McKinsey & Company

Developing high-quality climate action plans

Session #3 of a five-step program
“From awareness to action”

July 9, 2024

Chapter Zero Kazakhstan
The Directors' Climate Forum

A five-step program "From awareness to action" by McKinsey

Session 1

Solving the Net-Zero equation

Explore the **requirements for achieving Net-Zero** emissions and understand the **implications for companies**

Session 2

Managing strategies in an uncertain world

Learn how to develop **strategic options for a low-carbon future**, set **baselines**, and choose the right **strategic posture** for your company

Session 3

Developing high-quality climate action plans

Discover how to create high-quality **climate action roadmaps** and drive change in value-focused boardrooms through **levers for decarbonization**

Session 4

Motivating leadership teams and organizations

Uncover the **capabilities and motivation** organizations need to navigate technological advancements, policy shifts, and investor expectations

Session 5

Mapping the road ahead

Understand the importance of essential **efforts and collaboration** between public and private sectors in achieving global economic transformation

McKinsey Sustainability

Our aspiration – To be the largest private sector catalyst for decarbonization, helping clients in all industries and sectors make meaningful progress by 2030 and reach Net Zero by 2050 in line with the Paris Agreement.

McKinsey on Climate, Decarbonization and ESG

10+ years of experience in helping clients innovate for Sustainability

Investing in capabilities and knowledge

Leading voice on climate

Convening power and Ecosystem access

Setting targets to reduce our greenhouse-gas emissions

In 2023

1,720+
sustainability-related client engagements

>200
Data **scientists, analysts, researchers and knowledge consultants**

>100
publications in 2020 with ~1.5 mil views on McKinsey.com site

>20
leading industry associations we are partnering with

2030
- target year we set to reach Net Zero

Today’s speaker: Pawel Torbus

Associate Partner at McKinsey & Company, Warsaw

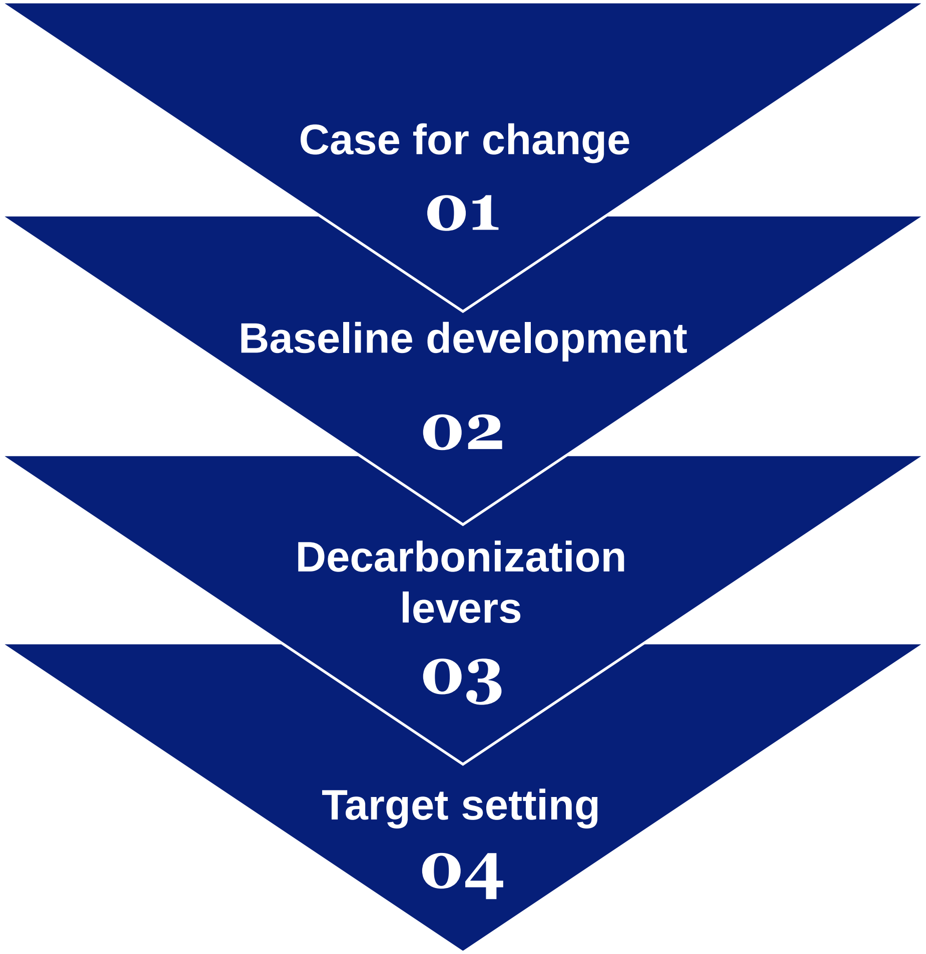
Experience

- Global Lead of Energy Solutions: Decarbonization Team
- Serves O&G, chemical, mining and industrial players around the globe on finding their optimal decarbonization pathways and understanding trade-offs
- Deep expertise in industrial operations, corporate and regulatory strategy, abatement cost analysis and market regulations

Education

- Pawel holds two Master of Science degrees in Chemical Technology at University of Science in Krakow, Poland
  and in Energy Engineering and Management at Instituto Superior Tecnico Lisbon, Portugal
- Undertook a ~2 years research internship in Institute of Energy and Fuel Processing Technology in Zabrze, Poland

Key components of decarbonization target-setting and pathway development



01 Decarbonization trends including regulatory, financial and consumer behaviour changes

02 Set baseline boundaries, collect data, build GHG emissions baseline, and analyze the output

03 Identify decarbonization levers and assess impact and costs, building Marginal Abatement Cost Curves (MACC) for prioritization for the mid term and the long term

04 Set the target based on SBTi-aligned best practices and define potential decarbonization pathways based on industry trends, 1.5oC and 2oC alignment and abatement potential of NPV positive and negative levers

Key components of decarbonization target-setting and pathway development

Detailed next

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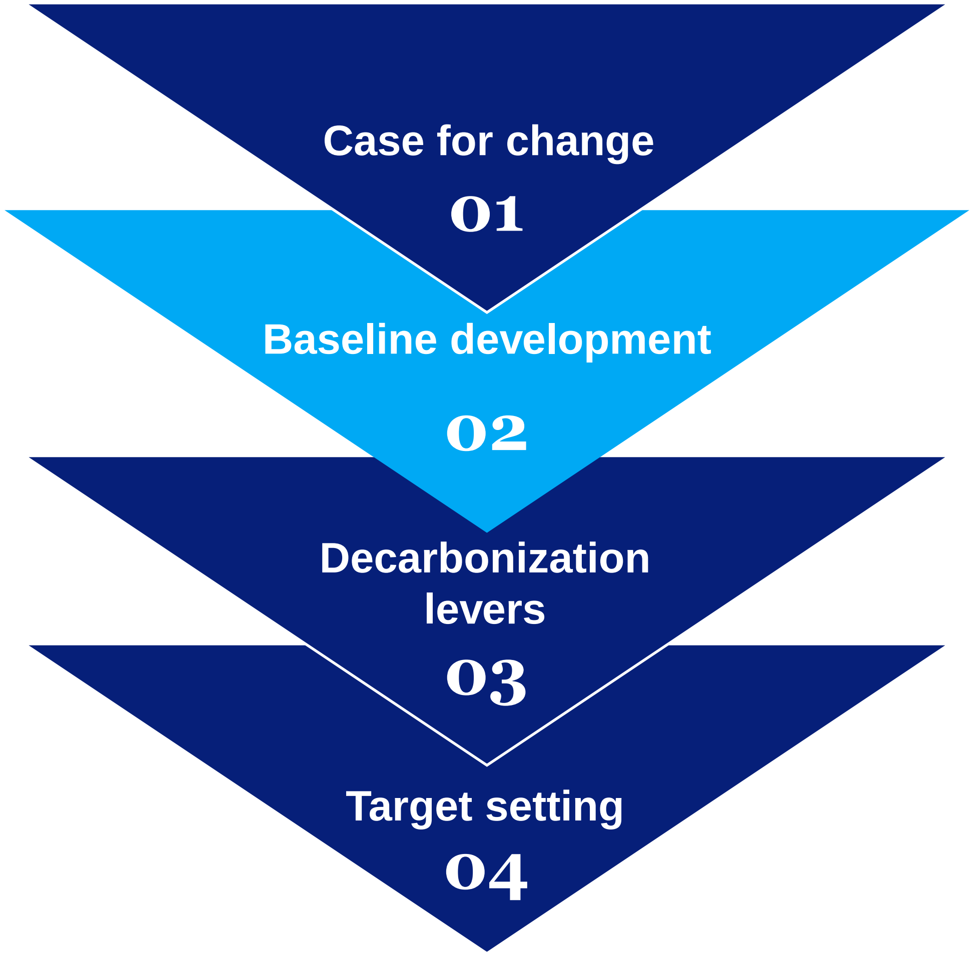

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Baseline | 6 questions to be answered after baselining exercise

1. What are the most significant GHG emission sources?
2. Which specific assets/processes generate the most emissions across operations?
3. What drives them and how much control does the company have on drivers?
4. What are alternative, less emitting ways to get to the same outcome?
5. At a high level, what would be the trade-offs to reduce emissions from the most polluting sources?
6. How would decarbonization create value for the company?

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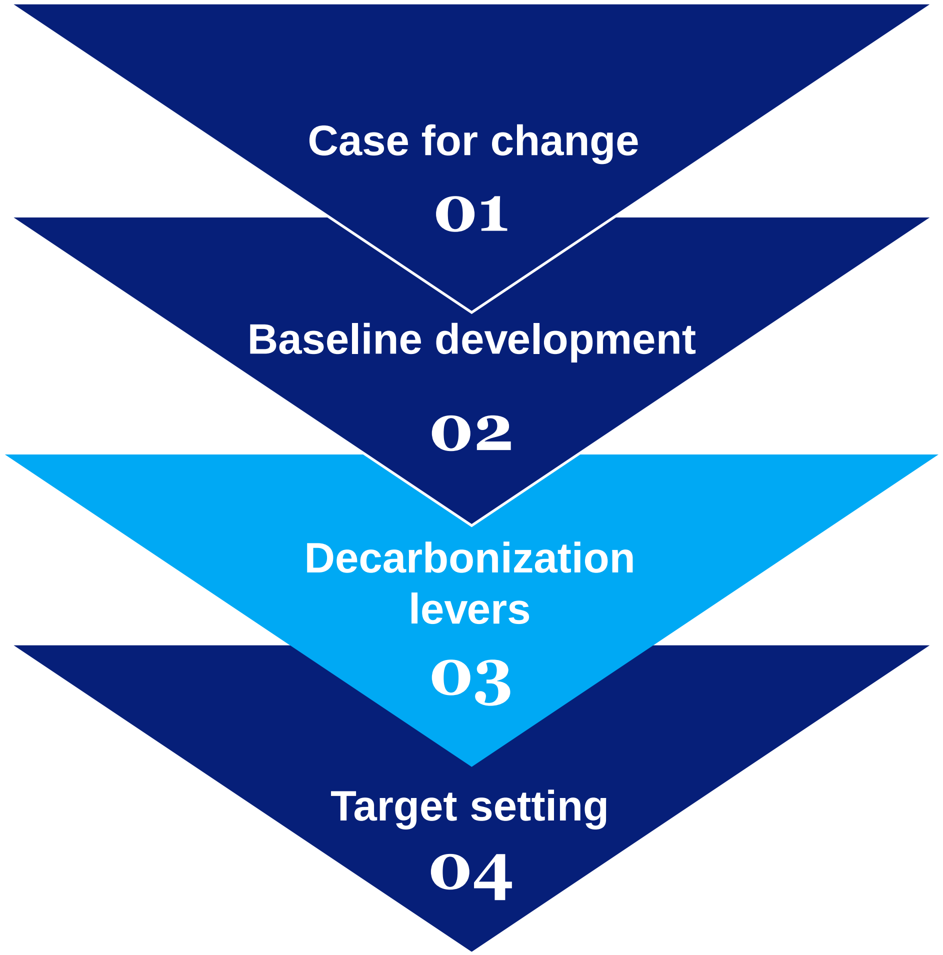

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Poll – Decarbonization levers

Key steps to identify and prioritize decarbonization levers

Step 01 — Identify levers

Using the emission baseline from previous step, **levers could be identified first for focus areas to decarbonize**

- Levers could be identified through **workshops** with the operations and sustainability group and **expert peer discussions**, when possible
- Levers should be carefully **assessed** based on the company's specific context

Step 02 — Analyze cost and abatement potential

For each lever, typical information should be collected to assess the **Marginal Abatement Cost** (MAC) including

- Lever lifetime
- Total cost of the lever
- Any expected savings to be delivered by the lever
- Volume of GHG emissions saved over the lever lifetime
- Potential governmental support such as tax rebates and subsidies

Step 03 — Build the MACC for assets/ geographies

The **Marginal Abatement Cost** of a specific lever is **calculated based on the Net Present Value of the lever and the total GHG emissions abated** over the life of the lever

Then, to build the MACC, the **Marginal Abatement Cost and abatement per tCO_2 of each lever are collated** on a bar chart

Step 04 — Prioritize levers and build pathway

Levers should be **prioritized** over different time horizons to reach desired emissions reduction and optimal associated costs

Such prioritization is **based on the company's level of ambition and capital availability** for negative NPV levers

This will help build a potential **decarbonization pathway** based on prioritized levers and assess the gap to net zero pathway

Step 1: Identify levers – After defining emission baseline, a long-list of levers is identified across all sources of emissions

● Levers prioritized for review based on initial economic assessment

○ Levers feasible, but de-prioritized based on internal economics assessment

Illustrative

Emission source	Considerations to select the target lever	RES	Efficiency	CCUS	Hydrogen	Electrification	Biofuels	Innovation
		Groups of levers						
Electricity generation (offsite)	Compare current to alternative electricity sources, e.g., grid supply, on-grid RES, own RES, on-site gas with CCUS. For example, grid power is more expensive, but has lower emissions intensity (0.45 tCO_2/MWh) versus own gas generation (~0.6 tCO2/MWh)	●		●	*Possible storage for high-share RES*		○	
Electricity generation (onsite)		●	●	○	*Possible storage for high-share RES*		○	
Steam generation (onsite)	Compare current costs and efficiency of fossil-fuels driven steam generation from boilers via electrification or CCUS, with machine drives to be assessed with direct electrification	*Required for electrification*	●	●	○	●	○	● *Conc. solar power*
Process heating	Process heating is typically high temperature (>400C) and is limited to alternative fuels like electricity, biogas (limited availability), hydrogen (high costs, carbon footprint depending on production route) or post-combustion CCUS	*Required for electrification*	●	●	○	●	○	
Machine drive	Review costs of steam-powered turbines and engines versus electric motor	*Required for electrification*	●		○	●	○	
Process emissions	Difficult to abate emissions. Solutions include change of technology (e.g., hydrogen from SMR to ATR+CCUS) and CCUS on the emissions stream (e.g., CCUS on FCC coke)		●	●				○

Step 1: Identify levers – Levers could be identified and stress-tested through workshops with operations and the sustainability team

Sustainability team

Leads ideation workshops and could perform an assessment of initiatives led by peers for inspiration

Operations

Take an active part in initiative ideation and help assess, at a high-level, feasibility and operating model adjustments needed for each lever

Finance

While typically engaged at a later stage, the finance team should be involved from the start as they will be in charge of assessing timing and feasibility of levers based on financial situation

Thought partner and catalist (optional)

Step 1: Identify levers – Decarbonization levers should be carefully assessed vs each specific company’s internal and external context

Regulatory context

Each national, and sometimes regional, jurisdiction has its own policies and regulations on climate change, including subsidies for specific abatement technologies, carbon taxes or penalties, which may affect a lever’s profitability

Company’s baseline

The company’s starting point is important to build a relevant list of abatement levers. In-flight initiatives with an impact on the baseline, or levers that had been previously implemented, should be identified early in the process

Geographic location

Location-specific factors such as access to technology or implementation capabilities have an impact on a lever’s abatement efficiency

Operating costs

The lever’s costs include operating costs which vary greatly from one company to another even if they belong to the same industry or are based in the same country

Step 2: Analyze cost and abatement potential – Generating a MACC requires calculating each lever's financial impact and abatement potential

Overview of type of information needed

1

The lever lifetime

- The number of years for which the lever is expected to deliver GHG abatement

2

The total cost of the lever

The total implementation cost and any ongoing operational costs required for the life of the lever, including

- Upfront capital costs
- Cost of finance
- Ongoing operational expenses
- Discount rate (to allow for the diminishing real value of money over time)
- Potential tax rebates and subsidies

3

Any expected savings to be delivered by the lever

- Potential operational cost savings
- Lever revenue stream opportunities
- Asset salvage values

4

The volume of GHG emissions saved over the lever lifetime

- A factor of multiplying anticipated reduction in consumption values by an emission factor (emission factors used for the baseline should be leveraged)

Step 2: Analyze cost and abatement potential – The Marginal Abatement Cost of each lever is calculated using a specific formula

$$\text{Marginal Abatement Cost (\$/t } CO_2e) = \frac{-\text{ Net Present Value (\$)}}{\text{Total GHG emissions abated over the life of the lever}}$$

Where,

$$\text{Net Present Value} = \frac{\text{Total lever costs – Total lever savings}}{(1+\text{Discount rate})^{\text{lever lifetime}}}$$

The Net Present Value (NPV) represents the total value of the lever by summing all its costs and savings and adjusted for the time value of money

- Where costs exceed the savings, the NPV will be a negative value representing a net cost to the agency
- Conversely, where the savings exceed the costs, the NPV will be a positive number evidencing that the lever will pay for itself

To calculate the Marginal Abatement Cost, it is necessary to multiple the NPV by negative one (-1)

- This is to show that levers with negative Marginal Abatement Cost are in fact economically viable
- Conversely, a positive Marginal Abatement Cost has a true cost per tCO2e abated and is associated with a negative NPV

Step 2: Detailed Marginal Abatement Cost calculation formula

Abatement cost formula

Abatement cost is defined as potential carbon tax at which NPV of decarbonization initiative is equal 0:

$$\text{Abatement cost } [USD/tCO_2e] = \frac{\textbf{CAPEX difference } [USD] + \textbf{NPV (OPEX difference during asset lifetime) } [USD]}{\textbf{NPV (abated emissions during asset lifetime) } [tCO_2e]}$$

Methodology

CAPEX difference [USD] = **Decarbonization CAPEX** [USD] – **Reference CAPEX** [USD]

- In case of brownfield decarbonization, reference CAPEX is 0, as source of emissions (e.g. gas turbine, Steam Methane Reforming unit) already exists in asset.
- Reference CAPEX should be considered in case of greenfield decarbonization due to potential choice between clean and emissive units

OPEX difference [USD/year] = **Decarbonization OPEX** [USD/year] – **Reference OPEX** [USD/year]

- In OPEX difference calculations include potential OPEX change due to fuel switch, increased unit efficiency etc.
- Negative OPEX difference represents potential yearly savings achieved together with emissions abatement

Abated emissions [tCO_2e/year] = **Decarbonization case emissions** [tCO_2e/year] – **Reference case emissions** [tCO_2e/year]

- Abated emissions represent difference in emissions between decarbonization and reference case
- Net-zero levers (e.g. full switch to renewables, green hydrogen, green electrification) assume abatement of all unit emissions, however part of levers assumes partial decarbonization (efficiency improvements for gas-fired units, uncaptured emissions by CCS)
- Abated emissions are discounted in abatement cost formula as they represent future cash flow assuming that each tonne of CO_2e is related to potential carbon tax [USD/tCO_2e]

Step 2: Electric steam boilers will significantly reduce emissions from heat generation

Marginal Abatement Cost calculation example: steam boiler electrification

Reference case calculations

$$CAPEX = 0$$

$$OPEX = \frac{Natural\ gas\ price\left[\frac{USD}{GJ}\right] * 3.6\left[\frac{GJ}{MWh}\right]}{Gas\ boiler\ efficiency\ [\%]} = \frac{5\ \frac{USD}{GJ} * 3.6\frac{GJ}{MWh}}{95\%} = \mathbf{19}\ \frac{USD}{\frac{MWh_{output}}{year}}$$

$$Emissions = \frac{Natural\ gas\ EF\left[\frac{kgCO_2}{GJ}\right] * 3.6\left[\frac{GJ}{MWh}\right]}{1000 * Gas\ boiler\ efficiency\ [\%]} = \frac{56.4\ \frac{kgCO_2}{GJ} * 3.6\frac{GJ}{MWh}}{1000 * 95\%} = \mathbf{0.21}\frac{tCO_2}{\frac{MWh_{output}}{year}}$$

Decarbonization case calculations

$$CAPEX = \frac{Solar\ price\left[\frac{USD}{kW}\right] * 1000\left[\frac{kW}{MW}\right]}{365 * 24h\ * Cap\ factor\ [\%]} + \frac{El.boiler\ price\left[\frac{USD}{kW}\right] * 1000\left[\frac{kW}{MW}\right]}{365 * 24h\ * Cap\ factor\ [\%]} + \frac{Molten\ salt\ price\left[\frac{USD}{MWh\ capacity}\right] * \frac{16\ [hr]}{24\ [hr]}}{365\ [days]} = \mathbf{346}\ \frac{USD}{MWh_{output}}$$

$$OPEX = \frac{El.boiler\ fix.O\&M\left[\frac{USD}{MW}\right]}{365 * 24h} + El.boiler\ var.O\&M\left[\frac{USD}{MWh}\right] + \frac{Solar\ OPEX\left[\frac{USD}{kW}\right] * 1000\left[\frac{kW}{MW}\right]}{365 * 24h\ * Cap\ factor\ [\%]} = \mathbf{6}\ \frac{USD}{\frac{MWh_{output}}{year}}$$

$$Emissions = 0$$

Impact[1]

$$NPV = CAPEX\ difference + NPV(OPEX\ difference) = -346{,}000{,}000\ USD + NPV\left(13{,}000{,}000\frac{USD}{year}\right) = -\mathbf{227{,}998{,}480}\ \text{USD}$$

$$Abatement\ cost = \frac{Initiative\ NPV}{NPV(abated\ emissions)} = \frac{-227{,}998{,}480\ USD}{NPV\left(-210{,}000\frac{tCO_2}{year}\right)} = \mathbf{120}\ \frac{USD}{tCO_2}$$

1. OPEX and emissions NPV is calculated for 25 years assuming 10% WACC

Description

Steam boiler electrification lever assumes replacement of existing **gas-fired steam boiler** or auxiliary boiler with **electric** unit. Source of power energy potentially can be generated by own **renewables sources** (solar, wind) or **green electricity** (PPA provided by third party body). Thermal storage is possible with potential development of e.g. **molten salt heat storage**

Key inputs (Australia, 2030)

- **Onshore solar CAPEX:** 511 USD/kW
- **Onshore solar OPEX:** 12 USD/kW
- **Onshore solar capacity factor:** 28%
- **Electric boiler cost:** 300 USD/kW
- **Molten salt CAPEX:** 30,000 USD/MWh capacity
- **Heat storage operating time:** 16 hours/day
- **Electric boiler efficiency:** 98%
- **Natural gas price:** 4.74 USD/mmBTU
- **Thermal energy demand:** 1,000,000 MWh/year
- **Lifetime:** 25 years
- **WACC:** 10%

Step 2: We observe typical challenges companies face in an effort to evaluate impact of decarbonization levers

Success rate of implementing sustainability aspirations

>75% — Have emission-reduction aspirations[1]

~15% — Have a robust Net Zero plan[2]

? — **Have the right tools to succeed**

Common pitfalls in evaluating impact of decarbonization levers

- **Underestimating total cost of decarbonization** incl. required infrastructure, not performing holistic energy and emissions balances
- **Using typical emission factors instead of actual ones –** difference for fuel gas or imported electricity can be massive
- **Wrong units –** people are not used to express analysis in tCO2e (have seen mistakes of t with kt and kt with Mt)
- Not applying **discount factor on emissions**
- Using **wrong WACC** (it should be segment specific WACC)

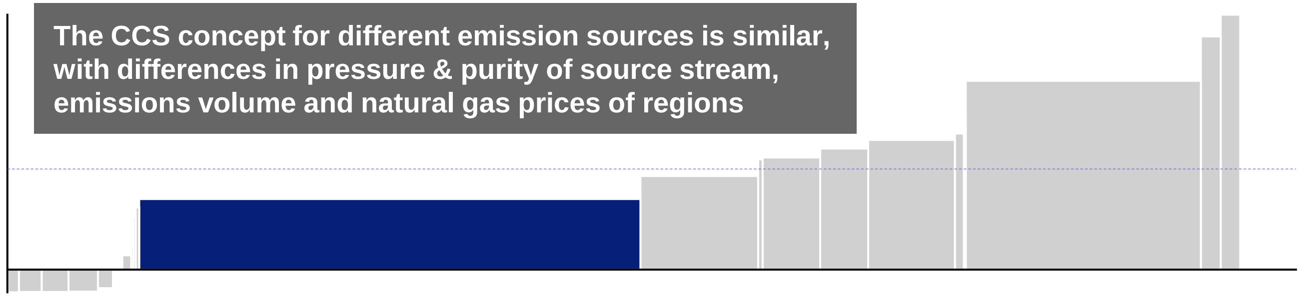
1. Cross industry trend - defined as setting at least one climate or energy commitment

2. Cross industry trend - defined as having a Science Based Target initiative (SBTi) Net Zero target

Source: WWF analysis of Fortune 100 Companies

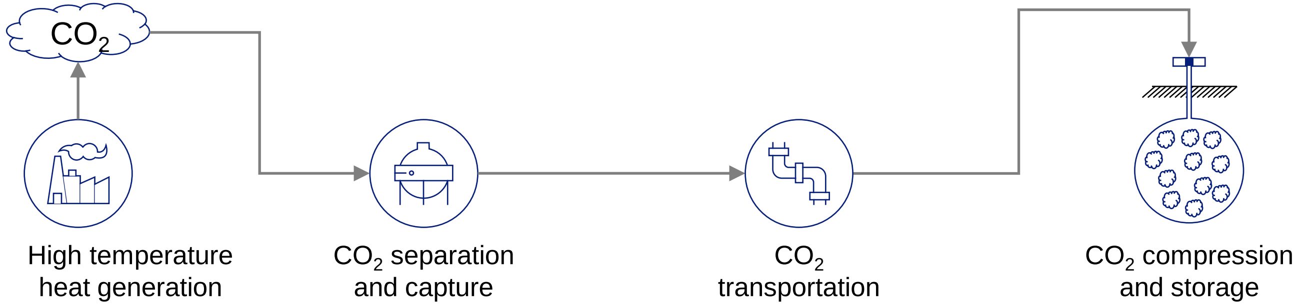
Step 2: Analyze cost and abatement potential – Each lever represents a business case compared to a reference scenario

Example: Apply CCS on furnaces



Example lever abatement cost	160$/tCO2 (2025)
Lever description	Flue gasses from heat generation process are captured, transported via pipeline and injected in reservoir for storage

Lever concept



Economic Assumptions	Unit	2025	2030	2040	2050
Carbon capture system capex for furnace[1]	$/tCO2	564	507	450	375
Pipeline CAPEX[2]	$/tCO2.year.km	1	1	1	1
Storage CAPEX[3]	$/tCO2	2.9	2.8	2.5	2.5
Storage Opex	$/tCO2	0.9	0.9	0.8	0.8
Compressor CAPEX[3]	Mn $	14	14	14	14

Operational Assumptions

CO2 capture rate	%	80	85	90	95
CO2 pipeline length	km	100	100	100	100

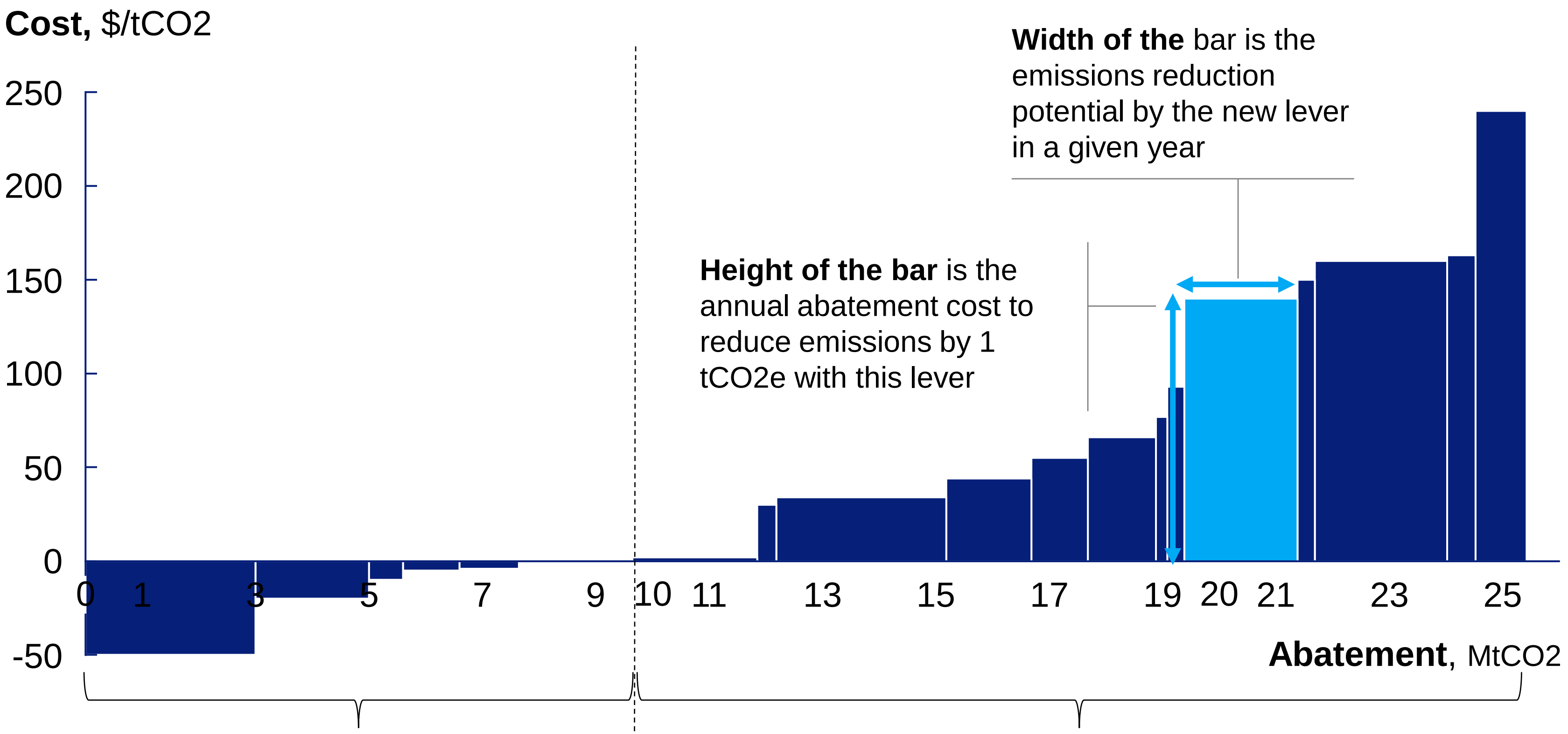
1.Capture cost was further adjusted for emissions size and type from different emission units; 2. These represent levelized cost over carbon abated; 3. Compressor CAPEX was further sized based on required power for different analogs and options

Source: Asset Decarbonization Assessment Suite

Step 3: Marginal Abatement Cost Curves help visualize decarbonization levers' impact and costs

Example of MACC

Illustrative



Negative Y-axis indicates levers that are NPV positive and create value: they provide cost savings for the party implementing the measures (e.g., $100 cost savings per every tonne of C02e abated through this lever)

Positive Y-axis indicates levers that are NPV negative: these levers have additional costs for the party implementing the measures (e.g., $80 additional cost incurred per every tonne of C02e abated through this lever)

- **Each bar on the cost curve** represents a decarbonization lever
- Levers are **sorted by increasing abatement costs** for the reduction of emissions by tC02e
- **Abatement cost** is calculated as the difference of average costs between new and replaced lever divided by the displaced emissions. It should include potential subsidies that would lower the cost of low carbon technologies

Source: McKinsey Sustainability Insights Strategy Analytics

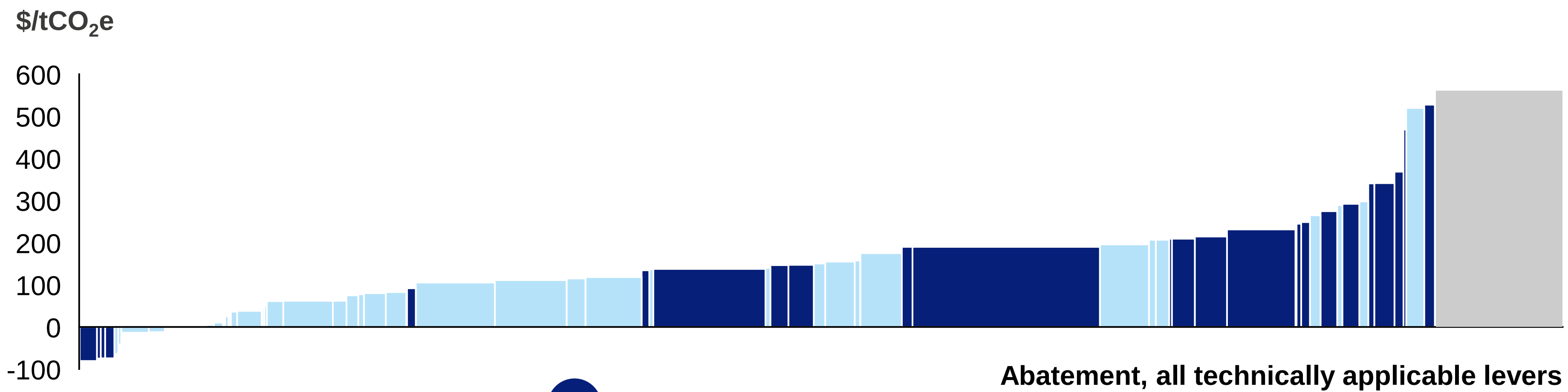
Step 3: Analyze cost and abatement potential – The unconstrained MACC can guide lever prioritization process

Illustrative

Selected applicable levers | De-prioritized levers | Unabated emissions

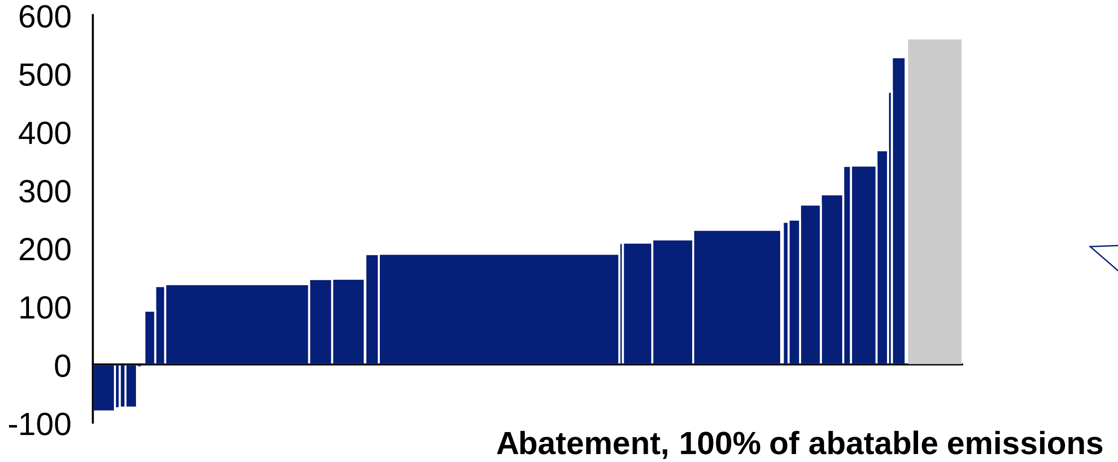
1 Unconstrained MACC

The unconstrained MACC contains multiple levers across same emission types, ordered by cost



2 Prioritized MACC

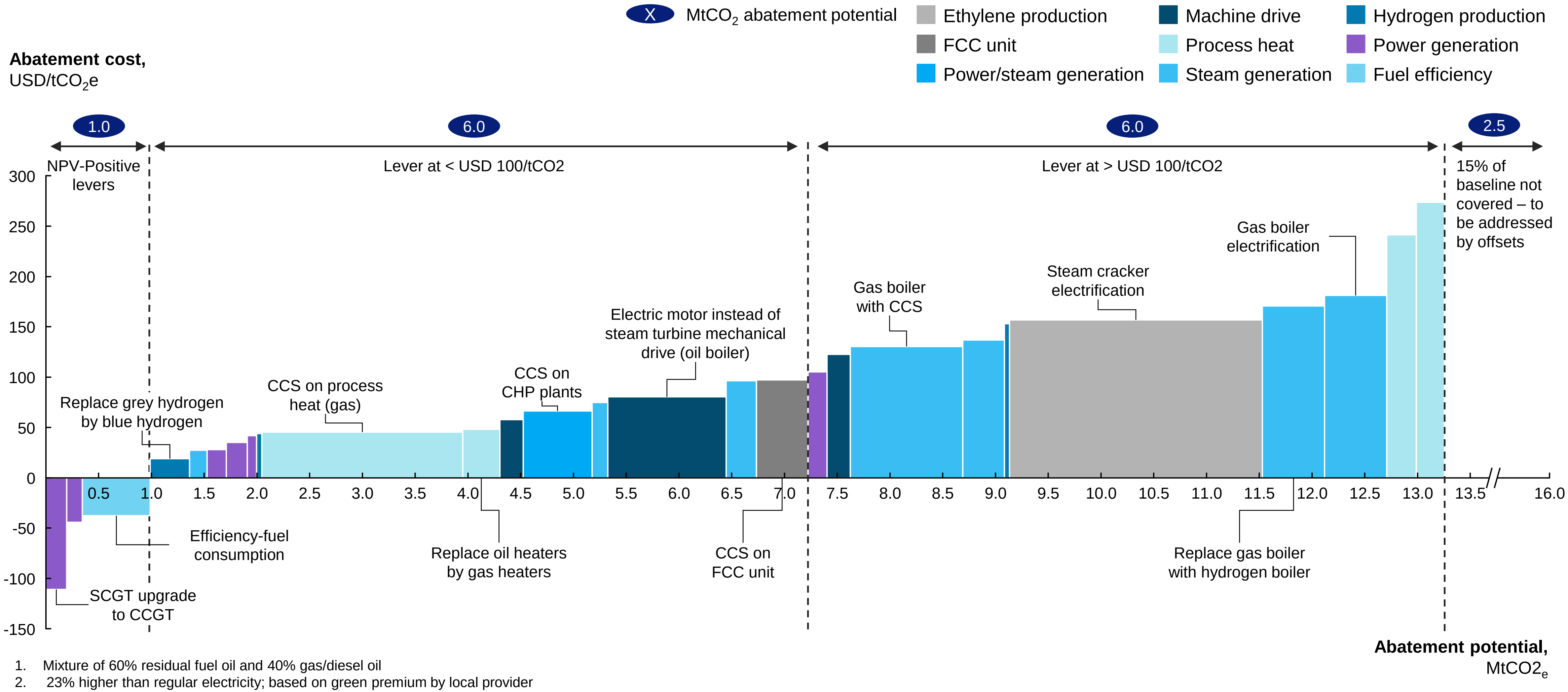
The constraint MACC contains a subset of complementary exhaustive levers covering 100% of the abatable emissions



Regional constraints and asset specific synergies allow to select an optimized list of applicable levers at the asset level

Step 3: Prioritize levers –
Levers could be prioritized and planned based on NPV and impact

MACC for a refinery

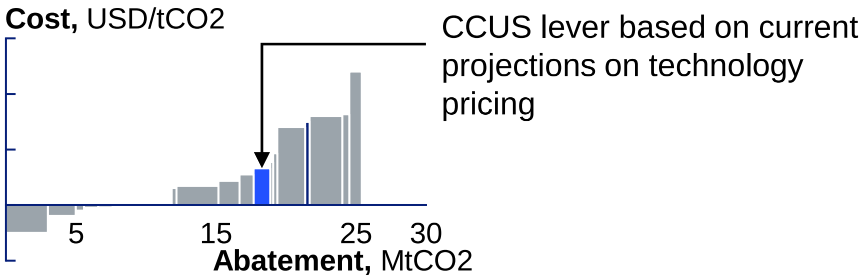
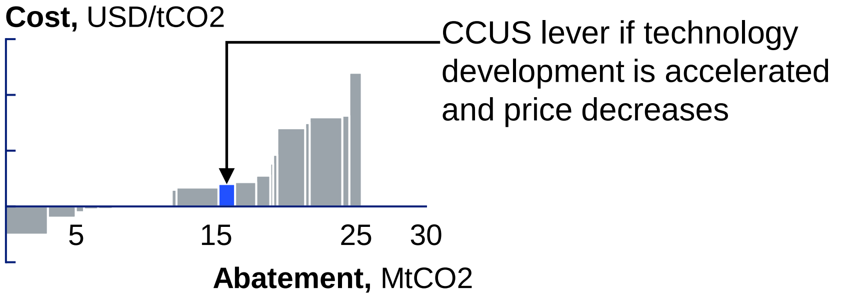
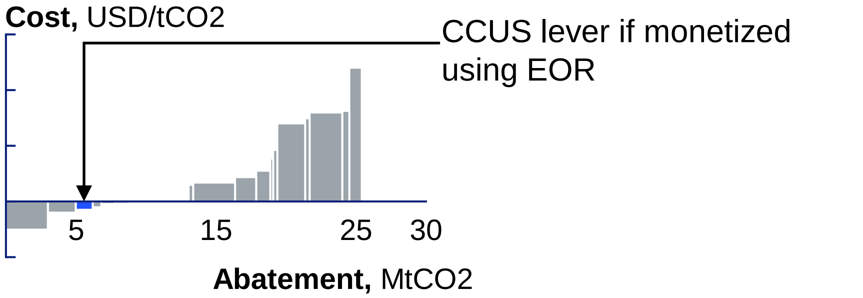


1. Mixture of 60% residual fuel oil and 40% gas/diesel oil
2. 23% higher than regular electricity; based on green premium by local provider
3. Varying from 500 USD/tCO2 for clean sources, such as grey hydrogen production, to 1400 USD/tCO2 in dirty sources such as FCC

Source: McKinsey Energy Insights – Asset Decarbonization Assessment

Step 3: Sensitivity analyses are usually conducted to examine resilience of chosen MACC compared to alternative scenarios

Illustrative

Sensitivities	Rationale	Examples	Illustration
Pace of decarbonization transition	Pace of overall transition, technology availability will impact pricing and availability of levers	• Target 2035 • Target 2050	
Market economy	Market economy dynamics will impact commodity prices and abatement cost	• Sensitivity on gas, electricity prices • Sensitivity on technology development and pricing	
Regulatory landscape	Incentives (i.e., carbon credits, green energy subsidies) and disincentives (i.e., carbon taxes) can change pathway prioritization	• Carbon tax of $100/boe • CAPEX subsidy for Hydrogen • EOR monetization	

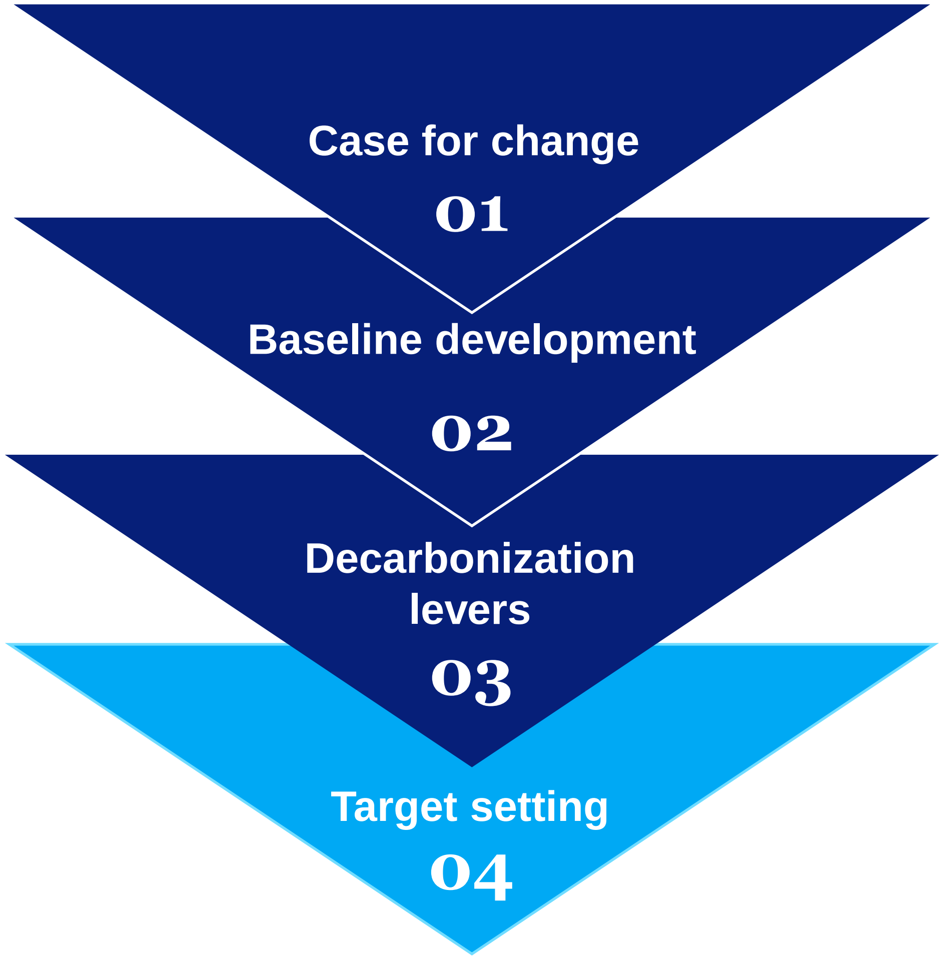
Source: McKinsey Catalyst Zero

Key components of decarbonization target-setting and pathway development

Detailed next

01 Decarbonization trends including regulatory, financial and consumer behaviour changes

Discussed in previous section “Importance of Net Zero in Kazakhstan”



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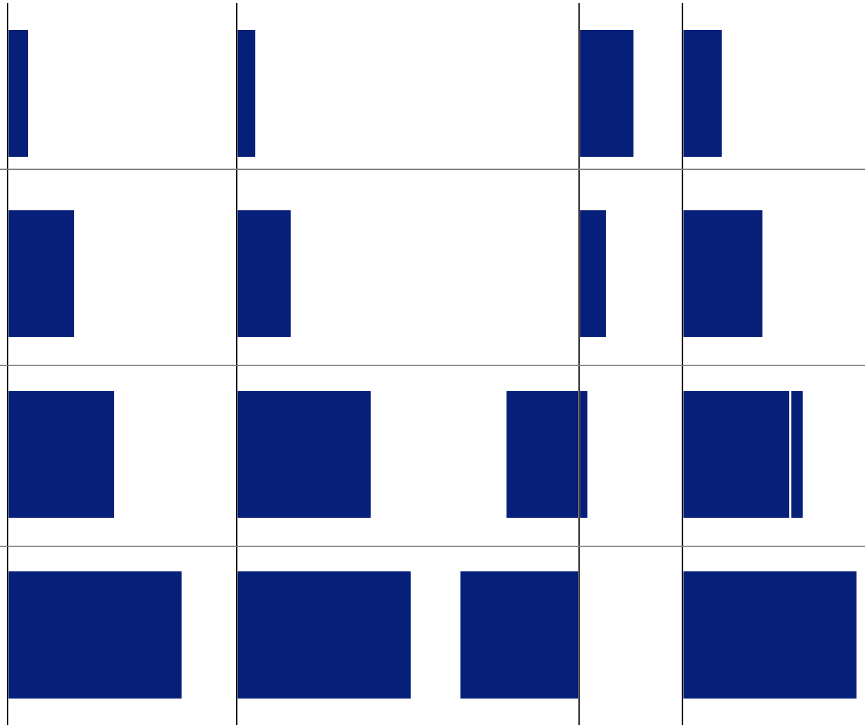
Step 4: Cost curves allow to outline possible options of emission reduction targets and associated costs

Example of 2030/2040/2050 view of progressive decarbonization options

ILLUSTRATIVE- TO BE FILLED BASED ON MACC DATA

						Levers				
Options	**Max cost of abatement** USD/t	**Emissions reduction** kt CO2	**CAPEX,** USD m	**NPV** USD	**Cumulative savings at given CO2 price,** USD M	**1 Energy efficiency**	**2 Technology switches**	**3 Set-up changes**	**4 Heat and power**	**5-7 CCS / DAC / Offsetting**
1 10% reduction	xx					✓		✓ BoB[1]		
2 30% reduction	xx					✓		✓ BoB	✓ RES	✓ Concentrated streams (x%)
3 50% reduction	xx					✓	✓ Green H2	✓ BoB	✓ RES	✓ Concentrated streams (yy%)
4 70% reduction	xx					✓	✓ Green H2	✓ BoB	✓ RES Bio-methane Biomass	✓ Concentrated streams (zz%) Other streams (ww%)

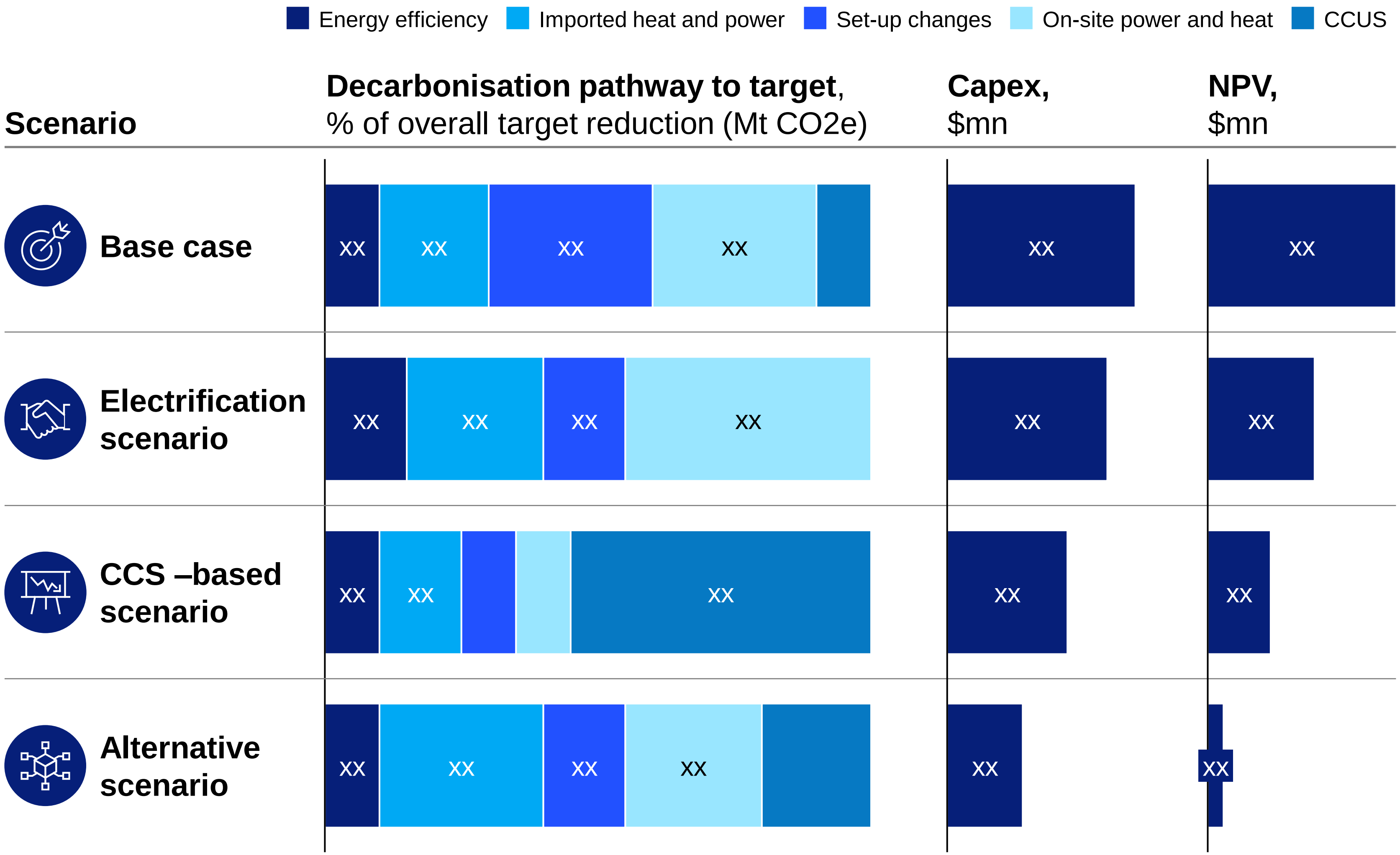


1. BoB - bottom of the barrel

Step 4: Trade-offs between different pathways are assessed to help making executive decisions

Example of decarbonization scenario comparison

ILLUSTRATIVE- TO BE FILLED BASED ON MACC DATA



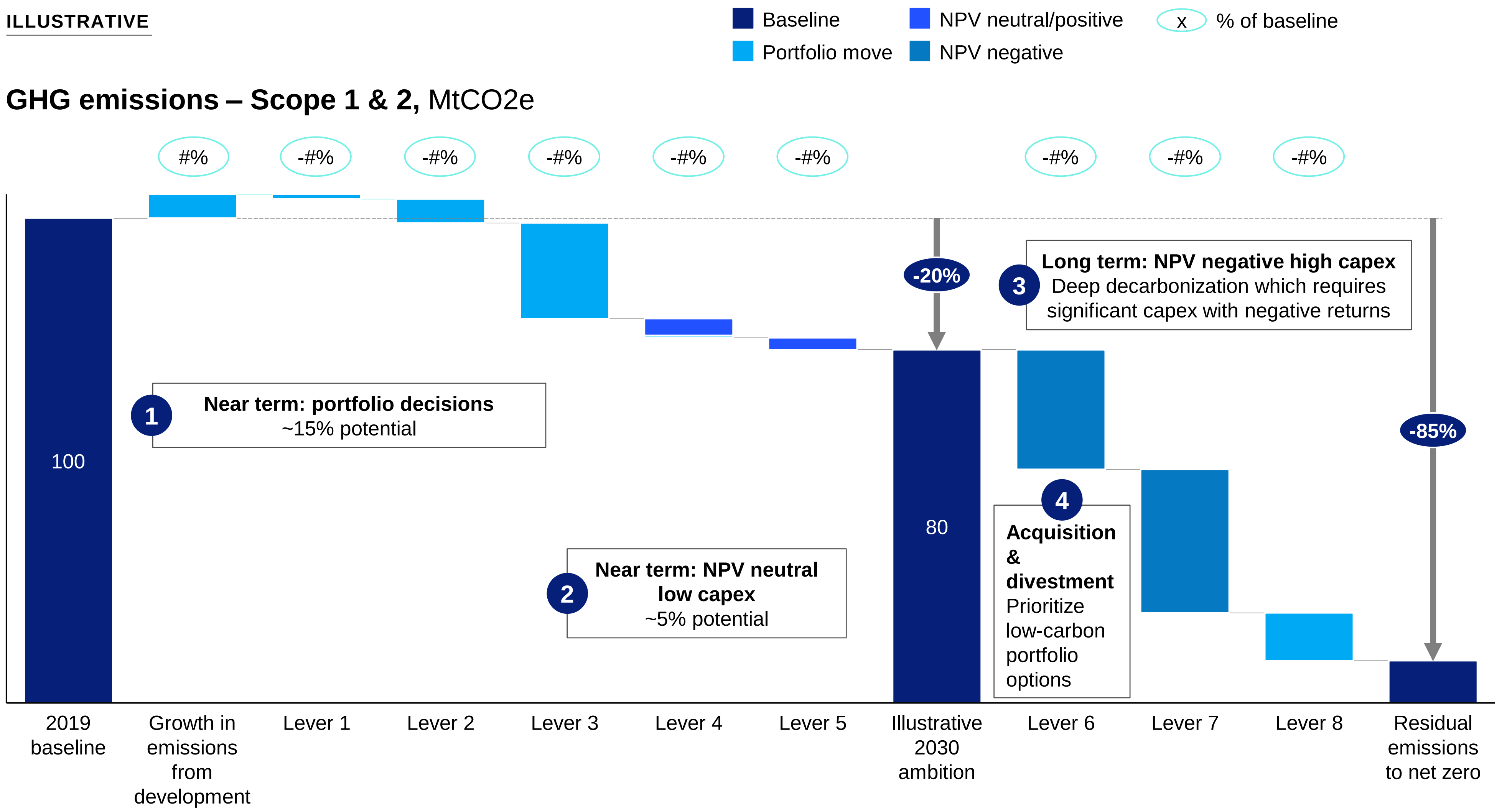
Each pathway has different Capex and NPV profile over time as well as underpinning mix of levers

Deterministic profile prioritizes NPV assuming unconstrained Capex

Depending on priorities decisions can be made to align on sub-optimal pathway in terms of NPV which allows meeting Capex constraints or portfolio priorities (e.g., not decarbonizing declining plants)

Step 4: Prioritize levers and build decarbonization pathway – Planning levers until 2050 will inform a potential decarbonization pathway and indicate the gap to net zero

ILLUSTRATIVE



A potential decarbonization pathway could be built based on lever prioritization

The next section provides additional guidance on how to set the target based on potential pathways including:

- The pathway built on lever prioritization
- A pathway based on leading peer commitments
- Linear 1.5oC and 2oC decarbonization pathways and potential sector-specific pathways

Step 4: High-level roadmap with interim targets will increase target credibility and allow for appropriate tracking

	2025 target	2030 target	2050 goal
Illustrative commitments	• 20% absolute Scope 1 + 2 emissions reduction • Clear roadmap in place for suppliers engagement	• 40% absolute Scope 1 + 2 emissions reduction • 25% absolute emissions reduction for material Scope 3 categories	• Net zero on all absolute emissions
Benefits	• Set early target which can be met through **NPV neutral and regulatory required levers**	• Aligned with **expectations on near-term targets** on absolute emissions • Responsive to external stakeholder pressure	• Aligns with **Paris Agreement 2050 goals** • In line with targets set by **leading peers** • Contingent on selecting and developing core technologies that are **economically viable and technically feasible**

Development of a tactical plan aims to clarify **interim targets up to 2050,** including setting up 2035 and 2040 targets in the future

Step 4: High-level roadmap should include technology choices and cash flow needed for emissions reduction projects

Example of Net-Zero Pathway for Scope 1 & 2 emissions

Illustrative output

Typically, **3-5 scenarios** are created based on

- Investment size
- Key strategic decision
- Key assumptions

Roadmap will incorporate **strategic choices** in technology, implementation **timing** along with key decisions such as abatement cost cut-off

Each scenario will result in **a detailed cash flow** and **emission model** that will enable **stress testing** the scenarios against business and financial metrics

CAPEX | OPEX | Offsets | Emissions intensity | Absolute emissions

Reduce emissions intensity Today to 2030

Pursue NPV-positive abatement, e.g., improve ops efficiencies, high-quality flared gas repurposing

R&D of future abatement tech and **seed offsets**

Reduce absolute and intensity 2030 to 2040

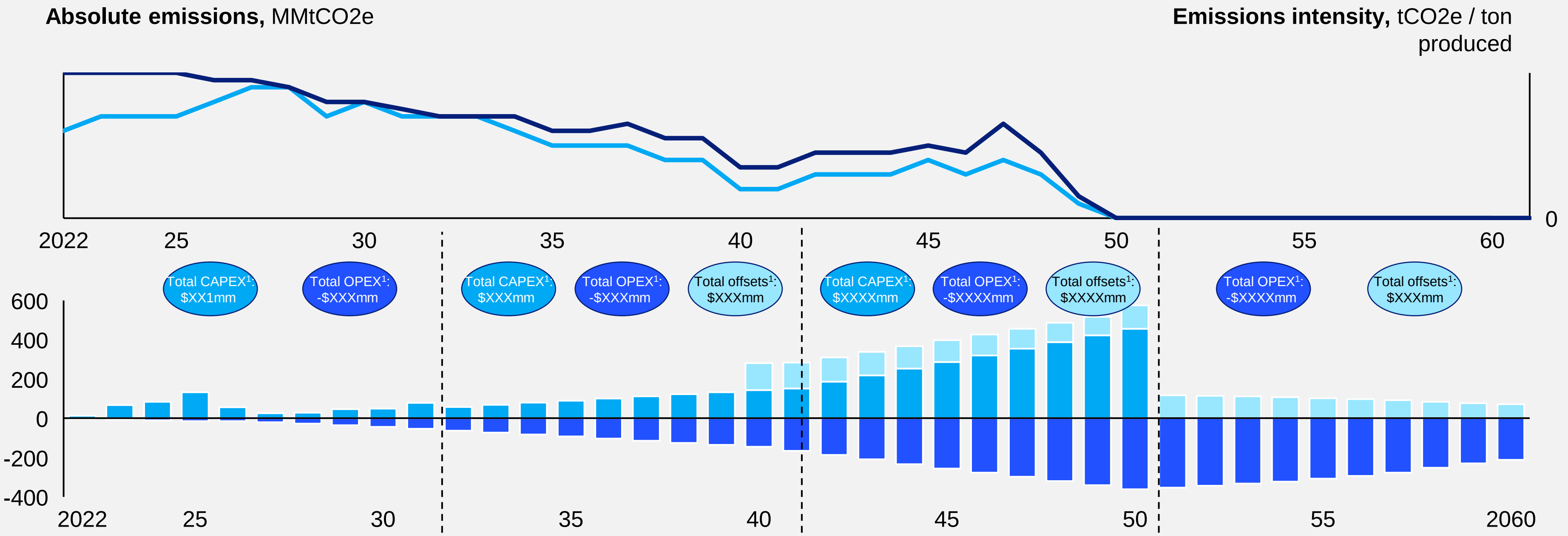
As operated production declines, **pursue abatements of <$50/ton**

CCUS offsets potential as CCS business launches

Drive to Net Zero 2040 to 2050

Decarbonize through CCS and electrification from renewable sources

Carbon offsetting for hard-to-abate emissions (e.g., >$100/ton)



Source: McKinsey Energy Insights: Asset Decarbonization (part of Catalyst Zero)

Over time, the initial decarbonization strategy will need to be translated into specific projects with Capex requirements

Depth of assessment and examples

Granularity of assessment	0 Emission baseline	1 Lever	2 Initiative	3 Specific project	4 Detailed design
		Heat system optimization Increase flaring efficiency	Heat integration Increase flow of air into flairs	Improve heat recovery for furnaces Install flair control systems	Recover heat from exhaust of Furnace A, to preheat product flow B and reduce exhaust temperature to 120 C

Enterprise-level

Business units
e.g., Upstream, Refining

Assets
Asset 1, asset 2

Units
Distill. Column, FCC

Equipments / Systems
Pumps, compressors

Strategic planning

Typically leading to:

- Strategic target-setting and update of the plan based on economic criteria (including cost, capex)
- Prioritization of assets and levers for further progression through implementation

Decarbonization roadmap detailing-out

Typically leading to:

- Update to asset-level long-term CAPEX plan
- Resourcing and launch of dedicated site-led project campaigns (e.g., pump / furnace reviews)
- Update of Group-wide R&D priorities

Implementation

Typically leading to:

- Starting feasibility studies for large-scale CAPEX projects
- Starting detailed design and FEED for small CAPEX projects
- Changes to operating regimes Detailed requirements for R&D roadmap

Next Webinar - Operationalize Net Zero strategy

- **Implementation infrastructure** to ensure rigorous execution (**regular cadence** to track initiatives, **KPIs,** etc
- **Required new competencies** to drive existing initiatives and/or generate new ideas
- **Communication** efforts, e.g. ESG townhall for employees, live dashboards, etc.