solar, wind, and other renewable projects
- Storage-linked renewable projects
- Corporate power purchase agreements for clean energy procurement

POTENTIAL IMPACTS

- Improves project bankability and accelerates renewable deployment
- Requires a credible off-taker and appropriate risk allocation between parties

Feed-in Tariffs and Power Purchase Agreements

Instrument	Description	Impacts:
Feed-in Tariffs (FiTs)	While feed-in tariffs have been widely used in other countries, KSA has not adopted a conventional FiT model. Instead, it relies on long-term Power Purchase Agreements (PPAs) awarded through competitive bidding under the NREP.	KSA has achieved record-low solar prices, e.g., \$0.0104/kWh (Sakaka Solar Project)
Competitive PPA Model	REPDO structures projects under the Independent Power Producer (IPP) model, where developers compete to offer the lowest cost of electricity over a fixed longer term.	Ensures price certainty for consumers and viability for developers
<u>Features of KSA's PPA Framework:</u> • Fixed-tariff structure (lowest bid wins) • Guaranteed offtake by SPPC (Saudi Power Procurement Company) • Payment denominated in SAR or USD (with optional hedging) • No inflation indexation (contracts are fixed price) • Government-backed guarantees, increasing investor confidence		Replaces the need for open-ended feed-in tariffs with market-competitive outcomes

Auction-Based Pricing Mechanisms (Reverse Auctions)

A reverse auction is a procurement method where sellers (e.g., power producers) compete to offer the lowest price at which they are willing to deliver a product or service—typically, electricity from renewable sources. Unlike traditional auctions where buyers compete by bidding higher prices, in a reverse auction the lowest bidder win.

Instrument	Description	Impacts
NREP's Competitive Bidding Process	KSA's preferred pricing mechanism is the reverse auction model, managed by REPDO and SPPC. Auction Structure: - Pre-qualified bidders submit price offers (in SAR/MWh or USD/MWh) - The lowest tariff is selected for PPA signing - Contracts awarded include land access, grid connectivity, fixed offtake Advantages Over FiTs: - Drives price discovery and efficiency - Avoids overpayment or long-term subsidy lock-in - Reduces risks of regulatory capture or price distortions	Solar and wind prices in KSA are among the lowest globally Promotes fiscal responsibility and consumer affordability



 Lowest price bids up to the required capacity win the auction.

KEY FEATURES

	Encourages intense competition among developers
	Delivers lowest possible price for the buyer
	Transparent, fair, and non-discriminatory process
	Supports efficient allocation of resources
	Long-term PPAs ensure bankability and investment certainty

Price discovery and competition

Reveal a competitive price and allocate opportunities using transparent rules.



Reverse / competitive auctions

- Competitive tenders allocate projects or capacity through transparent qualification and bid evaluation.

Strategic use, authority and limits

Legal or policy basis: NREP procurement; Principal Buyer tendering; Ministry of Energy supervision.

Key institutions: Ministry of Energy; SPPC / Principal Buyer; SERA and grid entities within their mandates.

Strategic objective: Deliver competitive, transparent and disciplined renewable deployment.

Specific use: Select developers and discover prices for utility-scale solar, wind and selected flexibility services.

Design boundary: A low bid is not automatically deliverable. Site, grid, contract and qualification design matter.

Evidence: Bid tariff; qualified bids; award-to-close time; completion rate

Revenue certainty and bankability

Create predictable cash flow and allocate commercial risks so projects can attract long-term capital.

A long-term contract defines the buyer, payment basis, performance obligations and allocation of commercial risks.

Strategic use, authority and limits

- **Legal or policy basis:** Electricity-sector framework, Principal Buyer procurement and project-specific executed contracts.
- **Key institutions:** SPPC / Principal Buyer; project company; lenders; SERA and system operator where applicable.
- **Strategic objective:** Create bankable revenue certainty and allocate construction, performance, dispatch and payment risks.
- **Specific use:** Support project finance for generation, storage, hydrogen derivatives, desalination and contracted outputs.
- **Design boundary:** Bankability depends on the actual credit support, indexation, curtailment and termination terms.
- **Evidence:** PPA tenor; contracted volume; debt-service coverage; curtailment settlement

Cost recovery

Tariff and subsidy structures are adjusted to improve economic signals, revenue sufficiency and efficient consumption.

Strategic use, authority and limits

- **Legal or policy basis:** Electricity-sector regulation; SERA revenue requirements; national fiscal and structural reform policy.
- **Key institutions:** SERA; Ministry of Energy; Ministry of Finance; electricity service providers.
- **Strategic objective:** Strengthen sector financial sustainability and efficiency while managing distributional consequences.
- **Specific use:** Improve cost recovery, shape demand and create transparent funding for network and service investment.
- **Design boundary:** Reform can burden households or exposed industries unless sequencing and targeted protection are designed together.
- **Evidence:** Revenue sufficiency; collection rate; subsidy cost; affordability indicators

Targeted subsidies and consumer support

Time-bound or eligibility-based support protects priority consumers or technologies without a blanket price subsidy.

Strategic use, authority and limits

- **Legal or policy basis:** Budget and social-protection decisions; programme-specific eligibility and administrative rules.
- **Key institutions:** Ministry of Finance; relevant social-policy authorities; Ministry of Energy; SERA.
- **Strategic objective:** Preserve affordability and acceptance during reform while focusing public resources on defined beneficiaries.
- **Specific use:** Protect vulnerable households, support adoption or bridge justified early-stage cost gaps.
- **Design boundary:** Poor targeting, weak exit rules or opaque funding can increase fiscal cost and distort behaviour.
- **Evidence:** Eligible beneficiaries; support per beneficiary; energy burden; leakage; sunset compliance

Subsidies and Tariff Reforms

Instrument	Description	Impacts
Electricity Subsidies (Pre-Reform)	Historically, electricity in KSA was heavily subsidized, resulting in: • Inefficient consumption • Budgetary burdens on the government • Disincentives for renewable deployment	Promotes demand-side efficiency Creates a level playing field for renewable energy competitiveness Supports financial sustainability of the Saudi Energy Co. (SE)
Tariff Reform under Vision 2030	As part of the Fiscal Balance Program, the government undertook gradual reforms starting in 2016: • Increased electricity prices for higher consumption tiers • Unified tariffs across residential, commercial, and industrial segments • Introduced time-of-use tariffs for large consumers • Aimed to reflect true cost of electricity production and distribution	
Direct Consumer Protection Measures	To mitigate social impacts of subsidy reforms: • The Citizen's Account Program provides cash transfers to low-income households • Industrial tariffs remain partially subsidized for energy-intensive sectors until transition strategies are fully implemented	

Tax Incentives and Exemptions

Instrument	Description	Impacts
VAT and Import Duty Relief	To support renewable energy deployment and reduce project costs, KSA offers import duty exemptions and VAT reductions on specific clean energy equipment, including: • Solar PV panels and inverters • Wind turbine components • Energy-efficient HVAC systems and insulation materials • These exemptions are administered in collaboration with: • Zakat, Tax and Customs Authority (ZATCA) • Saudi Standards, Metrology and Quality Organization (SASO) for equipment eligibility	Reduces upfront capital expenditure for developers Supports localization and technology transfer
Corporate Tax Relief for Renewable Projects	Although not universally implemented, the Ministry of Investment offers special economic zone incentives for renewable energy manufacturers and developers: • Corporate tax holidays (for qualified green tech firms) • Accelerated depreciation for renewable plant assets Capital investment deductions	Attracts FDI and joint ventures in renewable energy manufacturing
Green Industry Support via NIDLP	The National Industrial Development and Logistics Program (NIDLP) provides soft loans and preferential tax treatment for companies producing solar modules, batteries, EV components, and hydrogen infrastructure	

Capital mobilisation

Public institutions provide equity, loans, guarantees or credit enhancement to address scale and risk barriers.

- **Legal or policy basis:** PIF, NDF and sector-development-fund statutes and strategies; transaction-specific approvals.
- **Key institutions:** PIF; NDF ecosystem; SIDF and other development funds; Ministry of Finance where applicable.
- **Strategic objective:** Catalyse strategic sectors, localise value chains and crowd in commercially disciplined private investment.
- **Specific use:** Fund first-of-a-kind, infrastructure-heavy or strategically important projects and mitigate defined risks.
- **Design boundary:** Support should be additional, transparent and risk-priced to avoid crowding out or hidden contingent liabilities.
- **Evidence:** Private capital mobilised; leverage ratio; loss rate; local value; follow-on finance

Strategic use, authority and limits

Debt or sukuk finances eligible green expenditure under a framework with allocation and impact reporting.

- **Legal or policy basis:** Saudi Green Financing Framework; CMA rules; issuer framework and offering documents.
- **Key institutions:** Issuer; CMA; arrangers; external reviewers; investors and project owners.
- **Strategic objective:** Broaden the investor base and connect capital raising to credible environmental expenditure and reporting.
- **Specific use:** Finance or refinance eligible renewable, efficiency, clean-transport, water and waste assets.
- **Design boundary:** The label does not create viability; taxonomy, proceeds governance and impact reporting must be credible.
- **Evidence:** Allocation rate; financed impact; eligible spend; reporting timeliness; investor demand

PUBLIC FINANCING AND GOVERNMENT GUARANTEES

PUBLIC FINANCING

Providing capital to de-risk and catalyze energy projects and markets.

Lower Cost of Capital

Reduces financing cost and improves project bankability.

Catalyzes Private Investment

Crowds in private capital and expands financing capacity.

Supports Strategic Priorities

Directs capital to priority sectors and regions.

Accelerates Energy Transition

Enables faster deployment of clean and efficient energy solutions.

Creates Economic & Social Value

Drives job creation, local development, and technology transfer.

GOVERNMENT GUARANTEES

Mitigating risks to enhance bankability and attract private investment.

Mitigates Key Risks

Shields investors and lenders from specific project or market risks.

Improves Financing Terms

Leads to lower interest rates, longer tenors, and higher leverage.

Unlocks Private Investment

Enables participation of global investors and financiers.

Enhances Market Confidence

Strengthens credibility of projects and policy frameworks.

Supports Large-Scale Deployment

Facilitates bankability of complex, first-of-a-kind projects.

Public Financing and Government Guarantees

Instrument	Description
Loan Facilities	The Saudi Industrial Development Fund (SIDF) and National Development Fund (NDF) offer: • Concessional loans for project developers • Bridge financing and working capital support • Credit lines for renewable equipment manufacturers
Sovereign Guarantees	For utility-scale projects, the government may offer: • Sovereign payment guarantees through SPPC • Support for foreign exchange hedging in PPA contracts • Land access and permitting streamlining
PIF as Strategic Investor	The Public Investment Fund (PIF): • Co-develops mega renewable projects (e.g., Sudair, NEOM) • De-risks projects through equity investment and blended finance • Supports ESG-aligned projects through its Sustainability Fund

Tax, customs and investment incentives

Defined exemptions, allowances, customs relief or investment facilitation reduce eligible cost or friction.

Strategic use, authority and limits

- **Legal or policy basis:** Investment Law; ZATCA rules; industrial exemptions and programme-specific decisions.
- **Key institutions:** MISA; ZATCA; Ministry of Industry and Mineral Resources; Ministry of Finance.
- **Strategic objective:** Attract incremental investment, localise supply chains and accelerate priority technology capability.
- **Specific use:** Reduce qualifying import or establishment costs and reward additional local manufacturing, R&D or employment.
- **Design boundary:** Eligibility must be legally confirmed for each transaction; broad assumptions about exemptions are unsafe.
- **Evidence:** Incremental investment; local content; jobs; tax expenditure; additionality

Carbon credits and market mechanisms

Verified emission reductions or removals become transferable units or incentives under defined standards.

Strategic use, authority and limits

- **Legal or policy basis:** Voluntary Carbon Market Company rules and selected crediting standards; project-specific MRV.
- **Key institutions:** Market operator; project developers; validation and verification bodies; buyers and national authorities.
- **Strategic objective:** Create environmental value signals and channel finance toward credible reductions or removals.
- **Specific use:** Monetise eligible mitigation outcomes, support climate strategies and develop market infrastructure.
- **Design boundary:** Credits do not replace direct reduction; integrity depends on additionality, baselines, permanence and no double counting.
- **Evidence:** Credits issued and retired; price; verification findings; permanence risk

Green finance policies, institutions, tools and governance

Addressing climate change, as well as biodiversity and other environmental goals, will require an unprecedented acceleration of investment and financing towards climate-friendly, nature-positive and sustainable pathways, and a shift away from harmful activities. Policies, public financial institutions, and a whole-of-government approach will need to be further leveraged to drive transformation of the financial system, along with a focus on environmental integrity and outcomes.



KEY INVESTMENT AND FINANCING TOOLS

EQUITY INVESTMENTS	DEBT FINANCING	BLENDED FINANCE	GUARANTEES & RISK MITIGATION	GREEN & SUSTAINABILITY BONDS	PUBLIC - PRIVATE PARTNERSHIPS (PPPs)
Direct investment in projects or companies in exchange for ownership stakes.	Loans and credit facilities to fund projects and assets.	Use of concessional capital to mobilize private investment at scale.	Tools that reduce financial risk and enhance bankability of projects.	Debt securities issued to raise capital for eligible green and sustainable projects.	Collaboration between public and private sectors to finance, build and operate projects.
Typical Use • Project development • Greenfield projects • Strategic platforms • Growth capital	Typical Use • Project finance • Refinancing • Working capital • Asset finance	Typical Use • Early-stage projects • High-risk projects • Technology demonstration • Infrastructure	Typical Use • Political risk • Offtaker risk • Currency risk • Credit enhancement	Typical Use • Renewable energy • Energy efficiency • Clean infrastructure • Green hydrogen	Typical Use • Large infrastructure • Long-term services • Energy projects • Utilities

GREEN FINANCE TOOLS

Mobilizing Capital for a Sustainable Energy Future



TRIGGER QUESTIONS

MINISTER OF ENERGY

- What policy reforms will unlock more private green capital?
- How can we align energy transition goals with fiscal and economic priorities?
- What international partnerships and funding opportunities should we pursue?

KA CARE

- How can we better coordinate stakeholders to de-risk and scale investments?
- What capacity building is needed to strengthen green finance readiness?
- How can we improve transparency and track the impact of green investments?

KAPSARC

- What are the most cost-effective pathways for our energy transition?
- Which sectors and technologies offer the highest investment potential?
- How can data and analytics improve investment decisions and policy design?

SEEC

- Which projects in our pipeline are most attractive to investors?
- How can we improve the bankability and risk profile of our projects?
- What financing structures and partners can help us close more deals?

SERA

- How can we activate more private capital and local investors?
- What market barriers are limiting growth and how can we remove them?
- How can we foster innovation and new green business models?

NRRC

- What financing solutions can support the development of nuclear projects?
- How can we manage long-term risks and ensure cost competitiveness?
- What collaborations can accelerate safe and sustainable nuclear deployment?

Green Certificates | Renewable Energy Attributes

Instruments can enable corporate green energy claims, be traded in voluntary or compliance markets and/or support renewable energy tracking and disclosure.

KSA's Current Position

KSA now effectively has an emerging national renewable energy certificate / green certificate market, although it is not yet as mature or standardized as markets in Europe or some U.S. states. The market today is mainly based on I-RECs (International Renewable Energy Certificates) rather than a fully standalone domestic Saudi-only certificate regime. KSA has:

- renewable energy projects generating tradable certificates
- active issuance and trading of solar I-RECs
- growing corporate demand for renewable electricity claims
- price reporting and market assessments
- registry infrastructure through the I-TRACK / I-REC ecosystem

How the instruments combine

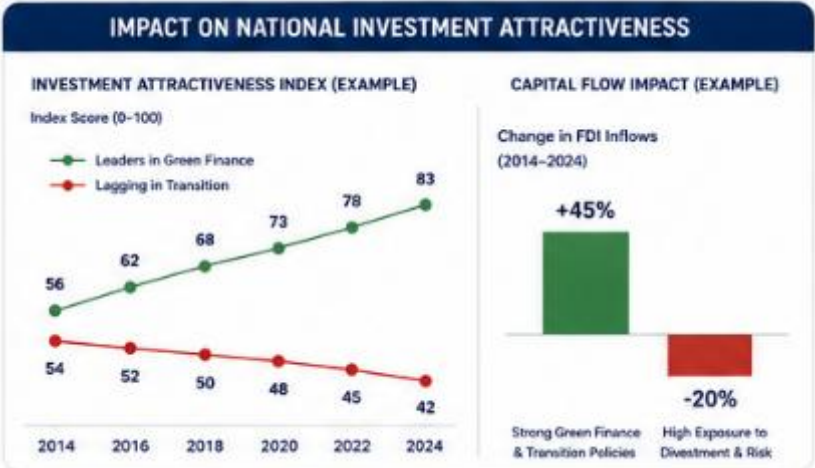
ID	Instrument	Price discovery	Bankability	Cost recovery	Affordability	Capital mobilisation	Capability	Environmental value
E01	Reverse / competitive auctions	3	1	0	0	1	1	1
E02	Long-term PPAs and offtake agreements	1	3	1	0	2	0	1
E03	Electricity tariff and subsidy reform	1	1	3	2	0	0	1
E04	Targeted subsidies and consumer support	0	0	1	3	1	2	1
E05	Public equity, development finance and guarantees	0	2	1	1	3	2	1
E06	Tax, customs and investment incentives	0	1	1	1	2	3	1
E07	Green bonds, sukuk and sustainable finance	0	1	0	0	3	1	2
E08	Carbon credits and market mechanisms	0	0	0	0	1	1	3

THE POWER OF CHOICE: DIVESTMENT PRESSURES MEET GREEN FINANCE SOLUTIONS

Shaping Capital Flows. Strengthening Nations. Building a Sustainable Future.

Divestment campaigns increase financial and reputational risks for carbon-intensive economies.
Green finance tools unlock new capital, lower costs, and boost national investment attractiveness.

The transition is clear. The choice is ours.



HOW EFFECTIVE POLICY DESIGN DRIVES A SUSTAINABLE ENERGY FUTURE



ENCOURAGES RENEWABLE ENERGY INVESTMENT



Clear long-term targets
Provide certainty and direction



Stable policy & regulatory framework
Reduces risk and builds investor confidence



Financial & economic incentives
Improve project visibility and returns



Competitive markets & transparent processes
Ensure efficiency and fair competition



More investment in renewable energy
Lower costs, more capacity, innovation and jobs



ENHANCES GRID STABILITY AND RELIABILITY



Integrated grid planning
Aligns generation, transmission and demand



Investment in grid infrastructure
Strengthens transmission, distribution and flexibility



Enables energy storage and flexibility solutions
Balances supply and demand



Smart systems & forecasting tools
Improve reliability and operational efficiency



A stable, resilient and efficient grid
Ready for today and tomorrow



CREATES A SUSTAINABLE MARKET ECOSYSTEM



Open and competitive market structures
Attract diverse players and encourage innovation



Effective pricing reforms
Reflect true value of energy and resources



Strong institutions and governance
Ensure transparency, accountability and trust



Stakeholder engagement and social inclusion
Builds public support, and shared value



A thriving, sustainable energy market
Resilient, inclusive and future-ready

KEY BENEFITS



Accelerates clean energy transition and Net Zero 2050 goals



Strengthens energy security and reduces emissions



Drives economic growth and job creation



Enhances investor confidence and global competitiveness



Improves quality of life for current and future generations

SUSTAINABLE ENERGY FUTURE FOR KSA

ENABLERS OF EFFECTIVE POLICY DESIGN



Evidence-based policy making



Consistent and long-term vision



Cross-sector coordination



Adaptive and flexible frameworks



Monitoring, evaluation and continuous improvement

Regional and Global Alignment

Driver	Implication
International buyers of Saudi clean power (e.g., hydrogen, aluminium)	Demand for traceable green energy attributes
Voluntary disclosure initiatives (RE100, CDP, GRI)	Corporates operating in KSA seek to prove renewable consumption
Carbon border adjustment mechanisms (CBAM)	Require evidence of low-carbon input energy for export products

Carbon Pricing and Market Instruments

Carbon pricing assigns a monetary cost to greenhouse gas (GHG) emissions to incentivize emissions reduction, encourage clean technology adoption and create economic value for low-carbon activities

KSA has launched a voluntary carbon market, driven by the Public Investment Fund (PIF) in partnership with Tadawul Group. Key features include:

- Regional platform: Regional Voluntary Carbon Market Company (RVCMC)
- First auction in 2022: over 1.4 million tons of CO₂ offsets sold
- Projects sourced from nature-based solutions and industrial reduction
- Buyers: Aramco, NEOM, SABIC, and other leading firms

KSA is studying long-term options for carbon pricing, including:

- Sector-specific cap-and-trade mechanisms
- Carbon taxes on high-emitting sectors

Policy Instruments

Simulator: Policy Instruments – Shaping Energy Markets

SAUDI ENERGY TRANSITION
Economic Instruments Awareness Exercise
Learn why each instrument is used, then assemble practical financing packages for Saudi energy-transition projects.

Learning progress **35%**

☐ **Facilitator mode**

1. LEARN	2. COMPARE	3. APPLY	4. QUIZ	5. RESULTS
Learn		SAVE PROGRESS	RESET CURRENT ACTIVITY	RESET EVERYTHING
Auto-save active				

THE ENERGY TRILEMMA FOR SAUDI ARABIA

Balancing today's energy needs and tomorrow's sustainable future

Saudi Arabia's energy trilemma is about simultaneously delivering reliable and affordable energy, enabling economic growth, and reducing environmental impact for a prosperous and sustainable future.

WHAT IS THE ENERGY TRILEMMA?

The energy trilemma represents the complex balance between three critical and interdependent dimensions of energy policy.



These goals must be pursued together.



Improving one dimension can impact the others.



The right balance today ensures a better future for all.



Keeping energy costs competitive for industries and consumers



Driving economic diversification and job creation



Ensuring energy accessibility and inclusivity



Reliable and diversified energy supply to meet growing demand



Strengthening energy infrastructure and operational resilience



Enhancing self-reliance while engaging with global markets



Reducing emissions and advancing cleaner energy solutions



Conserving natural resources and biodiversity



Supporting global climate goals and Net Zero by 2060

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ENERGY DILEMMA IN KSA

FOUR OPTIONS. ONE CRITICAL DECISION.



THE CHALLENGE

It's mid-July in Riyadh. Temperatures reach 48°C. Air conditioning loads spike. Renewable energy supply is intermittent due to a low wind period.

KSA MUST DECIDE HOW TO MEET PEAK ELECTRICITY DEMAND.



EVALUATE EACH OPTION USING THE THREE TRILEMMA LENSES



ENERGY RELIABILITY
Can it keep the lights on when needed?



ENVIRONMENTAL FOOTPRINT
What is the impact on emissions and air quality?



PUBLIC & INDUSTRIAL COST
What are the economic impacts on society and industry?

FOUR SOLUTIONS – CHOOSE YOUR PATH

1 INCREASE FOSSIL FUEL-BASED GENERATION TO MEET PEAK DEMAND



SOLUTION

Dispatch additional natural gas and oil-fired power plants at maximum capacity to quickly meet demand.

IMPACT ON THE THREE LENSES

ENERGY RELIABILITY	★★★★★	Very High
ENVIRONMENTAL FOOTPRINT	★☆☆☆☆	High Emissions
PUBLIC & INDUSTRIAL COST	★★★☆☆	Medium-High

KEY CONSIDERATIONS

- Fastest and most controllable response
- Increases emissions and fuel consumption
- May impact long-term sustainability goals



BEST USE CASE:
Short-term emergency with high reliability priority

2 IMPLEMENT CONTROLLED LOAD-SHEDDING WITH REAL-TIME UPDATES



SOLUTION

Temporarily reduce electricity supply in selected areas based on real-time system conditions with user notifications.

IMPACT ON THE THREE LENSES

ENERGY RELIABILITY	★★★★☆	Medium
ENVIRONMENTAL FOOTPRINT	★★★★★	Low
PUBLIC & INDUSTRIAL COST	★★★☆☆	Low-Medium

KEY CONSIDERATIONS

- Protects grid stability and prevents blackouts
- Direct impact on household and business comfort
- Requires strong communication and transparency



BEST USE CASE:
Balanced approach during high but manageable stress

3 ACTIVATE BACKUP DIESEL GENERATORS AND IMPORT POWER FROM NEIGHBORS



SOLUTION

Use backup diesel generation and import electricity from neighboring countries at high cost to meet demand.

IMPACT ON THE THREE LENSES

ENERGY RELIABILITY	★★★★★	High
ENVIRONMENTAL FOOTPRINT	★☆☆☆☆	High Emissions
PUBLIC & INDUSTRIAL COST	★☆☆☆☆	High

KEY CONSIDERATIONS

- Ensures supply when internal capacity is constrained
- Very high operational cost
- Higher emissions from diesel generation



BEST USE CASE:
Last-resort option for critical reliability needs

4 INCENTIVIZE INDUSTRIAL DEMAND REDUCTION THROUGH DYNAMIC PRICING



SOLUTION

Apply dynamic pricing and incentives to encourage industries to reduce or shift electricity use during peak hours.

IMPACT ON THE THREE LENSES

ENERGY RELIABILITY	★★★★☆	Medium-High
ENVIRONMENTAL FOOTPRINT	★★★★★	Low
PUBLIC & INDUSTRIAL COST	★★★☆☆	Medium

KEY CONSIDERATIONS

- Engages industry as part of the solution
- Requires effective pricing signals and participation
- Supports long-term demand-side management



BEST USE CASE:
Strategic response to reduce peak demand sustainably

K.A.CARE - Navigating the Energy Transition Program

Program Schedule Everyday Sunday June 14 through Thursday June 18 from 8:00 a.m. to 2:00 p.m. Lunch from 2:00 p.m. to 3:30 p.m.

DAY 1 (Sunday) Global Energy Landscape and Saudi Vision 2030	DAY 2 (Monday) Policy, Governance and Regulatory Frameworks	DAY 3 (Tuesday) Energy Security and Sustainability	DAY 4 (Wednesday) The Impact of Alternative Energy Technologies	DAY 5 (Thursday) Geopolitics and Market Dynamics
- Review global energy trends and Saudi Arabia's strategic direction. - Examine how the Kingdom's Vision 2030 blueprint drives energy sector transformation. - Link international developments and national ambitions.	- Review the policy and regulatory frameworks governing Saudi Arabia's energy transition. - Navigate policy and regulatory complexity. - Discuss solutions to drive national progress in the energy sector, from renewable energy targets and regulations to climate initiatives like the Saudi Green Initiative (SGI). - Investigate the key public sector stakeholders (regulators, government agencies, etc.) involved in driving the energy transition. - Examine tools used by government (laws, regulations, incentives, tariffs) to shape energy markets. - Understand how effective policy design can encourage renewable energy investment, ensure grid reliability, and protect consumers, thereby creating a sustainable market ecosystem.	- Explore how to balance the Kingdom's need for a reliable, affordable energy supply with sustainability and climate goals. - Review applicable frameworks such as the Circular Carbon Economy and strategies for reducing carbon emissions while maintaining energy security. - Undertake case studies (for example, integrating solar and wind projects into the national grid). - Assess how to manage the trade-offs and synergies between economic and environmental goals.	- Investigate the policy implications of technologies shaping the future of energy. (This includes renewable energy technologies (solar, wind), energy storage solutions, green and blue hydrogen, carbon capture utilization and storage (CCUS), nuclear energy, electric vehicles (EVs), energy storage and other solutions as part of the energy mix.) - Assess how emerging technologies can be integrated into Saudi Arabia's energy portfolio and what challenges and opportunities they bring. - Cultivate an innovative mindset to understand the emerging energy solutions, and technological change in their organizations. (This segment includes global best practices in renewable energy, using a simulation for maximum learning impact. MIT En-Roads and others)	- Analyze external factors influencing the energy transition, including geopolitical developments, international agreements (e.g. the Paris Agreement), global oil and gas market dynamics, and regional cooperation. - Discuss scenarios such as fluctuations in oil demand, investments by other nations in renewable energy, international pressure for decarbonization, and how these affect Saudi energy policy and projects. - Understand big-picture forces supports participants to anticipate risks and leverage opportunities. (This theme reinforces strategic thinking, enabling leaders to factor in global drivers when planning and executing domestic energy initiatives.)

THE FOUR PILLARS OF THE CIRCULAR CARBON ECONOMY

Closing the carbon loop. Creating value. Building a sustainable future for Saudi Arabia.

A circular carbon economy minimizes emissions, maximizes value and drives sustainable growth through four interconnected pillars.



REDUCE

Use less. Emit less.



Reduce carbon emissions at the source through efficiency, innovation and lower-carbon solutions.

- ✓ Improve energy efficiency
- ✓ Optimize operations and processes
- ✓ Shift to lower-carbon fuels and feedstocks
- ✓ Design for low-carbon from the start

EXAMPLES IN KSA



Energy efficiency in operations



Lower-carbon fuels



Low-carbon design



REUSE

Use again. Extend value.



Reuse CO₂ and by-products as valuable inputs to create products and fuels, displacing virgin resources.

- ✓ CO₂ utilization in chemicals and fuels
- ✓ Use industrial by-products
- ✓ Extend resource and asset value
- ✓ Support new circular business models

EXAMPLES IN KSA



CO₂ to chemicals (e.g., methanol, urea)



CO₂ to fuels (e-fuels)



By-product utilization



REMOVE

Capture today. Protect tomorrow.



Remove CO₂ from industrial emissions and the atmosphere to achieve net zero and safeguard the future.

- ✓ Capture CO₂ from industrial sources
- ✓ Deploy Direct Air Capture (DAC)
- ✓ Store CO₂ safely and permanently
- ✓ Restore natural carbon sinks

EXAMPLES IN KSA



Industrial carbon capture (CCUS)



Direct air capture



CO₂ storage in geological formations



Nature-based solutions



RECYCLE

Close the loop. Keep resources in use.



Recycle carbon in closed loops and across value chains to maximize resource productivity and minimize waste.

- ✓ Recycle CO₂ across industries
- ✓ Close material loops
- ✓ Design products for circularity
- ✓ Recover and recycle materials

EXAMPLES IN KSA



CO₂ recycling across industries



Circular materials management



Product circularity and end-of-life

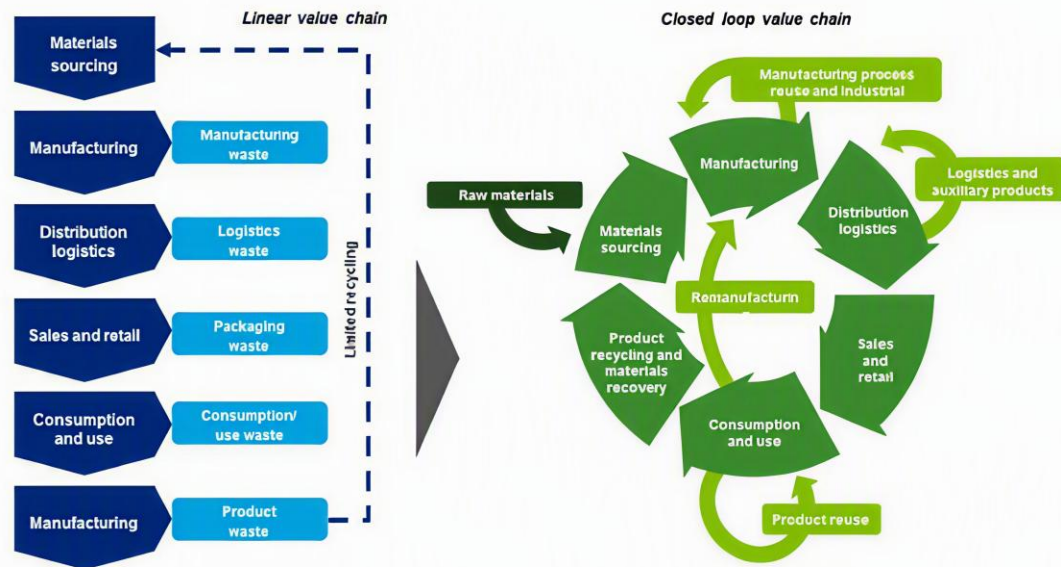


Figure 8. Simplified illustration of a linear and a circular economy³⁰

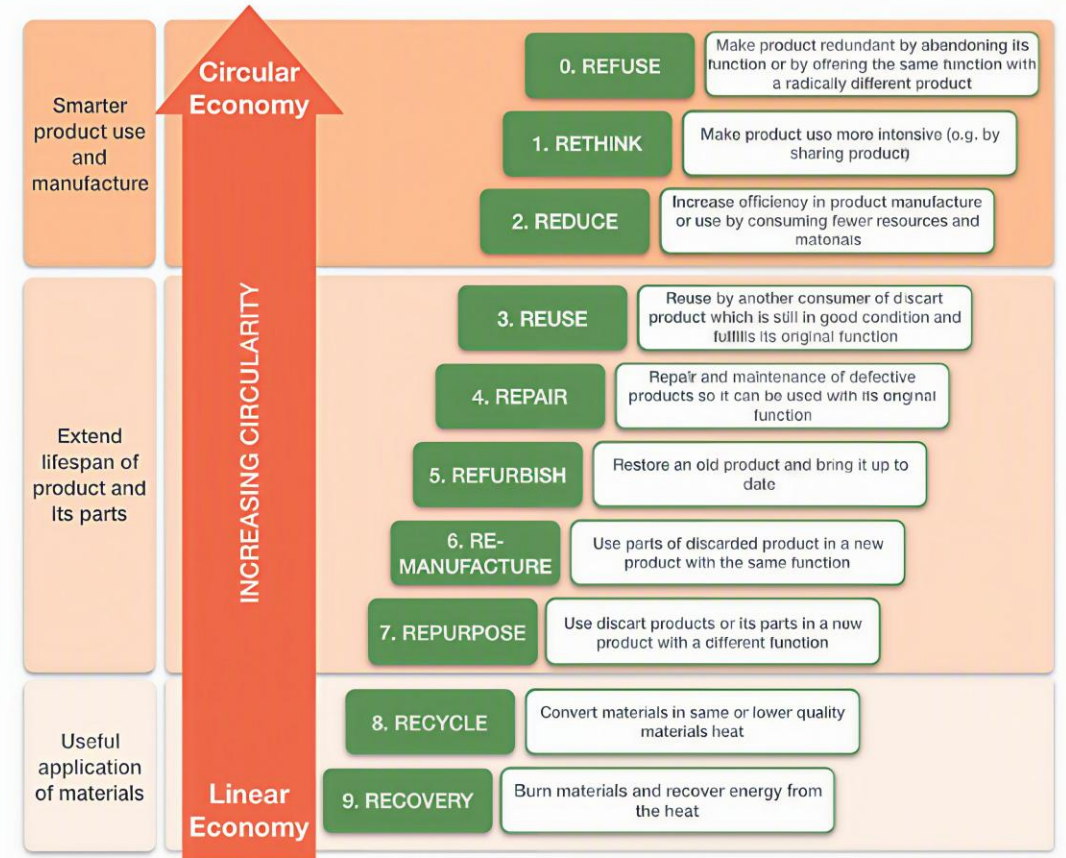


Figure 12. The 9R model for circular economy (Source: Lankester, 2018)

Cultural	Technological	Market	Regulatory
Company culture	Circular design	High upfront investment costs	Obstructing laws and regulations
Willingness to collaborate in the value chain	Ability to deliver high quality remanufactured products	Limited funding for circular business models	Limited circular procurement
Consumer interest and awareness	Lack of data, e.g. on impacts	Low virgin material prices	Lacking global consensus
Operating in a linear system	Too few large scale pilot projects	Standardisation	

■ Most pressing barriers
 ■ Intermediate pressing barriers
 ■ Least pressing barriers

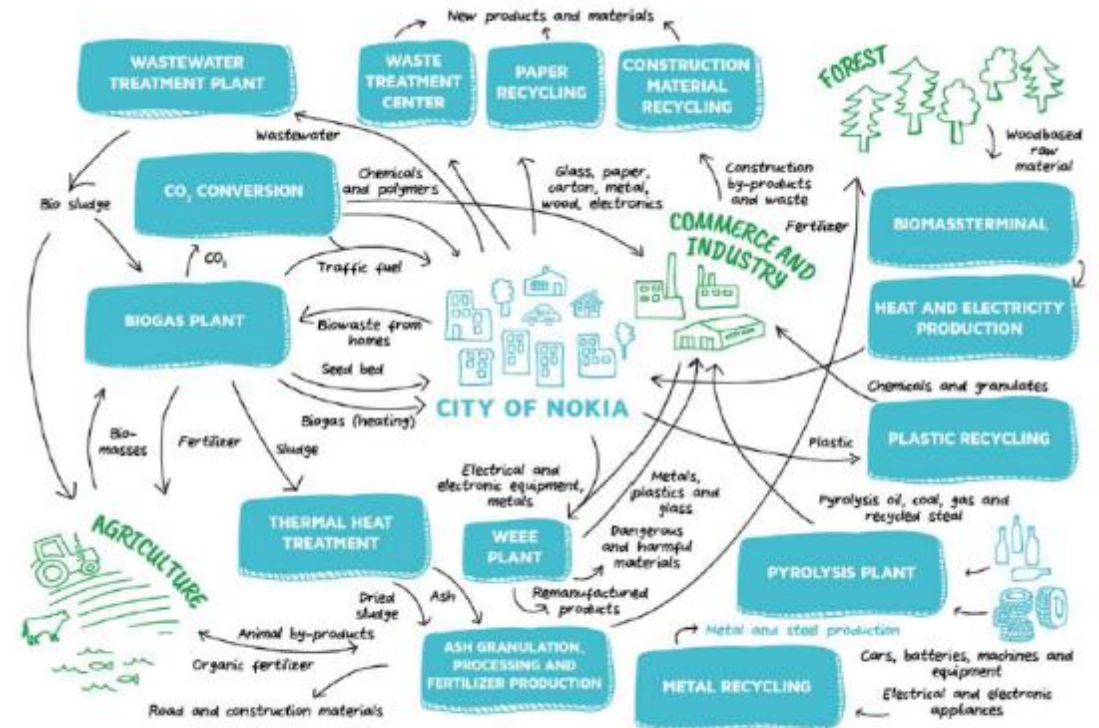


Figure 39. Industrial symbiosis at ECO3. (Source: Nordregio, 2019)

Our Objectives



Attracting investment from both local and global partners to foster sustainable growth.



Leveraging cutting-edge knowledge and technology to champion recycling best practices.



Advancing sustainable development and enhancing the quality of life for communities.



Driving economic growth by creating job opportunities and expanding the recycling sector

Key Pillars of the Circular Economy in KSA

1. Waste Management and Recycling Targets

The Kingdom has committed approximately SAR 100 billion to overhaul its waste management infrastructure by 2035. National benchmarks are moving away from landfilling toward material circularity: [YouTube · Frost & Sullivan](#)

- **2035 Goals:** Divert 85% of industrial waste from landfills, recycle 42% of municipal waste, and compost 35%.
- **Entities Involved:** The [National Center for Waste Management \(MWAN\)](#) acts as the regulatory authority, while SIRC operates large-scale processing and recycling facilities across the country. [Recycling Expo Middle East +2](#)

Economic and Business Impact

- **Economic Growth:** The circular economy push is expected to contribute approximately SAR 120 billion to the national GDP.
- **Job Creation:** The industry transition is slated to create nearly 100,000 new green jobs across various sectors.
- **ESG Compliance:** Industrial and commercial operators are rapidly aligning procurement and vendor practices with these targets to satisfy national ESG reporting requirements. [www.emerald.com +1](#)

ACTIVITY 3: GROUP EXERCISE – MATCHING REAL PROJECTS TO CCE PILLARS

Objective: Reinforce understanding of the four CCE pillars by connecting them to real Saudi initiatives.

INSTRUCTIONS SUMMARY

1 FORM GROUPS



Divide into four groups.
Each group gets 8-10 project cards or this project matrix.

2 TASK



Receive project descriptions and match each project to one CCE pillar.

3 GUIDING QUESTIONS



- What is the project's main mechanism for addressing carbon?
- Could a single project fall under multiple pillars?
- What assumptions must be true for this project to succeed?

4 OUTPUT



Create a visual map placing each initiative under the correct pillar and present for 5 minutes.

THE FOUR CCE PILLARS



REDUCE

Reduce emissions at the source through efficiency, clean energy and process improvements.



REUSE

Reuse CO₂ or resources for productive applications and extended value.



RECYCLE

Recycle waste or CO₂ into new materials, fuels or products.



REMOVE

Remove CO₂ from the atmosphere and store it durably in sinks.

PROJECT MATRIX – 9 REALISTIC KSA PROJECTS

#	PROJECT / INITIATIVE	DESCRIPTION	PRIMARY CCE PILLAR (PLACE YOUR MATCH)	WHY THIS PILLAR? (KEY MECHANISM)
1	Sakaka Solar Plant (Al Jouf Province)	Utility scale solar PV plant supplying electricity to the grid and displacing fossil-fuel generation.	REDUCE	Displaces natural gas/diesel power generation, reducing CO ₂ emissions at the source.
2	Energy Efficiency Program (Buildings & Government)	National program to improve efficiency in public buildings (HVAC, lighting, insulation, controls).	REDUCE	Lowers energy demand and associated emissions through efficiency improvements.
3	Aramco CO ₂ -EOR (Enhanced Oil Recovery)	Inject captured CO ₂ to enhance oil recovery from existing reservoirs.	REUSE	CO ₂ is reused as an input to increase oil production and reservoir performance.
4	NEOM Green Hydrogen for Ammonia	Produce green hydrogen using renewables and use it to make green ammonia for export and local use.	REUSE	Hydrogen (from water) is reused to create ammonia—a zero-carbon energy carrier.
5	Algae-Based CO ₂ -to-Biofuel Research (KAUST)	Use algae to convert captured CO ₂ into biofuels and valuable bioproducts.	RECYCLE	CO ₂ is recycled into fuels and chemicals through biological conversion.
6	Sadara Chemical Recycling Pilot (Plastics to Feedstock)	Convert plastic waste into chemical feedstocks to produce new materials.	RECYCLE	Waste plastics are recycled into usable chemical feedstocks.
7	Aramco CCUS Project at Hawiyah	Capture CO ₂ from gas processing facilities and store it in deep saline aquifers.	REMOVE	CO ₂ is captured and permanently stored underground, removing it from the atmosphere.
8	Saudi Green Initiative – Afforestation & Restoration	Planting 10B trees and restoring degraded lands across the Kingdom.	REMOVE	Trees absorb CO ₂ from the atmosphere and store carbon in biomass and soils.
9	Waste-to-Energy (Riyadh Waste Management Project)	Convert municipal solid waste into electricity and heat through advanced incineration with energy recovery.	REDUCE	Reduces methane from landfills and displaces fossil-based electricity with recovered energy.

THE 5 KEY GLOBAL DRIVERS OF ENERGY SYSTEM TRANSFORMATION

Powering a secure, sustainable and prosperous future for all.



DECARBONIZATION

Reducing emissions and transitioning to net zero through clean energy, efficiency and innovation for a healthier planet.



DIGITALIZATION

Leveraging data, AI and advanced technologies to optimize operations, enable smart decisions and unlock new value across the energy system.



DECENTRALIZATION

Empowering diverse energy resources and local solutions to enhance resilience, enable consumer choice and support sustainable communities.



ELECTRIFICATION

Shifting to electric solutions across transport, buildings and industry to improve efficiency and reduce emissions.



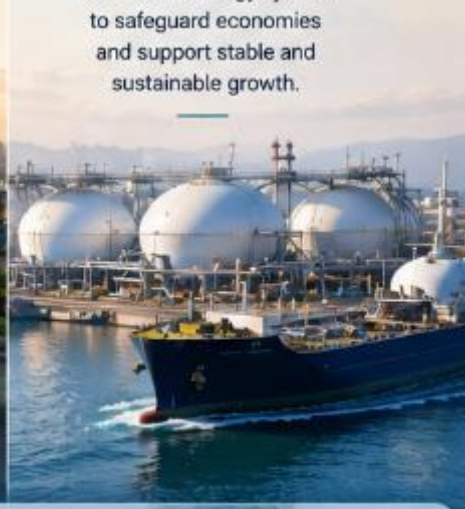
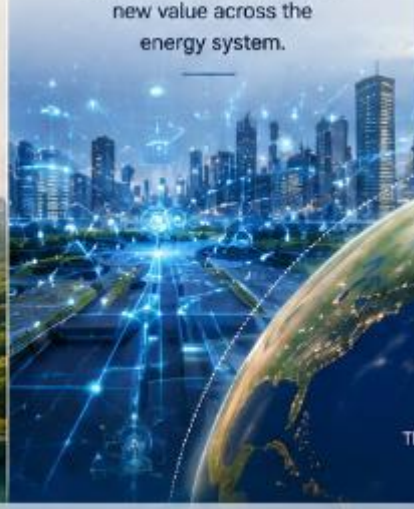
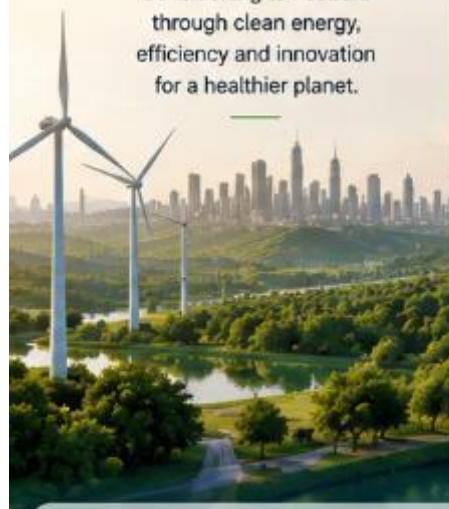
ENERGY SECURITY

Ensuring reliable, affordable and resilient energy systems to safeguard economies and support stable and sustainable growth.



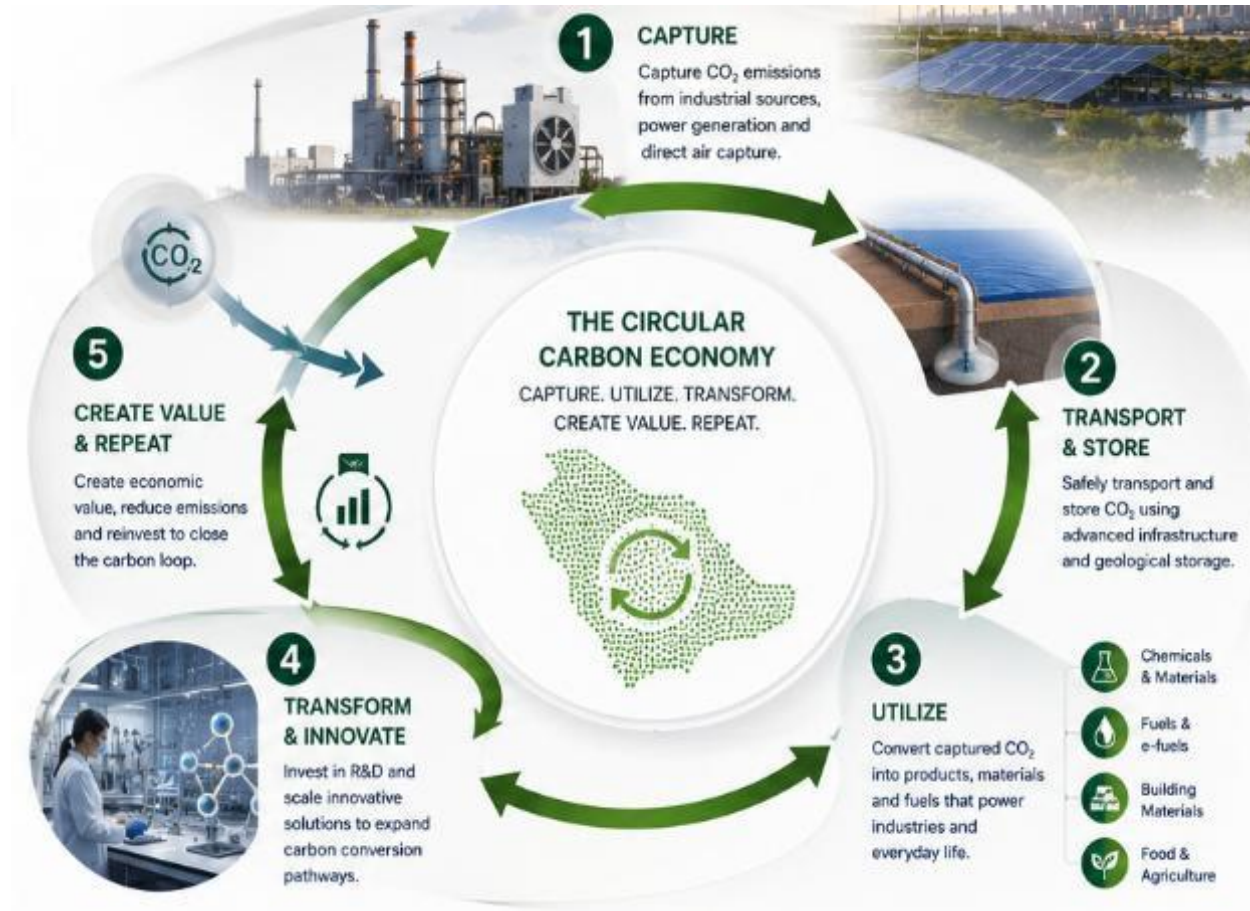
INTERCONNECTED DRIVERS. ONE TRANSFORMATIVE JOURNEY.

These drivers are interdependent and mutually reinforcing. Together, they enable a resilient, inclusive and sustainable energy future.



CIRCULAR CARBON ECONOMY

Building a sustainable future for Saudi Arabia



CARBON CAPTURE, UTILIZATION & STORAGE (CCUS)

A STRATEGIC ADVANTAGE FOR KSA. A SUSTAINABLE FUTURE FOR THE WORLD.

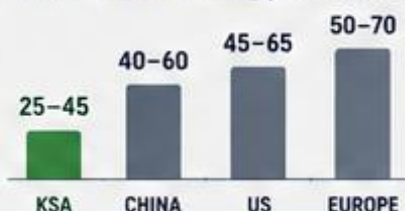
ECONOMIC COMPARISON (2030E)

COUNTRY	ANNOUNCED CAPACITY (Mtpa CO ₂)	EST. COST OF CAPTURE (USD/TON CO ₂)	STORAGE POTENTIAL	POLICY & SUPPORT ENVIRONMENT
UNITED STATES	~ 80	45 – 65	EXCELLENT	STRONG
CHINA	~ 50	40 – 60	MODERATE	STRONG
CANADA	~ 30	45 – 70	EXCELLENT	STRONG
AUSTRALIA	~ 25	45 – 65	EXCELLENT	MODERATE
NORWAY	~ 10	50 – 70	EXCELLENT	STRONG
SAUDI ARABIA (PROJECT PIPELINE)	~8–10	25 – 45	EXCELLENT (LARGE GEOLOGICAL POTENTIAL)	IMPROVING (RAPIDLY ADVANCING)

WHY KSA HAS A COST ADVANTAGE

-  Low-cost energy
-  Large storage potential
-  Centralized CO₂ hubs
-  Proximity to export markets

COST TO CAPTURE CO₂ (USD/TON CO₂)



THE UPSIDE FOR KSA



ECONOMIC OPPORTUNITY

CCUS market potential for KSA

\$50 – \$100B+
by 2035



CO₂ EXPORTS

Export up to

50 – 100 Mtpa CO₂
by 2035 to global markets



INDUSTRIAL COMPETITIVENESS

Enable cleaner production in cement, steel, chemicals & power – protecting jobs and exports



EMISSIONS REDUCTION

Avoid up to

200 – 300 Mt CO₂/yr
by 2035



JOBS & VALUE CREATION

Create

40,000+ high-skilled jobs across the CCUS value chain



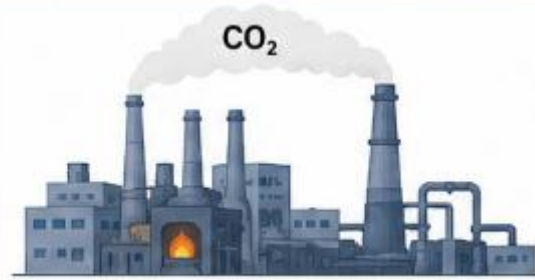
KSA COMPETITIVE ADVANTAGES

- ✓ Abundant energy resources
- ✓ Strategic location between Asia, Europe & Africa
- ✓ Vast storage potential in saline aquifers
- ✓ Existing industrial base & infrastructure
- ✓ Strong government commitment &

HOW CO₂ IS CAPTURED

Capturing today. Securing tomorrow.

1. INDUSTRIAL SOURCES



2. POWER GENERATION



3. DIRECT AIR CAPTURE (DAC)



4. TRANSPORT



OR



OR



5. PERMANENT STORAGE



CO₂ is injected deep underground into suitable geological formations (in depleted oil & gas reservoirs or saline aquifers) for permanent storage.

6. UTILIZATION (OPTIONAL)



E-FUELS



CHEMICALS



BUILDING MATERIALS



BEVERAGES

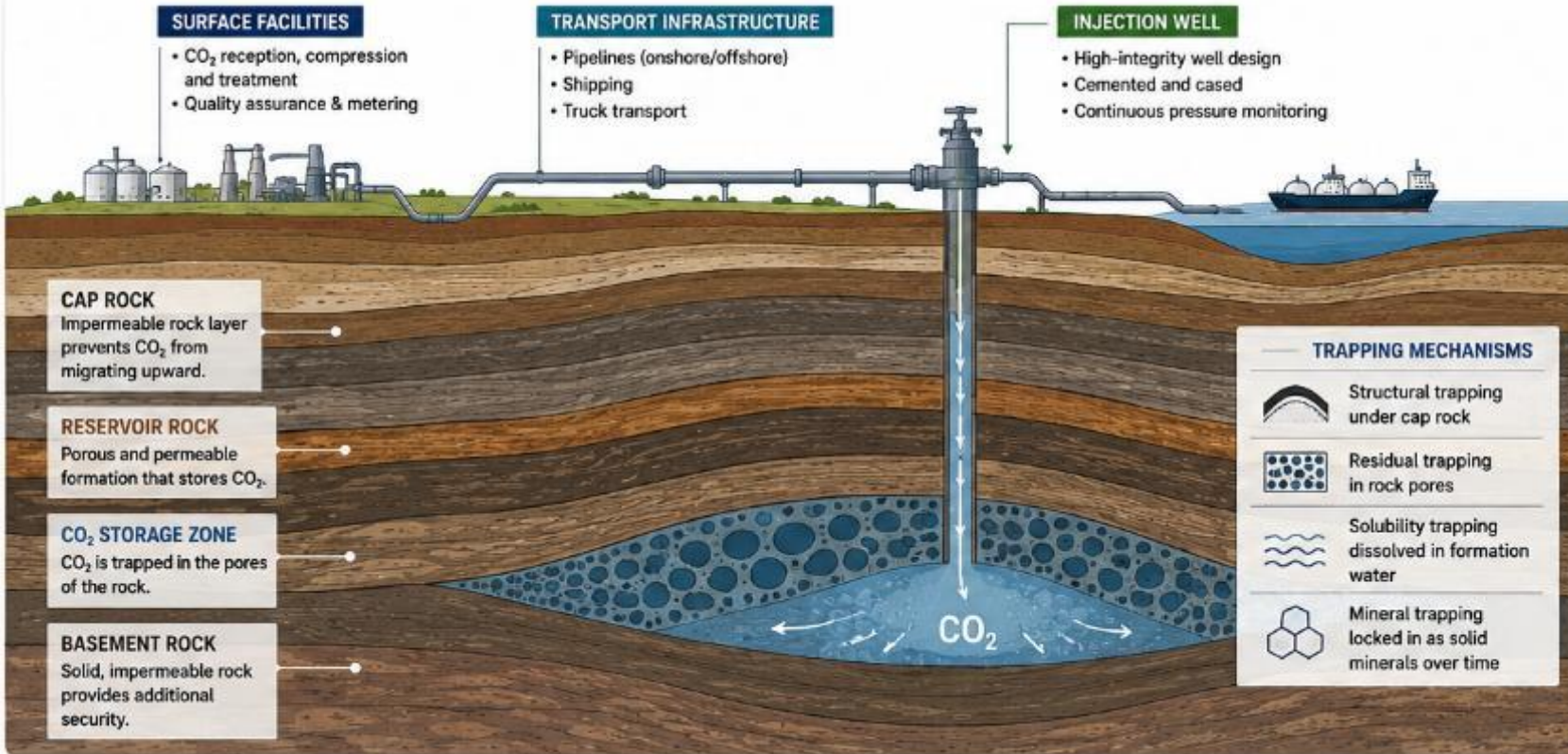


AGRICULTURE

Captured CO₂ can be used as a valuable resource in various industrial and commercial applications.

SAFE CO₂ STORAGE: ADVANCED INFRASTRUCTURE & GEOLOGICAL STORAGE

Capturing today. Storing safely. Protecting tomorrow.



5. MONITORING & VERIFICATION



Seismic surveys track subsurface changes.



Pressure monitoring ensures well and formation integrity.



Groundwater monitoring protects overlying aquifers.



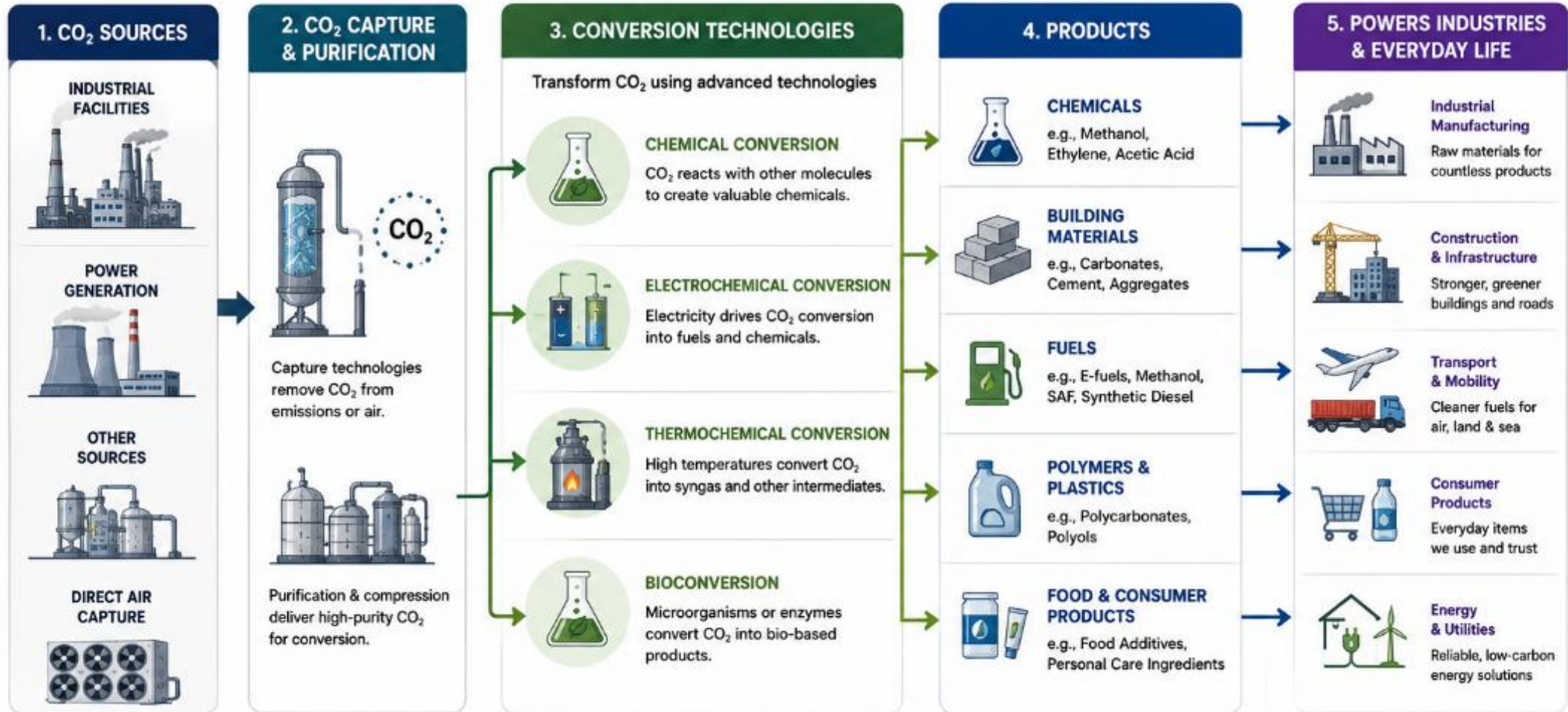
Satellite & surface monitoring for long-term oversight.

6. SAFETY BY DESIGN

- ✓ Site selection & geological assessment
- ✓ Engineered well integrity
- ✓ Robust monitoring & verification
- ✓ Regulatory oversight & reporting
- ✓ Long-term stewardship

TURNING CO₂ INTO SOLUTIONS

From Emissions to Products. Powering Industries and Everyday Life.

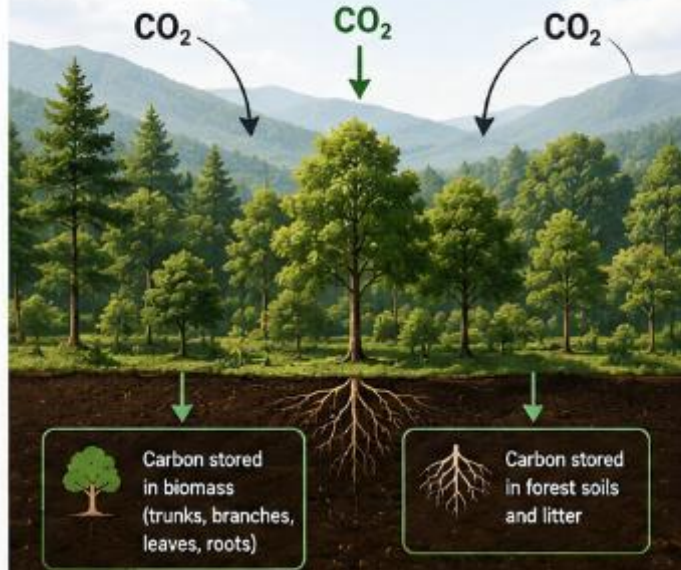


NATURAL SEQUESTRATION: NATURE'S POWER TO STORE CARBON

Afforestation, Soil Carbon and Ocean Sinks – Working Together for a Sustainable Future

1. AFFORESTATION & REFORESTATION

Trees absorb CO₂ from the atmosphere through photosynthesis and store carbon in biomass and soils.

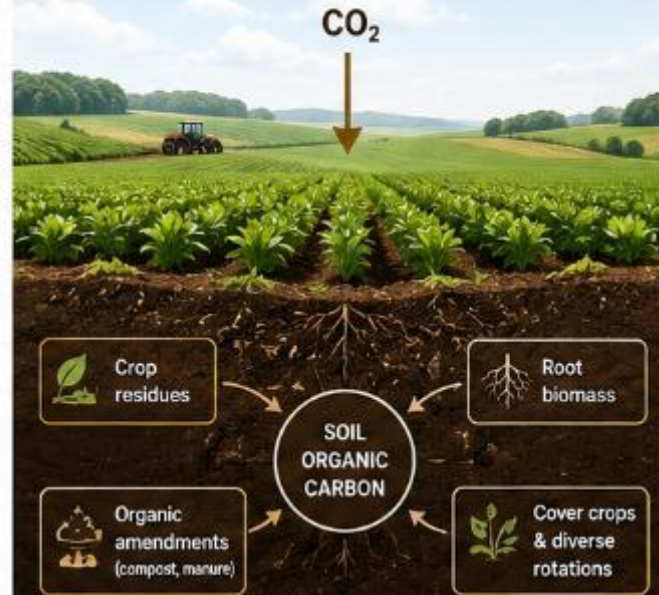


KEY ACTIONS

- Planting new forests
- Restoring degraded lands
- Protecting existing forests
- Promoting native species diversity

2. SOIL CARBON SEQUESTRATION

Healthy soils capture and store CO₂ in organic matter, improving soil health and productivity.

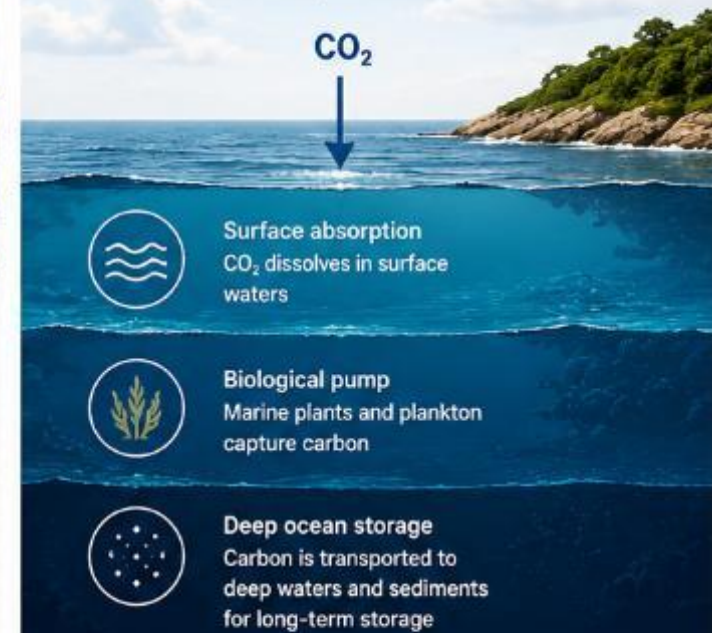


KEY PRACTICES

- Reduced tillage
- Cover cropping
- Organic amendments
- Agroforestry
- Crop rotation
- Managed grazing

3. OCEAN SINKS

Oceans absorb CO₂ from the atmosphere. Carbon is stored in marine biomass and deep ocean waters.



KEY SOLUTIONS

- Protect and restore coastal ecosystems (mangroves, seagrass, salt marshes)
- Support ocean health and productivity

THE 5 KEY GLOBAL DRIVERS OF ENERGY SYSTEM TRANSFORMATION

Powering a secure, sustainable and prosperous future for Saudi Arabia and the world.

Five Drivers. One Transformation.

Different perspectives. Shared responsibility. Better decisions.



DECARBONIZATION

Transitioning to low-carbon energy systems to achieve net zero and protect our planet.



DIGITALIZATION

Leveraging data, AI and advanced technologies to optimize systems, enhance efficiency and enable smarter decisions.



DECENTRALIZATION

Empowering diverse energy resources and local solutions to improve resilience, consumer choice and community participation.



ELECTRIFICATION

Shifting to electric solutions across transport, buildings and industry to improve efficiency and eliminate emissions.



ENERGY SECURITY

Ensuring reliable, affordable and resilient energy systems to safeguard economies, support growth and deliver energy for all.

KA CARE
Operational realities, cost competitiveness and impact on downstream industries.

MINISTER OF ENERGY
National priorities, policy direction and long-term value.

SEEC
Economic efficiency, competitiveness and private sector perspective.

KAPSARC
Evidence-based analysis, modeling and scenario insights for informed decisions.

SERA
Market structure, regulation and fairness in enabling the energy transition.



DIVERSE PERSPECTIVES. STRONGER OUTCOMES.

Let's collaborate to shape the right energy future.

NRRC
Protecting vulnerable groups and ensuring a just and inclusive transition.



TRIGGER QUESTIONS FOR DISCUSSION



DECARBONIZATION

- How can we accelerate decarbonization while maintaining energy affordability and competitiveness?
- What are the highest impact actions to achieve net zero?



DIGITALIZATION

- How can data, AI and digital technologies unlock value across the energy system?
- What are the key enablers for digital trust, cybersecurity and capabilities?



DECENTRALIZATION

- How can we scale decentralized solutions while ensuring reliability and system integration?
- What policies and business models best empower local participation?



ELECTRIFICATION

- Which sectors and applications should we electrify first for the greatest impact?
- How do we build the infrastructure and skills needed to support large-scale electrification?



ENERGY SECURITY

- How do we strengthen energy security in an increasingly complex world?
- What mix of resources, partnerships and resilience measures should we prioritize?

One study found that applying AI-powered digital twin models to renewable energy facilities could cut unplanned downtime by 35 per cent and increase energy production by 8.5 per cent. It also improved fault detection accuracy by 98 per cent while reducing energy costs by 26 per cent.

Other studies indicate similar efficiencies could be made in other sectors. In agriculture, for example, researchers found that AI could potentially enable large reductions in the power used to heat greenhouses, and predict energy consumption patterns in irrigation based on factors such as light and heat, allowing farmers to plan watering to minimise energy use.

The differentiator is orchestration. An unprecedented convergence of new technologies—digital twins, quantum computing and physical AI, to name just three — is making possible a fundamentally different kind of organization. How will you translate breakthrough innovations into a tangible business win?

Former US energy secretary Steven Chu once described energy efficiency as “not just low-hanging fruit” but “fruit that is lying on the ground”. Yet despite being cost-effective, this critical method of decarbonisation is widely underused.

The process of identifying where and how energy is wasted is complex and time-consuming, which is why technologies and management practices in this area are not adopted as widely as they could be. Artificial intelligence could now be changing that.

But if complexity is hampering progress on energy efficiency, it is something AI is effective at managing. “AI is really good when you’ve got complex and highly unpredictable data,” says Kimmins.

In factories and other large industrial operations, he explains, sensors attached to every piece of equipment generate large volumes of data that AI can use to identify inefficiencies in equipment or processes.

ARAMCO: PROGRESSING TOWARDS A CIRCULAR CARBON ECONOMY IN KSA

Transforming carbon into value. Powering a more sustainable future.

Aramco is leveraging our scale, technology and partnerships to close the carbon loop—reducing emissions, reusing carbon and creating new opportunities for the Kingdom and the world.

OUR VISION



A Circular Carbon Economy that supports a lower-carbon future while creating value for generations to come.

OUR APPROACH



INNOVATE

Develop and deploy breakthrough technologies to convert and reuse carbon.



COLLABORATE

Partner across industries, government, and academia to scale solutions.



INVEST

Allocate capital to high-impact opportunities that drive the energy transition.



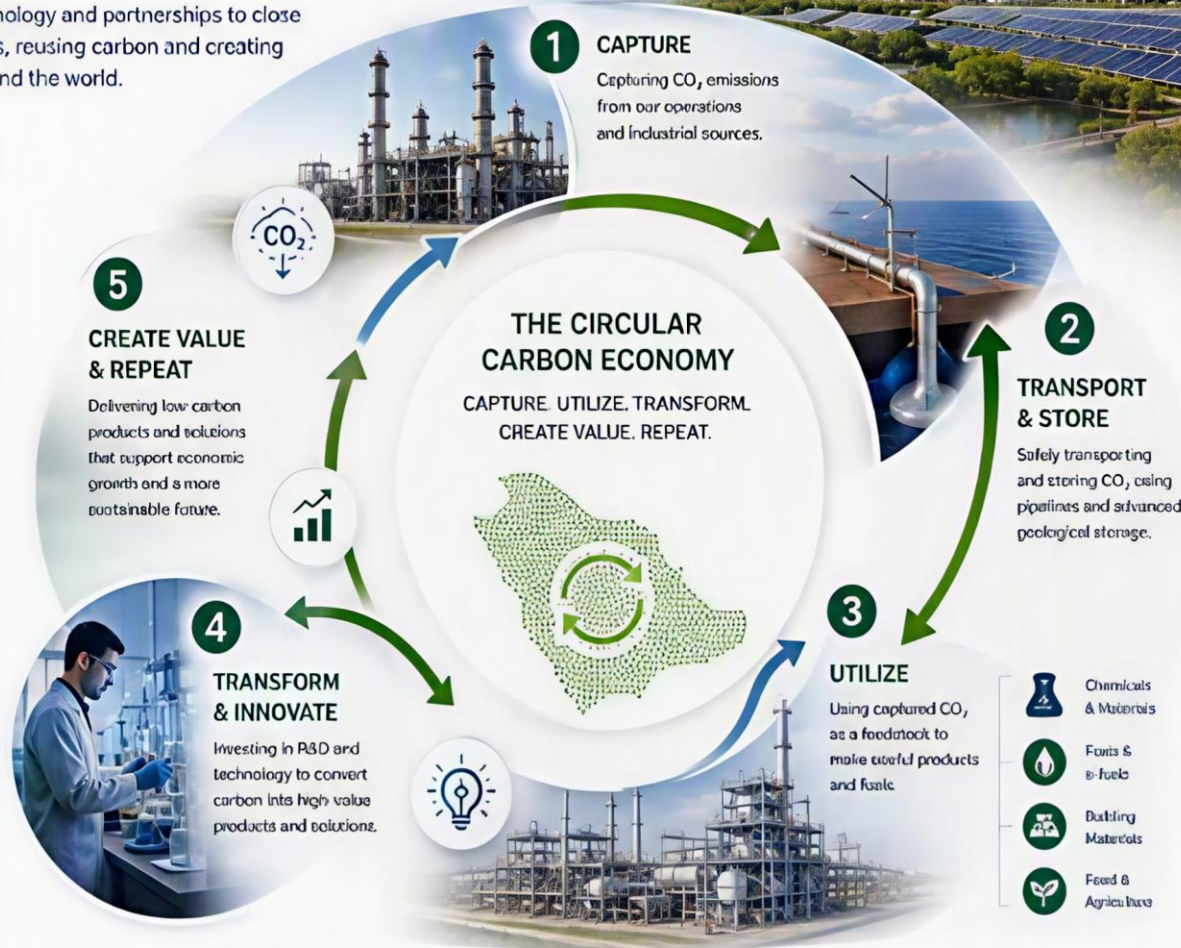
OPERATE RESPONSIBLY

Apply the highest HSE standards and minimize environmental impact.



CREATE VALUE

Turn carbon into products and solutions that benefit people, the economy and the planet.



WHERE WE CREATE VALUE

LOW CARBON FUELS

Lower-carbon fuels for transportation, shipping and aviation.



CHEMICALS & MATERIALS

CO₂-based chemicals and polymers for everyday products.



BUILDING A BETTER FUTURE

Low-carbon building materials for sustainable infrastructure and cities.



FOOD & AGRICULTURE

Innovative solutions to support food security and sustainable farming.



- Chemicals & Materials
- Fuels & Fuels
- Building Materials
- Food & Agriculture

OUR ENABLERS



TECHNOLOGY LEADERSHIP



WORLD-CLASS ASSETS & SCALE



STRATEGIC PARTNERSHIPS



TALENT & CAPABILITIES



DISCIPLINED INVESTMENT

OUR PROGRESS

CO₂ -11 Mtpa
CO₂ captured from our operations by 2027 through our CCUS acceleration program

Expanding CO₂ pipeline network and storage capacity in KSA

Investing in innovative technologies and partnerships to enable carbon utilization

Multiple projects in development across chemicals, fuels, materials and new industries

Building used co-products and treating high-quality jobs for a sustainable future

OUR COMMITMENT

Advancing innovation. Acting today.
Delivering a Circular Carbon Economy for Saudi Arabia and the world.

Lower Emissions

Create Value

Enable Growth

Secure a Better Future

CASE STUDY

NEOM: A GIGA-PROJECT FOR A ZERO-EMISSION FUTURE

A Vision in Action. A Model for the World.

NEOM is Saudi Arabia's giga-project and a living laboratory for sustainability, designed to function as a zero-emission city powered entirely by renewable energy, hydrogen, and smart technologies.



NEOM AT A GLANCE



Population (Target)
1 Million+
by 2030s



100%
Renewable Energy
by design



Hydrogen
Key energy carrier
and export



Net Zero
Emissions across all
sectors



AI-Driven City
Smart systems optimize
every resource

1. NEOM: A ZERO-EMISSION CITY OF THE FUTURE

NEOM integrates innovation, sustainability, and circularity to build one of the world's most advanced sustainable urban ecosystems.



Hydrogen-Based Public Transport

FCEV (fuel cell electric vehicles) and hydrogen-powered buses, ferries, and logistics form the backbone of clean mobility.



Zero-Waste Construction

Circular construction practices, modular building, local sourcing, and waste-to-resource systems ensure minimal waste and maximum reuse.



AI to Optimize Energy Flows

Artificial intelligence and digital twins balance supply and demand in real-time, optimizing energy, water, mobility, and waste systems for maximum efficiency.



Carbon-Neutral Urban Design

Compact design, passive cooling, regenerative landscapes, and nature-positive solutions create a city that enhances biodiversity while staying carbon neutral.



2. SAUDI CCE DIPLOMACY CONTEXT



G20 LEADERSHIP IN 2020

- During its 2020 G20 Presidency, Saudi Arabia championed the Circular Carbon Economy (CCE) agenda.
- The CCE framework was formalized in the G20 Energy Ministers' Communiqué, recognizing its role in achieving energy security, economic growth, and environmental sustainability.
- This was the first time the CCE concept was officially endorsed at the multilateral level.



GLOBAL PARTNERSHIPS & CLIMATE DIPLOMACY

- International Energy Agency (IEA):** Collaborative initiatives on emissions measurement, clean energy transitions, and energy data transparency.
- International Renewable Energy Agency (IRENA):** Partnerships to scale renewable energy, green hydrogen, and capacity building.
- Saudi Arabia's Role:** Bridging producers and consumers, promoting pragmatic solutions, and advocating for a just and inclusive transition through CCE diplomacy.



CCE Diplomacy Mission: Build global trust, enable technology collaboration, and accelerate climate action while safeguarding national development priorities.



3. DISCUSSION PROMPTS FOR PARTICIPANTS



1 How does NEOM integrate multiple CCE pillars simultaneously?

Consider how NEOM uses Reduce, Reuse, Recycle, and Remove in its energy, mobility, construction, and urban design systems.



2 What message does Saudi Arabia send globally by championing the CCE model?

Think about leadership, responsibility, innovation, and the ability to deliver real-world, scalable solutions for climate and development.



3 Can the CCE framework be a "third way" that balances global decarbonization with national sovereignty?

Discuss how CCE supports energy security, economic diversification, and climate goals without compromising national interests.



TAKEAWAY

NEOM demonstrates how the CCE framework turns ambition into action—creating a replicable model for cities, industries, and nations to achieve a sustainable, resilient, and prosperous future.

Liquid Fuel Displacement in Saudi Arabia

What does displacement mean?

Replace crude oil, fuel oil and diesel used domestically with natural gas, renewable electricity and grid connections, supported by energy-efficiency improvements.

2030 programme ambition

Aramco's 2024 report describes an ambition to displace approximately 1 million barrels of oil equivalent per day of liquid fuels by 2030. This is a target, not an achieved saving.

How the transition works

Expand gas supply and networks; convert plants and industrial equipment; add solar, wind and storage; connect diesel-powered users to the grid; reduce energy demand.

Main drivers and delivery

The Ministry of Energy leads policy; Aramco expands gas supply. Power producers and grid utilities enable switching; SEEC supports efficiency; MEWA facilitates agricultural electrification.

Recent delivery milestones

Jafurah began gas production in December 2025. Aramco's February 2026 update targets roughly 80% more sales-gas production capacity by 2030 versus 2021 production levels.

Benefits and success measures

Less domestic oil burning can free oil for higher-value uses and lower combustion emissions. Track actual liquid-fuel savings, reliability, costs and emissions, including methane leakage.

Natural Gas: Energy Transition, CO2 and ESG

Energy-transition contribution

In KSA, gas displaces oil-based fuels in power generation and desalination. Flexible gas plants can balance solar and wind output, while efficient combined-cycle plants reduce fuel use.

Environmental contribution

Control methane leaks and flaring; improve efficiency; manage water and land impacts. CCS can reduce plant CO2 emissions, but capture readiness alone does not demonstrate emissions abatement.

CO2: lower, but still emitted

Gas combustion produces less CO2 per unit of fuel energy than coal or oil. Actual savings depend on plant efficiency and the fuel displaced. Natural gas remains a fossil fuel, not zero-carbon energy.

Social contribution

Reliable power supports households, industry and employment. ESG performance also requires affordability, worker and community safety, skills development and responsible management of local impacts.

Methane: the critical condition

Natural gas is mainly methane, a powerful greenhouse gas. Leaks, venting and supply-chain emissions can erode the climate benefit. Assess lifecycle CO2-equivalent emissions, not combustion CO2 alone.

Governance contribution

Assign board accountability, verify CO2 and methane data, and align investment with NDC goals. Report absolute emissions and intensity; test asset lifetimes against transition risks and avoid carbon lock-in.

DIGITAL GRIDS AND DEMAND-SIDE MANAGEMENT

SMARTER GRIDS. EMPOWERING CONSUMERS. SUSTAINABLE FUTURE.

VISION د

WHAT ARE DIGITAL GRIDS?

Digital grids leverage advanced technologies, real-time data and automation to monitor, predict and optimize power flows across the network.



Real-time Monitoring

Sensors and IoT devices provide end-to-end visibility.



Advanced Analytics & AI

Forecast demand, detect faults and optimize operations.



Automation & Control

Self-healing networks and automated response to events.



Cybersecurity

Protecting critical infrastructure and customer data.



DEMAND-SIDE MANAGEMENT (DSM)

Empowering consumers to make smarter energy choices and actively manage demand.



Load Shifting

Move energy use to off-peak periods



Demand Response

Incentivize customers to reduce or shift usage during peak times



Energy Efficiency

Use less energy through smarter devices and behaviors



Dynamic Pricing

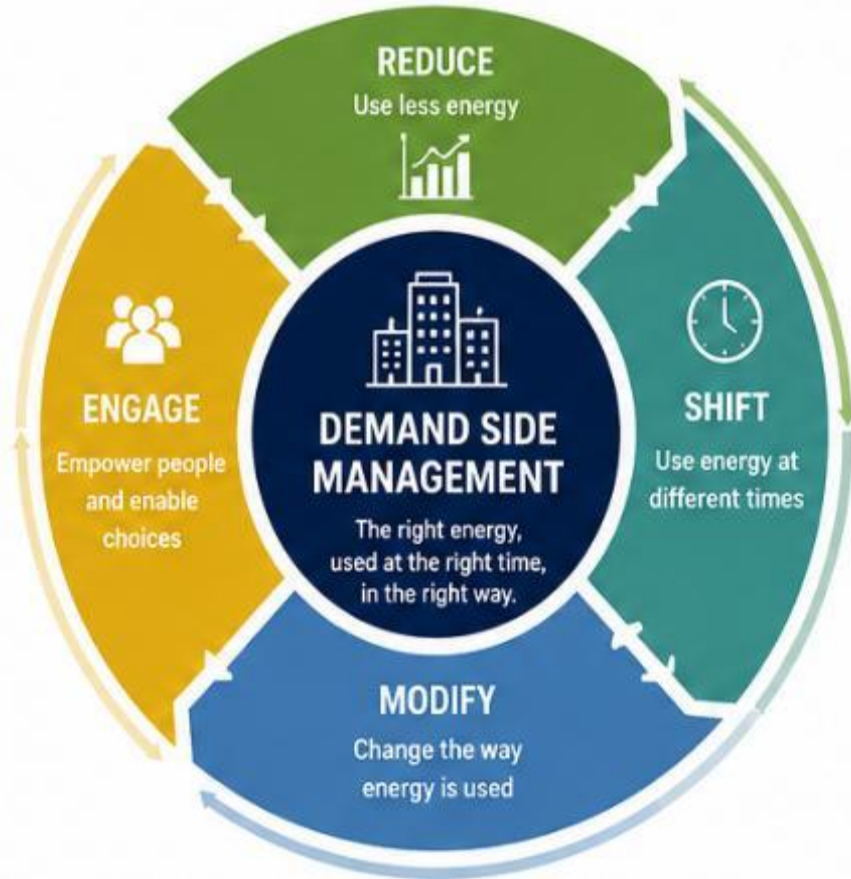
Price signals that reflect real-time supply and demand



Customer Engagement

Apps and platforms that provide insights and control

DEMAND SIDE MANAGEMENT



WHY IT MATTERS

-  Reduces peak demand and overall energy use
-  Lowers energy costs for consumers
-  Defers infrastructure investments
-  Improves grid reliability and resilience
-  Reduces emissions and environmental impact

KEY STRATEGIES & TOOLS

-  **Time-of-Use (TOU) Pricing**
Incentivize lower usage during peak times
-  **Demand Response (DR)**
Adjust or reduce demand in response to incentives or grid needs
-  **Energy Efficiency**
Use efficient equipment and processes to reduce consumption
-  **Smart Controls & Automation**
Optimize energy use with smart thermostats, sensors and controls
-  **Behavioral Change**
Encourage energy-saving behaviors through awareness and feedback

THE IMPACT



Lower Peak Demand



Lower Energy Costs



Reduced Emissions



Improved Reliability



Deferred Investments



A SMARTER, CLEANER, STRONGER ENERGY FUTURE

DIGITAL GRIDS & DEMAND-SIDE MANAGEMENT

TRIGGER QUESTIONS FOR GROUP DISCUSSION



1 STRATEGIC ALIGNMENT

- How do digital grids and DSM support KSA's Vision 2030, SGI and Net Zero 2060 goals?
- What should be our top 3 strategic priorities over the next 5 years?



2 CONSUMER & SOCIETY

- How can we better engage and empower consumers to participate in DSM?
- What incentives or programs will drive lasting behavior change?



3 TECHNOLOGY & DATA

- What digital technologies and data capabilities will deliver the most value?
- How do we ensure cybersecurity, data privacy and system interoperability?



4 GRID OPERATIONS & FLEXIBILITY

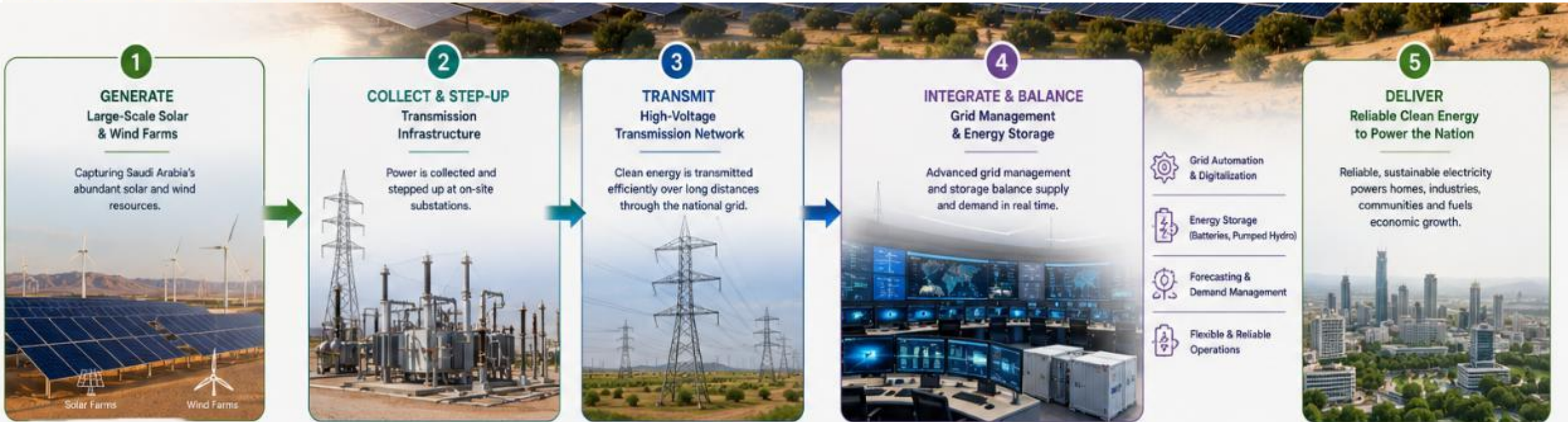
- How can we use digital tools to enhance grid flexibility and reliability?
- What investments are needed to modernize the grid for the future?



5 POLICY, REGULATION & MARKET

- What policy and regulatory changes are needed to enable DSM at scale?
- How can market mechanisms encourage flexibility and innovation?

INTEGRATING LARGE-SCALE SOLAR & WIND ENERGY INTO THE NATIONAL GRID



Ireland just got a bright glimpse of its clean-energy future, and it came from the sky. During a sunny spell, utility-scale solar supplied a record 37.06% of national fuel demand at 2:30 p.m. on May 24, according to Green Collective data cited by Solar Ireland.

That should be great news for households, businesses, and anyone worried about imported fossil fuels. But Solar Ireland is warning that the country may be letting too much clean electricity slip away because grid upgrades, [storage](#), flexibility, and day-to-day system operations are not moving as fast as solar generation itself.

UTILITY-SCALE **VS.** DISTRIBUTED ENERGY MODELS

Two Approaches. One Goal: Affordable, Reliable, Sustainable Energy for All.

UTILITY-SCALE ENERGY MODEL

Centralized. Large-Scale. Grid-Driven.



Centralized
Generation



High-Voltage
Transmission



Centralized
Grid Operation



One-Way Power
Flow



SCALE & CAPACITY

Large plants deliver power to millions; economies of scale.



RELIABILITY & CONTROL

Proven reliability with established operations and grid management.



COST STRUCTURE

Lower cost per unit at scale; high upfront capital investment.



INFRASTRUCTURE NEEDS

Extensive transmission & distribution networks; long lead times.



FLEXIBILITY

Less flexible; slower to adapt to changing demand and technologies.



RESILIENCE

Vulnerable to single points of failure and extreme events.



ENVIRONMENTAL IMPACT

Can integrate large-scale renewables but needs land and water resources.

VS.

BOTH MODELS ARE IMPORTANT



Energy Security



Affordability



Sustainability



Innovation



Economic Growth



Energy Access

The right mix – today and tomorrow – depends on technology, geography, policy and people.



DISTRIBUTED ENERGY MODEL

Decentralized. Flexible. Customer-Centric.



Distributed
Generation



Energy Storage
& Flexibility



Smart, Local
Grid Management



Two-Way Power
Flow



SCALE & CAPACITY

Modular and scalable; empowers communities and businesses.



RELIABILITY & CONTROL

Local resilience; less impact from centralized outages.



COST STRUCTURE

Lower upfront for small-scale; costs depend on technology mix.



INFRASTRUCTURE NEEDS

Reduced need for long-distance transmission; leverages existing assets.



FLEXIBILITY

Highly flexible; adapts to local needs and new technologies.



RESILIENCE

More resilient; diverse and distributed resources.



ENVIRONMENTAL IMPACT

Enables high renewable penetration and lower local emissions.

TRIGGER QUESTIONS FOR DISCUSSION



STRATEGIC DIRECTION

- What is the optimal balance between utility-scale and distributed models for KSA's future?
- How do these models align with Vision 2030 and Net Zero 2060?



COST & VALUE

- What are the total system costs of each model over the long term?
- How do we ensure affordability while driving innovation?



RELIABILITY & RESILIENCE

- Which model better ensures energy security in the face of climate risks and cyber threats?
- How do we strengthen grid resilience across all regions?



SUSTAINABILITY & ENVIRONMENT

- Which model enables faster decarbonization and higher renewable integration?
- What are the land, water and biodiversity implications?



PEOPLE & COMMUNITIES

- How do we empower communities and create local jobs and industries?
- What skills and capabilities are needed for each transition pathway?



POLICY & REGULATION

- What policies and market designs best support the right mix of both models?
- How do we enable private investment and fair competition?



COLLABORATION & GOVERNANCE

- How can stakeholders collaborate to plan, invest and operate together?
- What data, standards and governance frameworks are needed?

General Electric nuclear reactors. According to Constellation Energy, one of the contractors responsible for the plant, the pair of reactors has an output of 2,646 megawatts, which generated 21,944,000 MWh (megawatt-hours) of electricity in 2025.

Towards the solar energy side, a single solar panel from Tesla that sits right on top of your house generates up to 420 watts of electricity, or about enough to power a small refrigerator.

One megawatt is 1 million watts. So, doing the math, it would take more than 2,380 Tesla solar panels to generate one megawatt of electricity. A single reactor at Peach Bottom makes 1,323 megawatts. That means it would take 3.15 million Tesla solar panels to cover the output of a single nuclear reactor.

Core
components
of a grid
P169

Component	Function
Smart Meters	Provide real-time consumption data, enable dynamic pricing and remote control
Supervisory Control and Data Acquisition (SCADA)	Monitor and control grid operations from central platforms
Advanced Distribution Management Systems (ADMS)	Optimize voltage control, load balancing, and fault detection
Sensors and IoT Devices	Measure grid conditions (voltage, frequency, temperature) at multiple points
Big Data and AI Platforms	Predict demand patterns, renewable availability, and fault risks
Communication Infrastructure	Use of fibre optics, 5G, and wireless mesh networks for rapid data transfer

Innovation Adoption Lifecycle P174

Adopter Category	Characteristics
Innovators	Risk-takers, technologists, early testers, often involved in pilot projects
Early Adopters	Opinion leaders, trendsetters, willing to try new technology based on proven benefits
Early Majority	Pragmatic users, adopt once benefits and reliability are visible
Late Majority	Sceptical users, adopt under pressure or regulatory incentives
Laggards	Traditionalists, resist change until necessary

TECHNOLOGY READINESS ACROSS THE ENERGY TRANSITION SPACE

From Innovation to Impact: Building the Technologies of a Sustainable Future



Examples – Adoption Lifecycle P175

Technology	Adoption Stage	KSA Context
Rooftop Solar	Early Adoption	Pilots in residential areas; limited due to policy and awareness
Utility-scale Solar	Early Majority	Strong deployment through NREP projects like Sakaka and Sudair
Green Hydrogen	Innovator Phase	NEOM project under development; not yet commercially deployed
Smart Meters	Early Majority	Nationwide rollout by SEC complete; now enabling DSM strategies
EVs and Charging Stations	Early Adoption	Initial adoption with incentives and infrastructure underway
Small Modular Reactors	Innovator Phase	Under technical evaluation as part of SNAEP

TECHNOLOGY READINESS LEVEL (TRL) SCALE

AND ITS APPLICATION TO ENERGY INNOVATION

TRL LEVEL	1	2	3	4	5	6	7	8	9
	BASIC PRINCIPLES OBSERVED	TECHNOLOGY CONCEPT FORMULATED	EXPERIMENTAL PROOF OF CONCEPT	TECHNOLOGY VALIDATION IN LAB	TECHNOLOGY VALIDATION IN RELEVANT ENVIRONMENT	TECHNOLOGY DEMONSTRATED IN RELEVANT ENVIRONMENT	SYSTEM PROTOTYPE DEMONSTRATION IN OPERATION	SYSTEM COMPLETE AND QUALIFIED	ACTUAL SYSTEM PROVEN IN OPERATION

KSA READINESS ASSESSMENT FOR KEY ENERGY INNOVATION AREAS							
(Rated on a scale of 1 to 5*)							
INNOVATION AREA	DESCRIPTION	KSA READINESS LEVEL (1-5)					RATING
		1	2	3	4	5	
 SOLAR PV	Utility-scale solar and PV manufacturing, cost reduction, and deployment at scale.	☐	☐	☐	☒	☐	4 Advanced
 WIND ENERGY	Onshore wind deployment and resource assessment.	☐	☐	☒	☐	☐	3 Developing
 GREEN HYDROGEN	Electrolyzer technology, production, infrastructure, and export value chains.	☐	☐	☒	☐	☐	3 Developing
 CARBON CAPTURE, UTILIZATION & STORAGE (CCUS)	Capture technology, infrastructure, storage capacity, and commercialization.	☐	☐	☒	☐	☐	3 Developing
 ENERGY STORAGE (BATTERIES)	Grid-scale storage technologies and integration.	☐	☒	☐	☐	☐	2 Emerging
 SMART GRID & DIGITALIZATION	Grid flexibility, AI/ML, IoT, and digital solutions for energy systems.	☐	☐	☐	☒	☐	4 Advanced
 CIRCULAR CARBON ECONOMY (CCE) SOLUTIONS	Circular carbon technologies, industrial use of CO ₂ , and carbon management.	☐	☐	☒	☐	☐	3 Developing
 NUCLEAR ENERGY	Nuclear power program development and regulatory readiness.	☐	☐	☒	☐	☐	3 Developing

* 1 = Initial / Research 2 = Emerging 3 = Developing 4 = Advanced 5 = Leading / World Class

 KSA is making strong progress in key technologies, with opportunities to accelerate commercialization and innovation to reach global leadership.

Aligning TLR's with Adoption Lifecycle P177

TRL Stage	Typical Adoption Phase	Required Action
TRL 1–4	Innovator	Government and institutional R&D funding
TRL 5–6	Early Adopter	Public-private pilots, regulatory sandboxing
TRL 7–8	Early to Late Majority	Scale-up support, incentives, international standards
TRL 9	Late Majority to Mainstream	Full market competition, de-risking through infrastructure support

Challenges P172

Challenge	Implication
Data privacy and cybersecurity	Need for secure communication and data handling protocols
Regulatory gaps	Tariff structures and DSM incentives require policy updates
Consumer awareness	Public education on smart meters, dynamic pricing, and energy-saving actions
Interoperability issues	Diverse technology vendors must align on common protocols
Investment costs	Requires sustained public-private investment in digital and grid infrastructure

THE ECONOMIC IMPLICATIONS OF RENEWABLE ENERGY INTEGRATION

Powering Sustainable Growth and Long-Term Prosperity

KEY ECONOMIC BENEFITS



LOWER COST OF ENERGY

Falling costs of solar and wind reduce the levelized cost of electricity, lowering power sector costs over the long term.



ENERGY SECURITY

Reduced reliance on fuel imports and price volatility improves energy security and stabilizes economic planning.



ECONOMIC DIVERSIFICATION

Renewables stimulate new industries, supply chains and investments, reducing dependence on hydrocarbons.



JOB CREATION & HUMAN CAPITAL

Creates quality jobs across manufacturing, construction, operations, and R&D while developing a skilled local workforce.



INNOVATION & TECHNOLOGICAL ADVANCEMENT

Drives innovation, local manufacturing and technology transfer, boosting productivity and competitiveness.



ENVIRONMENTAL & HEALTH SAVINGS

Lower emissions lead to reduced health costs and environmental impact, improving quality of life and productivity.

THE ECONOMIC IMPACT FLOW



RENEWABLE
ENERGY INVESTMENT



INFRASTRUCTURE
& GRID MODERNIZATION



INDUSTRY GROWTH
& INNOVATION



JOBS & SKILLS
DEVELOPMENT



ECONOMIC GROWTH
& PROSPERITY

MACROECONOMIC IMPACTS



GDP GROWTH

Investment in renewables and related industries boosts GDP and creates multiplier effects across the economy.



FISCAL BENEFITS

Lower fuel costs free up government resources for investment in social programs, infrastructure and innovation.



TRADE BALANCE IMPROVEMENT

Reduced fuel imports improve the trade balance and strengthen external economic resilience.



PRICE STABILITY

Diversified energy mix helps stabilize electricity prices and reduces exposure to global fuel price shocks.



PRIVATE SECTOR INVESTMENT

Clear policies and bankable projects attract domestic and foreign investment and unlock new business opportunities.

COSTS & CONSIDERATIONS



UPFRONT INVESTMENT

High initial capital requirements for renewable projects and grid infrastructure.



GRID & STORAGE NEEDS

Investments in grid flexibility, storage and digitalization are essential for reliability.



TRANSITION MANAGEMENT

Managing the transition of the workforce and communities dependent on traditional energy sectors.



POLICY & REGULATORY CERTAINTY

Stable policies, clear regulations and long-term visibility are critical to reduce investment risk.



TECHNO-ECONOMIC COMPARISON (INDICATIVE TODAY – WILL E	
Lower (falling with renewable cost decline)	PRODUCTION COST (USD/kg H_2)
High (electrolyzer CAPEX, renewable, grid)	CAPITAL INTENSITY
Near-zero (operational emissions negligible)	CARBON EMISSIONS
High flexibility with power system; locations need renewable & water	TECHNOLOGY MATURITY
Lowest operational cost (no fuel)	OPERATING COST
Improving; requires scale & supply chain build-out	COMMERCIAL READINESS
Strong long-term decarbonization and export potential	LONG-TERM OUTLOOK

TRIGGER QUESTIONS FOR DISCUSSION

STRATEGIC DIRECTION

- What role should green and blue hydrogen play in KSA's energy transition?
- How do they align with Vision 2030 and Net Zero 2060?

TECHNO-ECONOMIC

- What is the optimal balance between green and blue hydrogen in the near, medium and long term?
- What are the key cost drivers and how can we reduce them?

INFRASTRUCTURE & RESOURCES

- What infrastructure is needed for each pathway (power, gas, CO_2 , water, ports)?
- Where should we prioritize investment and why?



TRIGGER QUESTIONS FOR DISCUSSION

STRATEGIC DIRECTION

- How can hydrogen best support KSA's Vision 2030 and Net Zero 2060 ambitions?
- What role should exports vs. domestic use play in our hydrogen strategy?

MARKETS & COMPETITIVENESS

- Which international markets should we prioritize and why?
- How can we maintain cost leadership and ensure long-term competitiveness?

DOMESTIC VALUE CREATION

- Which sectors should be our first movers for domestic hydrogen use?
- How do we maximize local content, jobs and technology development?

INFRASTRUCTURE & INVESTMENT

- What infrastructure (pipelines, storage, ports) is needed and where should we invest first?
- How can we de-risk investments and attract private capital?

POLICY & REGULATION

- What policies, standards and incentives are needed to scale hydrogen?
- How do we ensure safety, sustainability and clear market signals?

SUSTAINABILITY & IMPACT

- How do we ensure a just transition and community benefits?
- What are the key environmental and water considerations?

COLLABORATION & GOVERNANCE

- How can we strengthen collaboration across government, industry, research and international partners?
- What governance model will best deliver speed, coordination and accountability?

GLOBAL COMPETITIVE HYDROGEN STRATEGIES FOR KSA

Learn. Adapt. Lead. Building a globally competitive hydrogen economy.



ENERGY PRICING REFORM

Balancing Economic Efficiency, Political Realities, and Environmental Goals

Smart pricing today. Sustainable prosperity tomorrow.

ECONOMIC EFFICIENCY

Allocate resources wisely. Drive sustainable growth.



TRUE COST REFLECTION

Align prices with the true cost of supply to promote efficient consumption.



FISCAL SUSTAINABILITY

Reduce government subsidies and reallocate resources to priority sectors like health, education, and infrastructure.



INVESTMENT & COMPETITIVENESS

Attract investment, boost productivity, and enhance the competitiveness of the Saudi economy.



ENERGY EFFICIENCY

Incentivize efficient energy use across households, businesses, and industries.

THE BALANCE WE SEEK

Reforming energy prices is about achieving the right balance for a stronger, fairer, and more sustainable future for Saudi Arabia.



POLITICAL REALITIES

Fair. Inclusive. Managed for long-term success.



SOCIAL EQUITY

Protect vulnerable groups through targeted support and safety nets.



PUBLIC ACCEPTANCE

Engage transparently and communicate the benefits clearly and consistently.



GRADUAL TRANSITION

Implement reforms in phases to ensure stability and build public trust.



STRONG GOVERNANCE

Establish clear policies, regulations, and institutions for effective implementation.

ENVIRONMENTAL GOALS

Price for a cleaner future. Protect our planet.



LOWER EMISSIONS

Price signals reduce consumption and support lower greenhouse gas emissions.



SUPPORT CLEAN ENERGY

Encourage investment in renewables and clean technologies.



RESOURCE CONSERVATION

Promote responsible use of natural resources for future generations.



ALIGN WITH NET ZERO

Support Saudi Arabia's commitment to net zero by 2060.

A PATH FORWARD

Practical steps for effective reform.



ASSESS & ANALYZE 1

Evaluate current subsidies, market impacts, and socioeconomic effects.



DESIGN REFORM 2

Develop a phased pricing strategy with targeted support measures.



COMMUNICATE & ENGAGE

Build public understanding through transparent and consistent communication.



IMPLEMENT GRADUALLY

Roll out reforms in stages with monitoring and feedback.



REINVEST FUTURE 5

Reinvest savings in people, innovation, and clean energy solutions.

THE RESULT

A balanced approach delivering long-term value for Saudi Arabia.



Stronger Economy

Efficient markets and sustainable growth.



Resilient Finances

Reduced fiscal burden and better resource allocation.



Social Benefits

Improved services and protection for those in need.



Cleaner Environment

Lower emissions and a healthier planet.



Sustainable Future

A prosperous Saudi Arabia for generations to come.

ECONOMIC TRADE-OFFS IN ENERGY PRICING REFORM

Balancing Affordability, Efficiency, Growth and Sustainability

Every pricing decision involves trade-offs.

The goal is to balance short-term impacts with long-term value.

LOWER PRICES (Subsidized)

Benefits in the Short Term



AFFORDABILITY

Keeps energy affordable for households and businesses.



SOCIAL STABILITY

Reduces cost-of-living pressure and supports equity.



ECONOMIC SUPPORT

Low energy costs support industries and economic activity in the near term.



POLITICAL ACCEPTABILITY

Easier to implement and maintain in the short run.

THE TRADE-OFF

Finding the right balance for a prosperous and sustainable Saudi Arabia.



HIGHER PRICES (Reformed)

Benefits in the Long Term



ECONOMIC EFFICIENCY

Encourages efficient energy use and reduces waste.



FISCAL SUSTAINABILITY

Reduces subsidy burden and frees up resources for priority investments.



INVESTMENT & INNOVATION

Attracts investment in clean energy, infrastructure and new technologies.



ENVIRONMENTAL BENEFITS

Lower emissions and reduced environmental impact support a sustainable future.

THE PRICING REFORM DILEMMA

Balancing Competing Priorities for
a Sustainable Energy Future

One Decision. Many Perspectives. Shared Future.
Let's shape the right balance for Saudi Arabia.



TRIGGER QUESTIONS FOR DISCUSSION



STRATEGIC DIRECTION

- What is the right pace for pricing reform in Saudi Arabia?
- What are our non-negotiables vs. areas of flexibility?
- How do we align pricing reform with Vision 2030 goals?



ECONOMIC IMPACT

- How will different pricing scenarios impact GDP, jobs, and competitiveness?
- What are the implications for industries and SMEs?
- How do we attract investment while reforming prices?



SOCIAL CONSIDERATIONS

- How will pricing changes affect households and vulnerable groups?
- What safety nets or support mechanisms are needed?
- How do we ensure a just and inclusive transition?



FISCAL SUSTAINABILITY

- How can reform reduce fiscal burdens and improve resource allocation?
- How do we balance subsidy reduction with economic stability?
- What is the long-term impact on government finances?



ENVIRONMENTAL & ENERGY TRANSITION

- How does pricing reform accelerate our net zero journey?
- How do we send the right signals for energy efficiency and renewables?
- What are the environmental trade-offs of different approaches?



IMPLEMENTATION & GOVERNANCE

- What regulatory, institutional, and market enablers are required?
- How do we ensure transparency and build trust?
- How do we monitor, evaluate, and adapt over time?

- Egypt has significantly boosted oil production in its Western Desert, increasing output by almost 12,000 barrels per day recently.
- Partnerships with companies like Apache Corporation and Agiba Petroleum have increased daily outputs, with Khalda Petroleum raising production by over 10,000 barrels per day.
- The use of advanced technologies, such as AI and aerial surveys, has contributed to improved efficiency and resource mapping.
- Egypt plans to drill 100 new exploratory wells by 2026, aiming to further increase reserves, bolster long-term energy security, and maintain its role as a leading regional producer.



“Great leaders do not create followers — they create owners.”



Deon van der Westhuizen

Integrated Governance and Risk | Integrated Reporting |
Psychological safety | Oil and gas and ESG | Supply Chain
Sustainability | Artificial Intelligence | | Leadership Development and
Coaching |

agile Agile Group of Companies



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