



Energy
Transitions
Commission

ETC 2025 Work Programme: impact to date and what's next

ETC Representatives meeting
18 September 2025

2025 ETC Reports

Pillar 1: Amplifying ETC reports

February

May

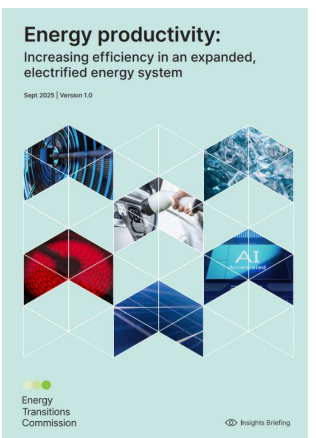
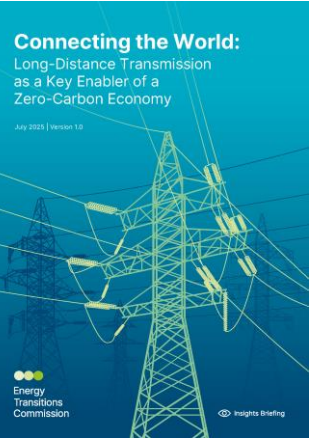
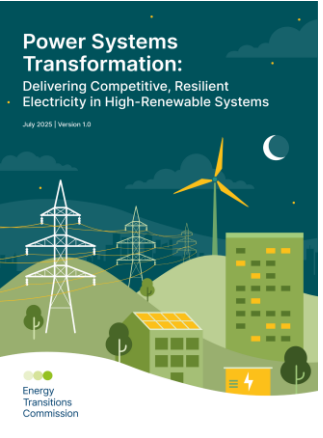
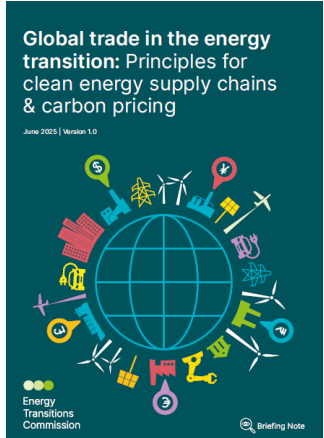
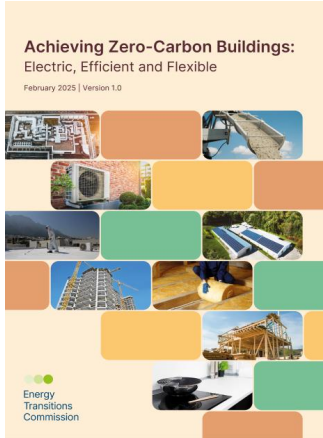
June

July

July

October

November



Upcoming reports

A complete picture of the buildings sector's emissions and energy use. ETC describes how a combination of electric, efficient, and flexible solutions can decarbonise buildings.

High-integrity carbon credits are required to scale up carbon dioxide removals and achieve corporate net-zero targets

Responding to SBTi's updated Net-Zero Corporate Standards consultation

Global trade can accelerate the energy transition through two key areas: following principles for nearshoring supply chains and implementing carbon pricing.

Operating and balancing power systems with high shares of wind and solar (e.g. 70-80%+) is possible through technologies existing today, delivering system stability and round-the-clock electricity.

Long-distance interconnectors play an important role in connecting low-cost clean energy to where it's needed most.

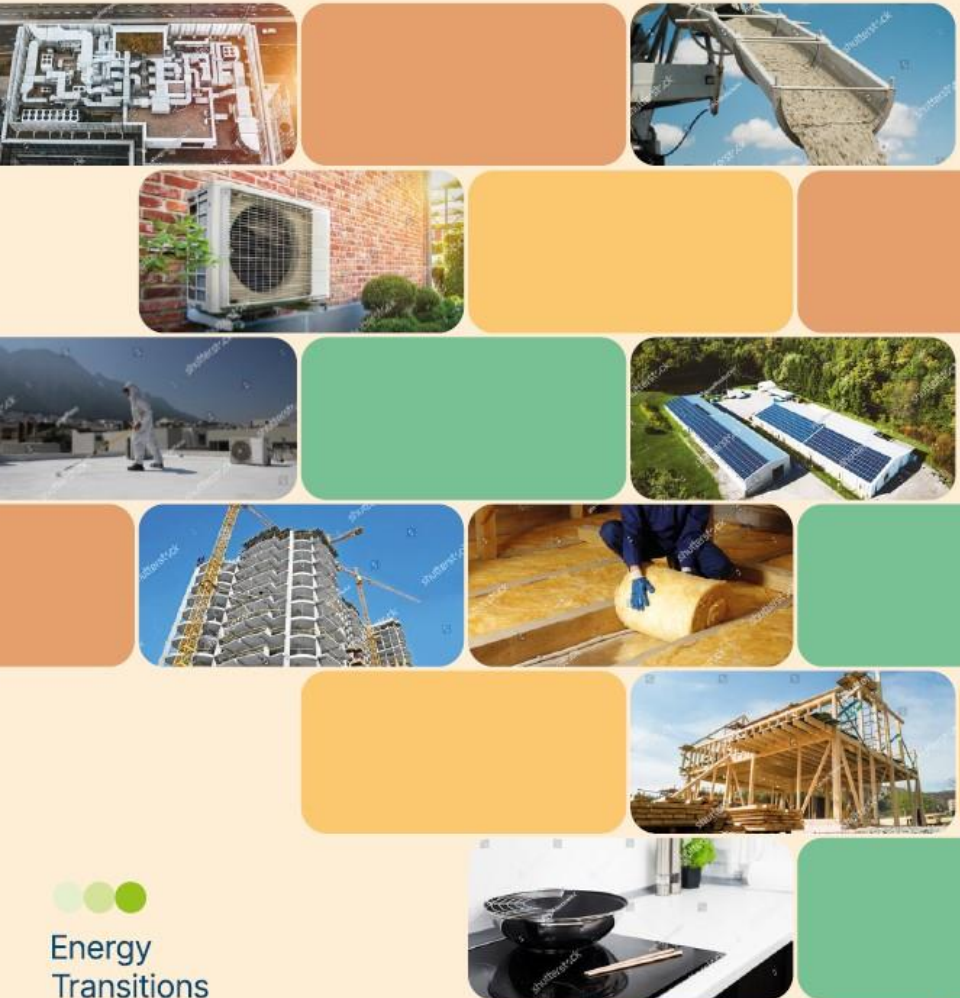
The world can more than double GDP by 2050 while cutting energy use by harnessing electrification, efficient technologies, and smarter material use.

Electrification and circularity can dramatically cut demand for carbon molecules while ensuring sustainable sourcing and safe end-of-life management resulting in zero net emissions.

Achieving Net-Zero Buildings: Electric, Efficient and Flexible

Electric, Efficient and Flexible

January 2025 | Version 1.0



Achieving Net-Zero Buildings: Electric, Efficient and Flexible (2024)

The Report outlines how to decarbonise the energy used to operate commercial and residential buildings, reduce embodied carbon from new buildings and accelerate the buildings energy transition

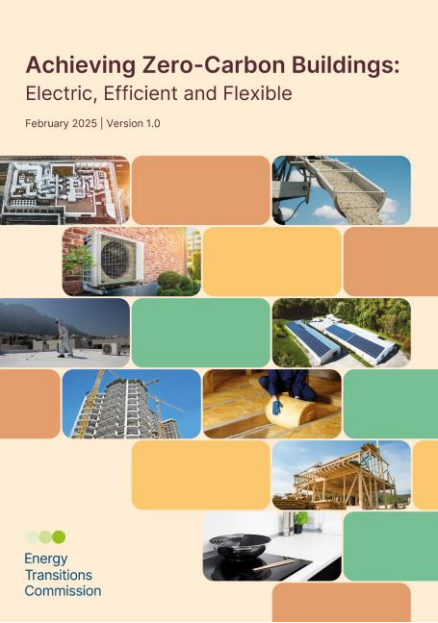
Key points:

- The global buildings sector contributes a third of global emissions (12.3 GtCO₂ in 2022), and 10% of direct use of fossil fuels.
- Key priorities include:
 - Transitioning away from fossil fuels by decarbonising heating and cooking with electric heat pumps and cookers.
 - Increasing the efficiency of growing electrical demand from cooling, appliances, lighting and electrified heating technologies.
 - Reducing the embodied carbon of the next generation of new buildings, by decarbonising steel, cement and concrete, and using alternative lower-carbon materials such as timber and hempcrete where sustainable supply can be guaranteed.
- Underpinning the entire buildings sector energy transition will be energy productivity – using less energy to power buildings, less materials to build, and better utilisation of existing buildings while maintaining the same living standards.

Achieving Zero-Carbon Buildings

Pillar 1: Amplifying ETC reports

February



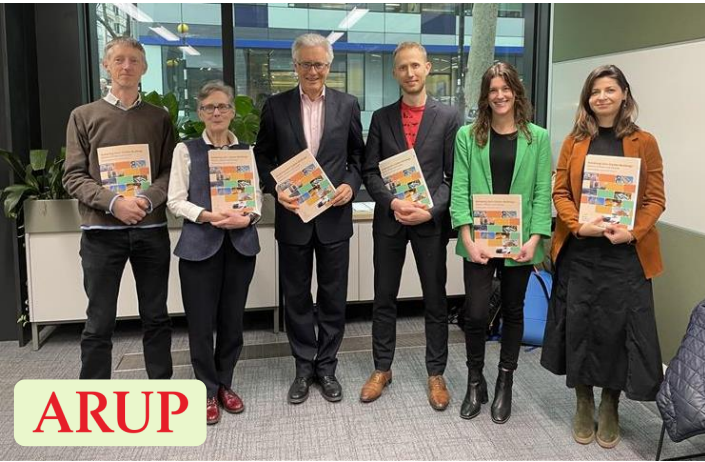
ETC draws a complete picture of the buildings sector's emissions and energy use and describes how a combination of electric, efficient, and flexible solutions can decarbonise buildings.

Targeted international media: trade titles and broadcast. Press release newswire distribution to over 30 countries and embargoed briefings with journalists led to coverage in over 600 news stories at launch.

	Commercial buildings must lead the transition to net-zero emissions
	How to decarbonise the building sector
	Episode 113 Guest: Lord Adair Turner, chair of the Energy Transitions Commission
	Zero-carbon Cooling in a Warming World: Expanding access while reducing carbon emissions



ETC x Arup webinar drew around 300 attendees



Roundtable in Madrid with Built Environment Stakeholders



- ETC members amplified key messages on social media
- Our buildings newsletter issue reached over 24,000 people
- ETC also joined panels hosted by WBCSD and Green Building Council España (GBCE)

Next steps in the buildings campaign

Continue to partner with member organisations



Continue to partner with trade associations



Global Alliance
for Buildings and
Construction



- Global ABC's COP30 pavilion
- Webinar series on heating/cooling and embodied carbon. Featuring insights from:
 - ETC's Buildings Decarbonisation report
 - GlobalABC's 650+ members, including case studies
 - Global ABC's annual global status report: progress towards zero-carbon buildings.

Questions for discussion

- Should ETC engage with EU (or other regions) on buildings legislation?
- Any other partnerships ETC should be engaging with further? E.g., WRI, World Green Buildings Council.
- Should ETC use the Energy Productivity campaign to retell the story with a focus on heating, cooling, cooking, appliances?
- What topics should ETC focus on?
 - Heating & Cooling
 - Embodied Carbon
 - Appliances
 - Commercial buildings



The role of carbon credits in accelerated corporate action

May 2025

Version 1.0



The role of carbon credits in accelerated corporate action (May 2025)

Building on ETC's 2022 report, *Mind the Gap*, this briefing note clarifies the role of high-integrity carbon credits in scaling up carbon dioxide removals and achieving corporate net-zero targets.

Key points:

In March 2025, SBTi published a draft revision of its Corporate Net-Zero Standard V2 (CNZS V2). In response, the ETC published this briefing, generally endorsing the high-ambition corporate strategies set out by the SBTi's Corporate Net-Zero Standard V2.

ETC welcomes additional action on scaling carbon credits outlined in the net-zero standard and notes that:

- Companies should base their use of carbon removals credits on their decarbonisation costs relative to revenue.
- Alongside ambitious Scope 3 emission reduction targets, companies that have low costs of decarbonisation should be required to gradually scale up purchase of carbon removals credits to address residual Scope 3 emissions
- SBTi have an opportunity to recognise companies that choose to be 'net-zero' today.

The role of carbon credits in accelerated corporate action

May



Shared the briefing directly with a list of key stakeholders, media, partners and businesses



“All good ideas, which we’ll consider seriously.”




David Kennedy, CEO of the Science Based Targets initiative



ETC clarifies the role of high-integrity carbon credits in scaling up carbon dioxide removals and achieving corporate net-zero targets, **building on our 2022 report, Mind the Gap.**

Responding to SBTi’s updated Net-Zero Corporate Standards consultation


ETC’s members and partners helped disseminate this visual-led work on social media


 **Julio Friedmann**  • 2nd
Helping Reduce & Remove CO2 from the air and oceans through investment, ...
1w • 



Huzzah! The [Energy Transitions Commission](#) has a new brief.

The ETC’s new briefing note clarifies the role of high-integrity carbon credits in scaling up carbon dioxide removals and achieving corporate net-zero targets. The ETC generally endorses the high-ambition corporate strategies set out by [@Science Based Targets initiative’s Corporate Net-Zero Standard draft revision \(CNZS V2\)](#) as an important step in helping to scale critical carbon dioxide removals.

All y’all can download the full analysis here:
https://lnkd.in/gfvEQ_J2

 **The role of carbon credits in accelerated corporate action**
energy-transitions.org



 You and 21 others 1 comment · 2 reposts

 **WRI Polsky Center for the Global Energy Transition**
1,978 followers
1w • 

The [Energy Transitions Commission’s](#) new briefing note clarifies the role of high-integrity carbon credits in scaling up carbon dioxide removals and achieving corporate net-zero targets. The ETC generally endorses the high-ambition corporate strategies set out by [Science Based Targets initiative’s Corporate Net-Zero Standard draft revision \(CNZS V2\)](#) as an important step in helping to scale critical carbon dioxide removals.

Download the full analysis: <https://lnkd.in/gYZMnak>



 **Industrial Transition Accelerator (ITA)**
1,687 followers
3d • 

The [Energy Transitions Commission’s](#) new briefing note clarifies the role of high-integrity carbon credits in scaling up carbon dioxide removals and achieving corporate net-zero targets.

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Download the full analysis: <https://lnkd.in/emp6kZy5>



Next steps in the carbon credits campaign

SBTi's Corporate Net-Zero Standard V2 will be used to set company targets in 2027

- Over **855 stakeholders** contributed to SBTi's public consultation.
- **Pilot Phase 1: Over 320 organisations** from all regions and sectors took part to further refine the draft Standard.
- **Pilot Phase 2** will test the draft using real-world data to identify any implementation challenges and validate key methodological assumptions.

ETC is part of COP30 Activation group #8 (under axis 3) on 'Landscape regulation and regenerative agriculture'.



ETC's 100 Mt/year by 2030 biochar target from 2021 *Mind the Gap* report is likely to underpin a "Plan to Accelerate Solutions" at COP30.

Questions for discussion

- **What other activities should ETC pursue in this space?**



Global Trade in the Energy Transition

Pillar 1: Amplifying ETC reports

June



At launch, presented key insights to the OECD



ETC members helped disseminate the report and findings on social media

Faustine Delasalle • 1st
Chief Executive Officer, Mission Possible Partnership
22h • 🌐

New briefing note from the [Energy Transitions Commission](#) on "Global trade in the energy transition: principles for clean energy supply chains and carbon pricing".

Clean trade can be a powerful accelerator of the global energy transition, enabling clean energy supply chains to scale up faster. However, growing concerns over concentrated supply chains and perceptions that carbon border adjustments are protectionist could significantly delay global progress.

Jean-Pascal Tricoire • 3rd+
Chairman at Schneider Electric
20h • 🌐

As the global energy landscape evolves, policy must keep pace. The [Energy Transitions Commission's](#) latest briefing offers timely insights on aligning technological progress and carbon pricing with effective global trade.

The ETC outlines a pragmatic and principled approach to two critical challenges:

- Building resilient domestic supply chains – Six policy principles to guide national strategies.
- Carbon pricing and CBAMs – A call for globally coherent policies to decarbonize hard-to-abate sectors.

Alan Thomson • 2nd
Director, Global Energy Business Leader at Arup
23h • 🌐

If you would like to know more about CBAM, carbon pricing, clean supply chains and other global net-zero mechanisms it is worth a read of this recent report from the Energy Transition Commission, one of Arup's Strategic Global Partners. A really concise, well written and informative overview of this rather dry, but important subject. [#Arup #CBAM](#)

Targeted international media, Tier 1, and trade outside of UK and US. Press release distribution to 30+ countries and briefings with journalists led to coverage in over 200 news stories around launch.

ETC discusses the role of trade in accelerating the energy transition and highlights two key areas: principles for nearshoring supply chains and carbon pricing.

- BusinessGreen** Report: Carbon levies and diverse supply chains 'essential' for energy transition
- Energy Monitor** ETC briefing highlights global energy trade challenges
- CARBONCOPY** Carbon Pricing Key to Drive Decarbonisation in Internationally Traded Sectors
- Borderlex** Interview: Europe 'can win argument' over carbon border adjustment

The block contains logos for CGTN and CNA. To the right is a promotional image for a 'PLUGGED IN' news segment. The image shows two men, one wearing headphones, with the text 'Does the EU energy transition need China?' and 'Hosted by: Brigitta Richard Swenson Editor-in-Chief, Montel'. The guest is identified as 'Guest: Lord Jonathan Adair Turner Chairman of the Energy Transitions Commission'.

Next steps in the Trade campaign

Further engagements with regional focuses



- **Late October:** Engaging with Chinese policymakers around the Bund Summit
- Participation in track-two dialogues with private sector companies



- **Late November:** Longi event with high-level business leaders (c-suite) on European supply chain and solar – ETC will participate and share insights from the report



- **After Climate Week NYC (/2026):** Pitch narrative to mainstream podcasters to engage with US. Could hook onto any further news on Trump's tariffs?
- Journalists that cover trade (not ETC's usual audience)



Questions for discussion

Stakeholder engagement

- Is there more we should be doing with the OECD to further this campaign?
- Which other key geographies to engage?
- Who are the other voices / what are the other views in this debate that we should consider?
 - How should we be engaging with LMICs who will have limited government capacity and where domestic prices could be impacted?

Content

- Is there any related work (analytical, policy, or implementation) that we should be aware of?

Private sector strategy

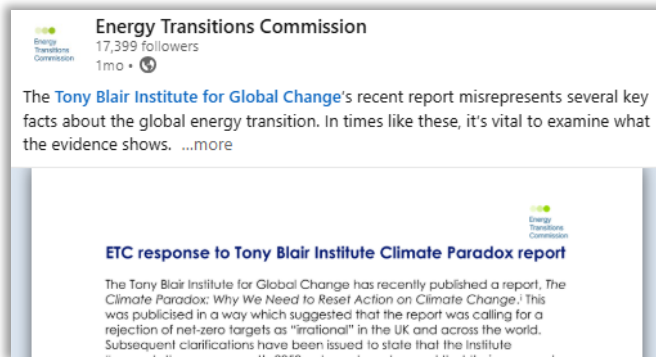
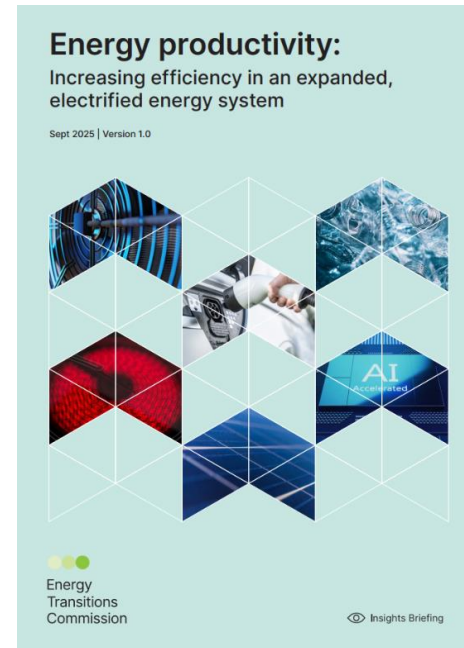
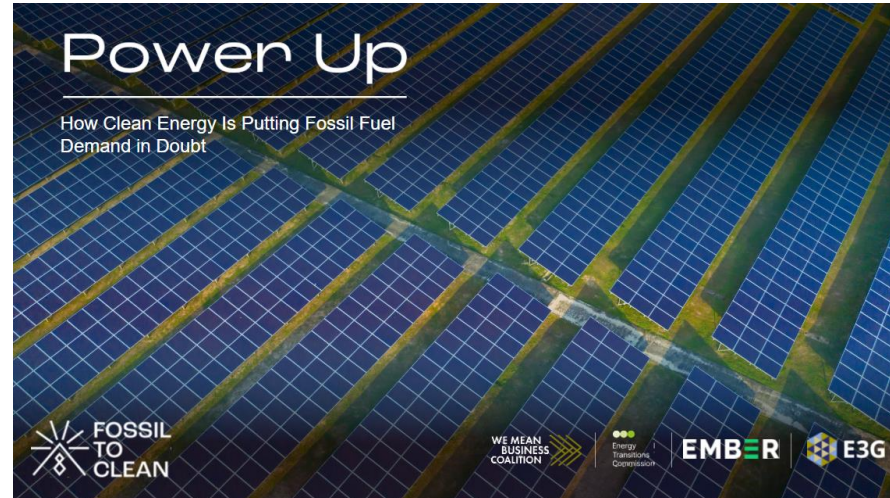
- Have companies started adjusting strategies in response to the CBAM and if so, what issues are you seeing?

ETC has sought to more actively engage in the state of transition debate



published a paper that misrepresented several key facts about the global energy transition.

Within a couple of days, ETC responded providing an evidence-based perspective, to educate, inform and combat disinformation.



ETC's statement was welcomed by industry leaders, including from Impax, Ember, and MPP for setting the record straight.

New analysis based on existing data *Power Up: How Clean Energy is Putting Fossil Fuel Demand in Doubt* (published Sep 17th), shows the world is speeding up on clean energy use and infrastructure development, and as a result demand for oil, gas and coal is set to slow or peak in the next few years.

WMBC, ETC, Ember and E3G reviewed existing reports to repackage the story into a joint narrative

Electrification is a key driver of productivity, enabling GDP to grow while energy demand falls. Delay this decade means locking in fossil fuel demand.

ETC sought energy efficiency group **Mission Efficiency** to ensure their voice reflects our analysis and key messages

We have a strong level of external engagement, beyond ETC membership

Over 60 events this year

And over 160 bilateral meetings, including interviews and podcast recordings



Informing the influencers and extending our reach

ETC has increased focus on international media

Descarbonizar los edificios a bajo coste

Expansión

US climate retreat highlights need for China-EU green co-op

GT Global Times

Von Immobilien zu Real Assets
Die Rolle der Erneuerbaren Energien in der Energiewende

[The Property Post]
Das Online-Meinungsportal für die deutsche Immobilienwirtschaft

Translating key ETC insights into foreign languages supported by youth ambassadors



Content "drops" to be translated into 150+ languages supported by 1200 activists

Reaching wider groups through events



KEELE WORLD AFFAIRS
Europe's Leading Series of Lecture Meetings on International Politics and Global Issues

Providing energy transition facts across the political spectrum



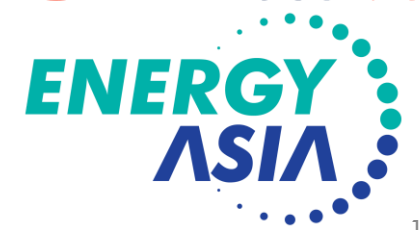
Partnering to drive greater impact and reach



Reaching new audiences at international events



High-Level Panel
Charting the Path: Catalyzing Leadership to Drive Systemic Change

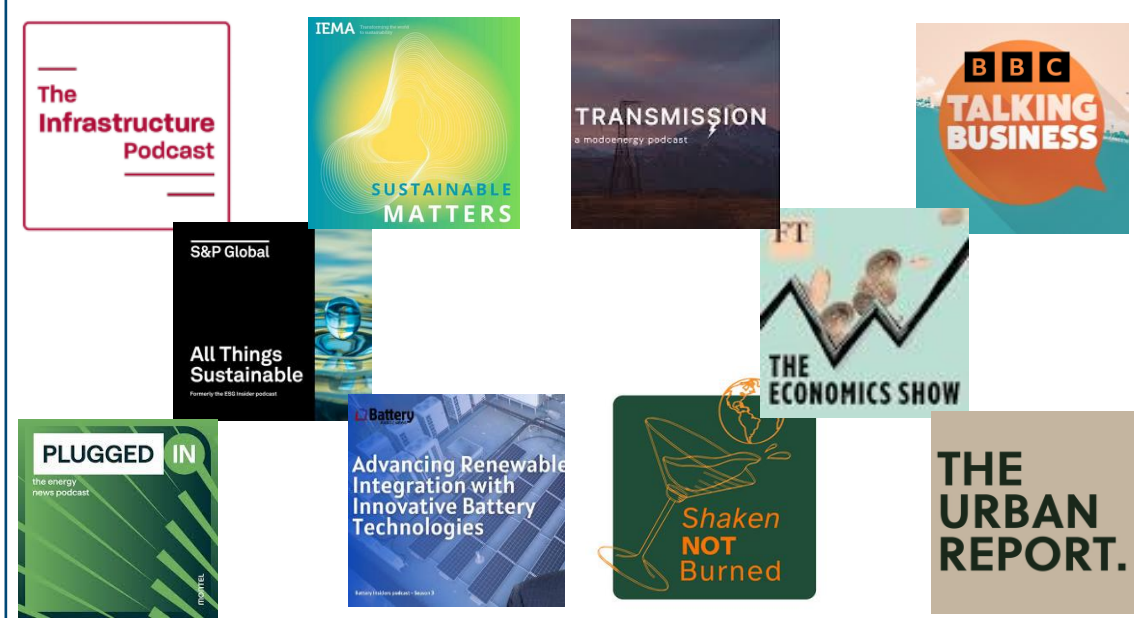


Delivering companywide webinars to maximise reach



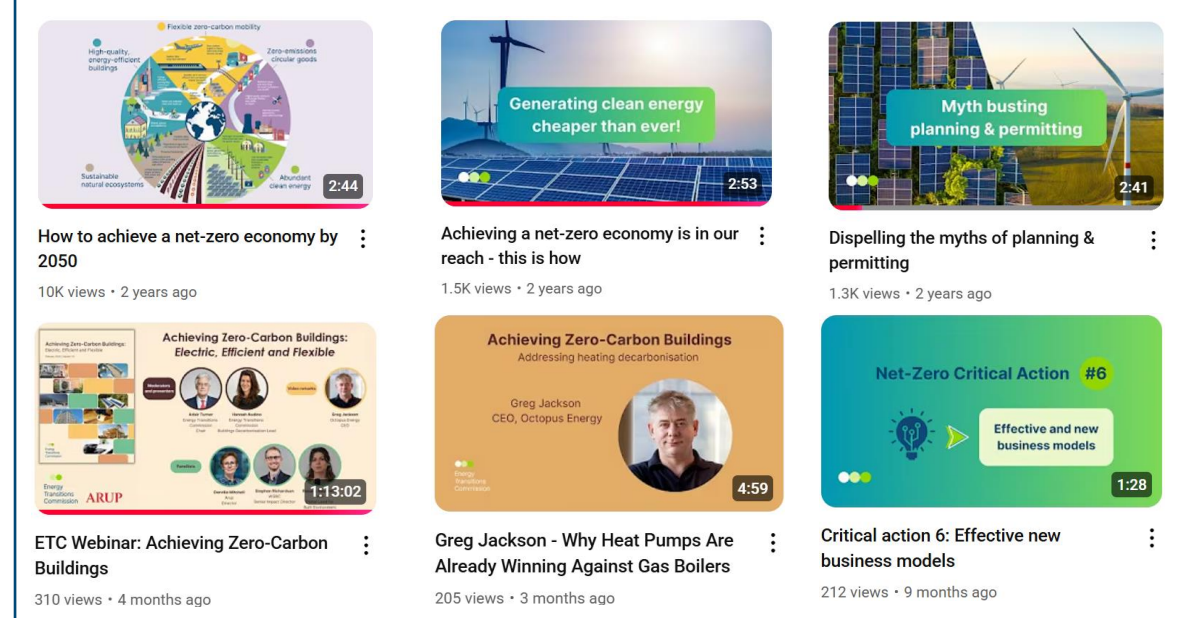
2025 has seen a renewed focus on podcasts and YouTube refresh

Recorded 10 podcast episodes



ETC have been successful at broadening our appearances on traditional Energy/Infrastructure podcasts

Refreshed ETC YouTube, longer-form content focus



Video thumbnails/titles of library updated, new longer form content prioritised to provide new routes to ETC content

ETC are seeking to further broaden our reach by landing spots on mainstream podcasts and working with leading YouTubers



New engagement in 2025 are leading to new possibilities...

Collaborations with YouTube channels

Arranged partnerships with prominent youtubers (500k+ subscribers) to feature ETC content in their videos



Partnerships with youth organisations

Collaborating with climate youth leaders to increase ETC content reach, translate reports into more languages and have youth ambassadors disseminate insights



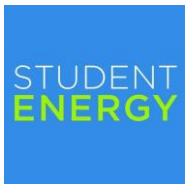
Assured energy transition fact database

Database of top ~20 misinformation tropes, equivalent facts and sources, with endorsement from global business leaders. Strategic interventions with senior media execs to “focus on facts”



Energy Transition 101 for Civil Society “data for the people”

Provide activists and students a common baseline of understanding of energy, the transition, and key recommendations to campaign for



Collaborations with other key actors

- Formalising partnership with **Global Optimism**
- Distributing energy productivity insights through **Mission Efficiency**
- Collaborating with **Global Alliance for Buildings and Construction** on webinars and decarbonising buildings

...but we could go even further in our engagement efforts

Globally



And in key regions



EUSEW 2025 Young Energy Ambassadors



Looking ahead to the rest of 2025



New York Climate Week, 21-28 September

- Adair will be ETC's main representative (21-23), supported by Maaïke Witteveen (21-24) and Peter Hulshof (21-24)
- ETC will not be hosting events, but are attending key events:
 - 21st: MPP "Build Clean Now" CEO dinner event, Mission 2025 events, perhaps with Christiana Figueres
 - 22nd: Utilities Alliance CEO Dinner and presentation of ETC Power Report
 - 23rd: Global Renewables Summit CEO lunch and roundtable on Future-proof power systems: flexibility, storage, grids and interconnection



There is still limited availability to secure ETC speakers for member hosted/recommended events, please let us know if opportunities arise



COP30 Belém, 10-21 November



- Adair will be ETC's main representative (11-20), supported by ETC+1 (...) and ETC Vice-Chair Faustine Delasalle (...)
- ETC has been invited to participate in the COP30 Action Agenda, regarding bioenergy and carbon removals
- Plans are in early stages, we are exploring:
 - *Speaking at the GRA Renewables Summit*
 - *Speaking at Buildings Pavillion for the UN Cool Coalition*
 - *Support for the MPP/ITA campaign*
 - *Continued opportunities with Mission 2025, WMBC, ECIU, GSCC*
 - *Wider events for members*



We are still in early stages of planning for COP30 and are very open to participating at events hosted or recommended by members



Low-carbon molecules



Key ETC focuses for the Autumn: Carbon Molecules and Energy Productivity

WIP title and cover

Carbon in Transition:

Innovations for sourcing and managing sustainable carbon

Executive Summary | Aug 2025 | Version 1.0



Energy
Transitions
Commission

Briefing Note

Even in a net-zero world, carbon molecules remain essential. **Electrification and circularity** can dramatically cut demand while ensuring sustainable sourcing and safe end-of-life management resulting in zero net emissions.

Launching in Autumn 2025

Provides a holistic roadmap for managing carbon in a net-zero system ahead of COP30, ensuring discussions extend beyond energy supply to include materials, circularity, and end-of-life strategies

WIP title and cover

Energy productivity:

Increasing efficiency in an expanded, electrified energy system

Sept 2025 | Version 1.0



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Commission

Insights Briefing

The world can more than **double GDP** by 2050 while cutting energy use by harnessing electrification, efficient technologies, and smarter material use, turning the **COP28 efficiency pledge** into a practical pathway

Launching in Autumn 2025

Frames and guides delivery of COP28 pledge to double the global rate of energy efficiency improvement by 2030.



The Carbon Molecules workstream is heading into its final stages

Overall objective of the carbon molecules workstream

Understand the volume of carbon molecules demanded in a low-emission future for the energy and materials sectors, and how to supply that demand in an optimal and sustainable way.

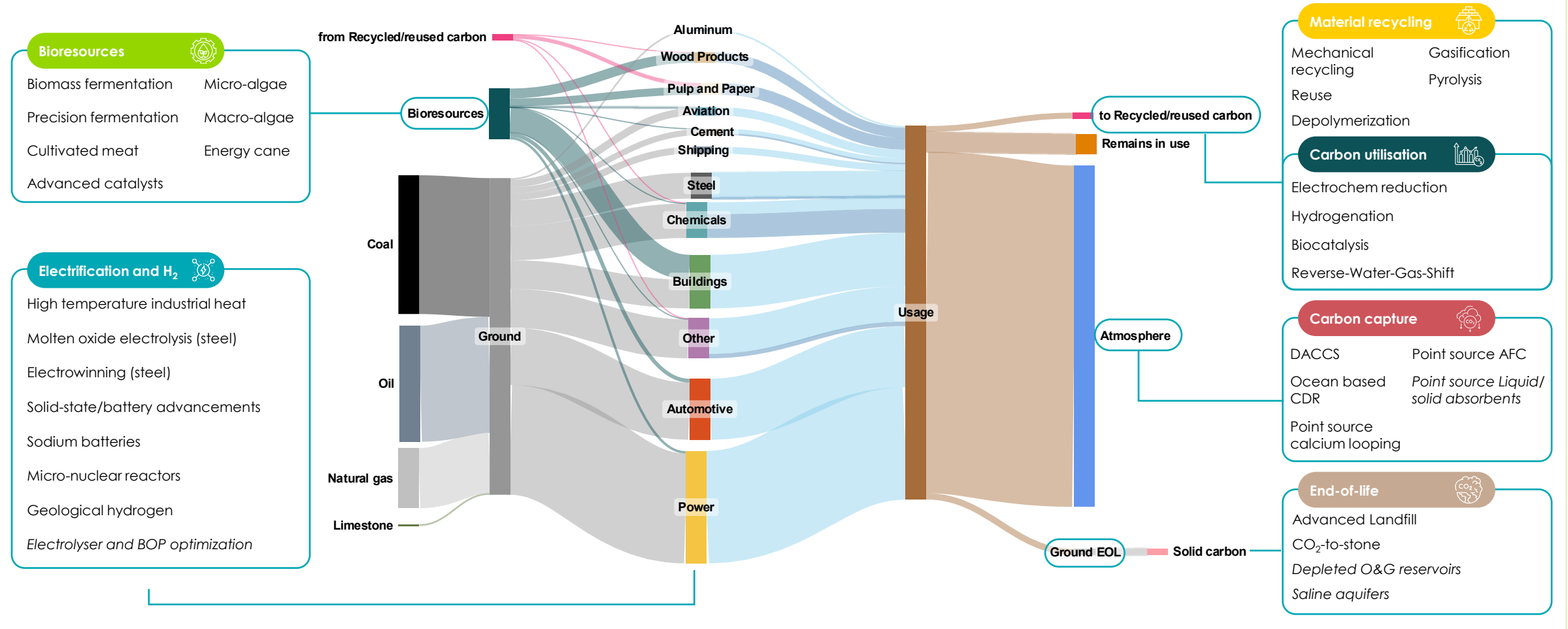
	2024	2025			
	Q4	Q1	Q2	Q3	Q4
Workplan	<p>Phase 1A How large can and should the role of direct electrification be in a zero-emission economy</p> <p>Phase 1B The role of hydrogen and derivatives (i.e., ammonia) in a zero-emission economy?</p>	<p>Phase 2 The potential to recycle and reuse carbon molecules</p>	<p>Phase 3 Sources of primary carbon: costs and sustainability and end-of life carbon management</p>	<p>Phase 4 Report production and communication campaign running into COP30</p>	
Deliverables	<p>For each phase</p> <ul style="list-style-type: none"> • A 5-pager published externally • A series of short innovation briefs for publication 			<ul style="list-style-type: none"> • Publication of the ETC report ahead of COP • A series of short innovation briefs for publication 	
Key interactions	<p>For each phase</p> <ul style="list-style-type: none"> • 1-2 workshops with ETC Commissioners 			<ul style="list-style-type: none"> • Report reviews • Report launch at COP 	

Current phase



We explored 30+ emerging technologies that shape the way carbon is sourced, used and managed at end of life

Carbon source and destination for the Energy and Materials Sectors, today



Technologies with low energy requirements, like reuse and recycling, currently have the lowest cost of abatement.

Emissions abatement cost in 2030/2035, \$/tCO₂e



Innovation / technology	Cost (\$/tCO ₂ e)	Counterfactual
Electrochem. reduction to methanol	2,092	Fossil methanol
Hydrogenation to methanol	1,077	Fossil methanol
Macroalgae - energy	1,065	Diesel
RWGS to methanol	1,021	Fossil methanol
Hydrogenation to methane	903	Fossil methane
Bio-Ethylene Innovative	638	Fossil ethylene
AtJ Innovative	563	Fossil kerosene
DACCS	498	n.a.
GTF Innovative	417	Fossil kerosene
Gasification	253	Fossil methanol
HEFA Innovative	247	Fossil kerosene
Solid-state batteries (shipping)	221	Fossil-fuelled containership
Electrified kiln (cement)	200	Conventional kiln
o-CDR	173	n.a.
Biocatalysis to ethanol	171	Corn-based ethanol
Incineration + CCS	130	Incineration (no CCS)
Point source - liquid absorption	126	Cement (unabated)
Depolymerization	113	Fossil PET
Process modification (AFC)	110	NG power (unabated)
Point source - calcium looping	108	Cement (unabated)
Pyrolysis	53	Fossil ethylene
Electrowinning (steel)	46	Blast furnace
MOE (steel)	41	Blast furnace
e-cracker (chemicals)	38	Naphtha cracker
Advanced landfill (MRBT)	17	Managed landfill
Mechanical recycling	-91	Fossil PET
Reuse	-106	Fossil PET

Key messages

1. Reuse and recycling has negative cost of abatement
2. Direct electrification technologies (electro winning, MOE, and e-cracking) are low-cost options if they progress to a higher TRL level
3. CCS is economic, but DACCS projections for 2030 are still very expensive
4. CCU is very expensive and cannot play a major role yet

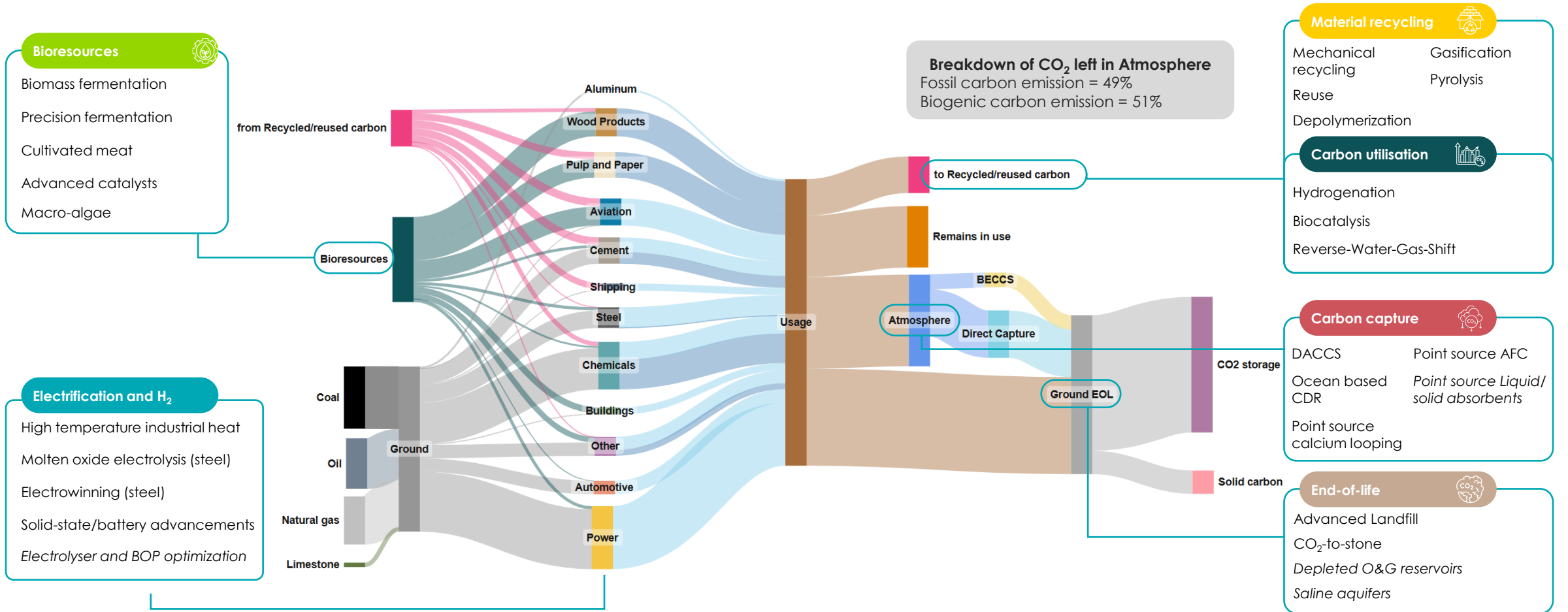
DAC, gasification and CCU **are energy intensive**.
Their competitiveness depends on cost of clean electricity

Hence, in the long term their role might be more significant than the chart suggest



Net zero 2050 balance shows 57% of carbon supply still derives from fossil fuels extracted from the ground

Carbon source and destination for the Energy and Materials Sectors, ACF scenario 2050



Key messages from the forthcoming Carbon Molecules report

Key messages

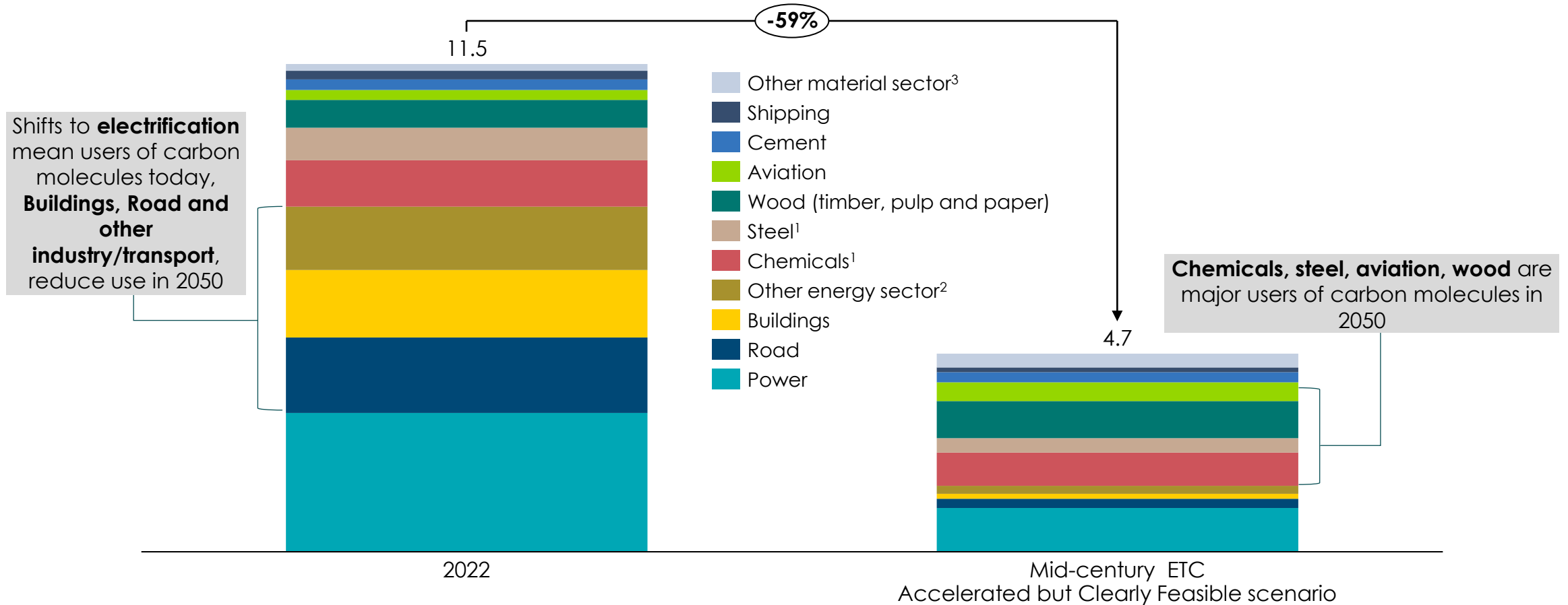
- 01.** **Electrification technologies and re-use models are most effective** for reducing carbon demand further, and offer low abatement costs relative to sourcing and other circularity technologies
- 02.** **Carbon demand will persist** even in a decarbonized world. Around **~3-5Gt** of carbon will be needed across energy and materials sectors. It must be actively planned for and managed.
- 03.** **Around a third of carbon used could be circular, but we need intervention to realise this**, as the business case is challenging across multiple recycling and carbon utilisation technologies
- 04.** **Sustainable primary carbon is constrained (biomass), or emerging (DAC, ocean-based), but there is upside potential to biomass** through alternative protein biotech and utilising degraded land. This land-use would have to be carefully governed to avoid food security and biodiversity risks
- 05.** **Linear end-of-life solutions, such as CCS and landfill to waste are being advanced**, and will play a role, especially where circularity solutions are challenged. These technologies would provide the necessary backstops, and pragmatic solutions especially in the near term.
- 06.** **Deep technology innovation is essential to close the gap**—promising technologies such as steel electrification, high temperature heat, alternative proteins, and O-CDR are still at early stage and there is uncertainty around costs



2. Carbon demand will persist even in a decarbonized world

Carbon Demand Across the Energy and Material Sectors

Gigatons of carbon (C)



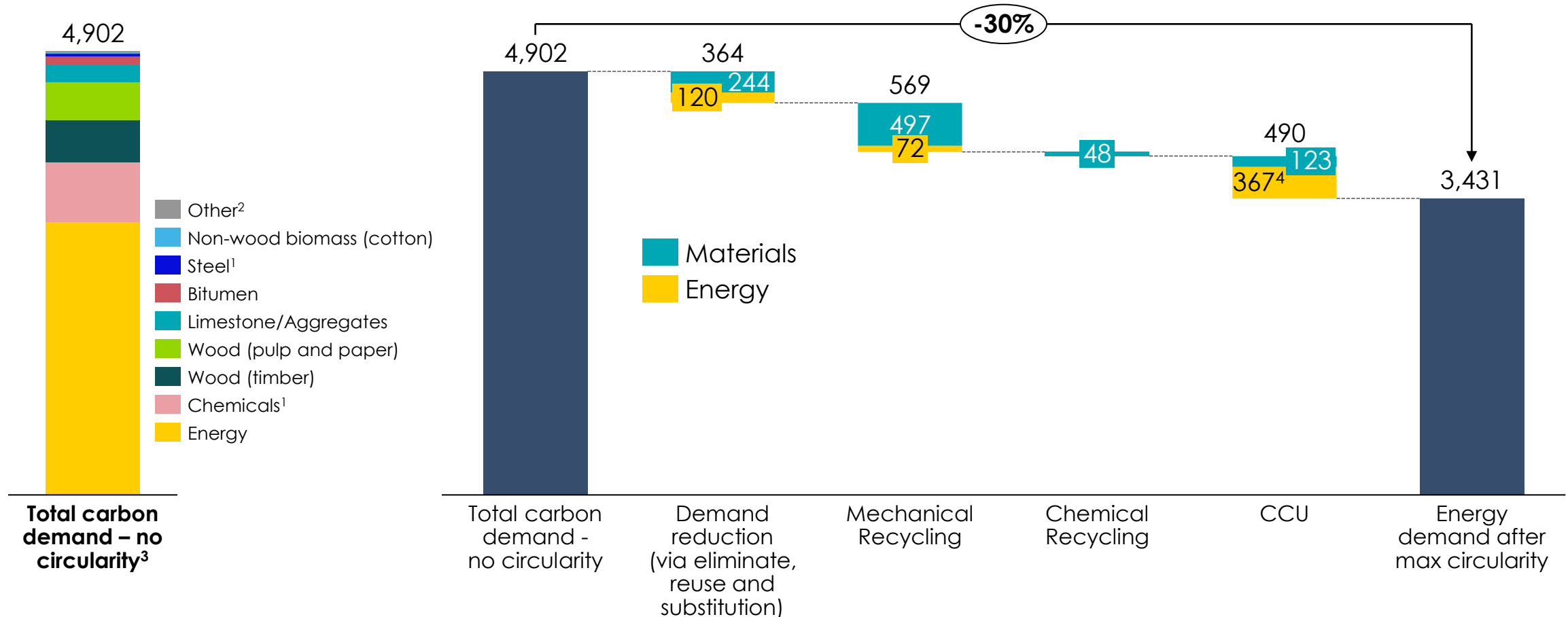
Notes: *ACF = Accelerated but Clearly Feasible scenario, based on ETC Fossil Fuels in Transition (2023) with minor updates. Sources: Chemicals: Planet Positive Chemicals Report (Systemiq, 2022, BAU Net-Zero scenario); Biomass: ETC Bioresources report (2021); Steel: MPP STS (2022); Cotton, Bitumen and Soda Ash: Systemiq analysis (2025). 1. Include energy based carbon feedstocks, a proportion of which which end in the final products (e.g. chemicals for plastics and steel), and others end in process emissions. 2. Includes remaining demand remaining sectors, primarily other industry and other transport. 3) Other material sectors include non-wood biomass, limestone, carbon ash, biochar, carbon fibre and charcoal. Carbon-based fuels include those fuels that also require carbon sources, e.g. e-methanol and synthetic aviation fuels.



3A. Maximum material circularity can reduce primary carbon demand in 2050 by 30%

Carbon Demand Across the Energy and Material Sectors, 2050

Million tons of carbon (C)

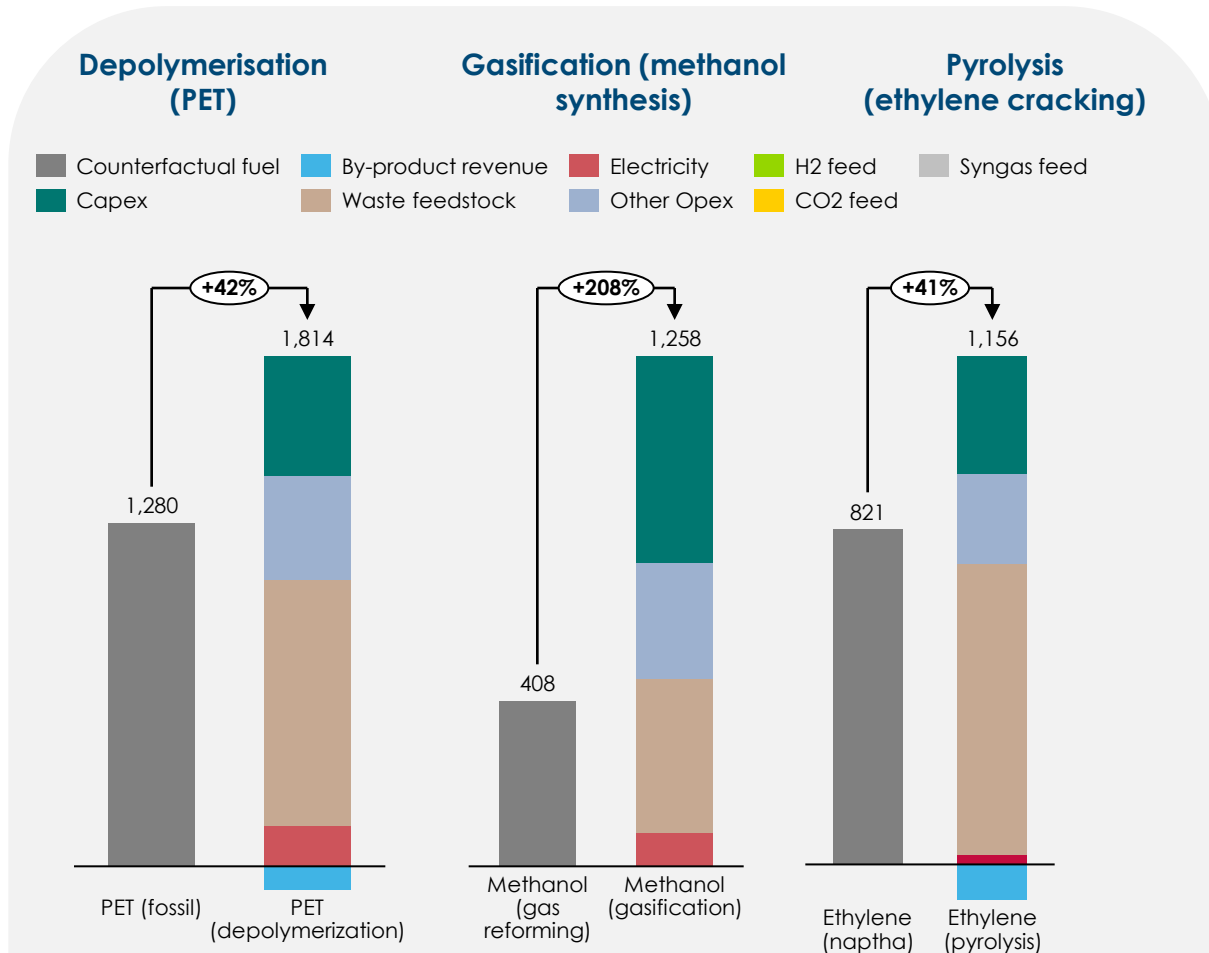


Notes: 1) Chemicals and steel include the feedstock from the energy system that has remained in material, i.e. plastic, in order to show the circularity levers. 2) Other includes carbon ash, biochar, carbon fibre, charcoal based on range in Systemiq reports. 3) Total carbon demand is shown without applying the circularity levers of ACF. 4) EOR is not reducing the carbon demand. Sources: Energy: Systemiq analysis (2025), based on Fossil Fuels in Transition (ETC, 2023); Chemicals: Planet Positive Chemicals Report (Systemiq, 2022, BAU Net-Zero scenario), and Systemiq (2024) Plastic Treaty Futures.; Biomass: ETC Bioresources report (2021); Steel: MPP STS (2022); Cotton, Bitumen and Soda Ash: Systemiq analysis (2025)

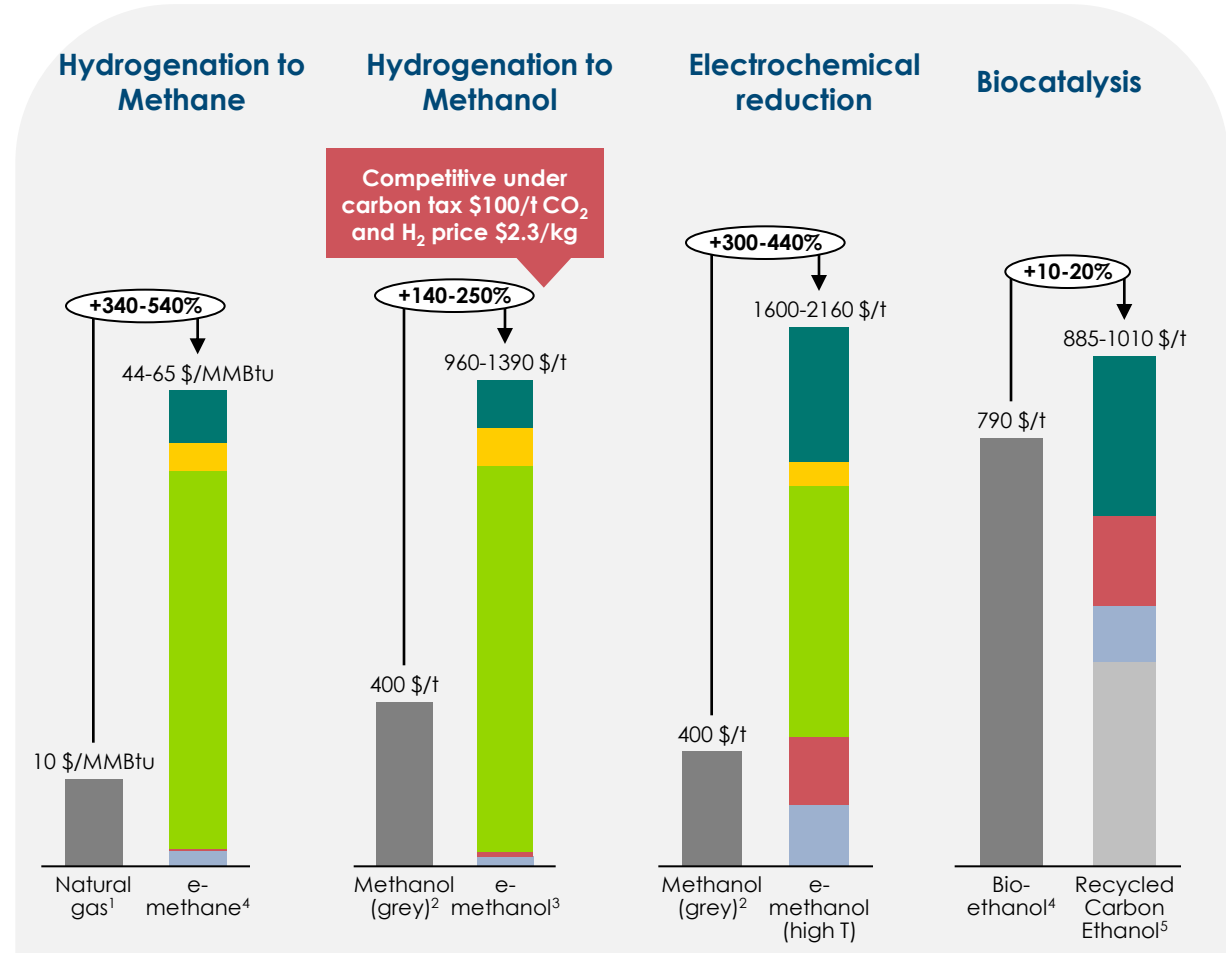


3B. However, the business case is challenging for chemical recycling and carbon utilisation technologies

Chemical recycling and thermo-conversion
Levelised cost of production \$/tonne (2025)



Carbon utilisation technologies
Levelised cost of production \$/tonne (2025)

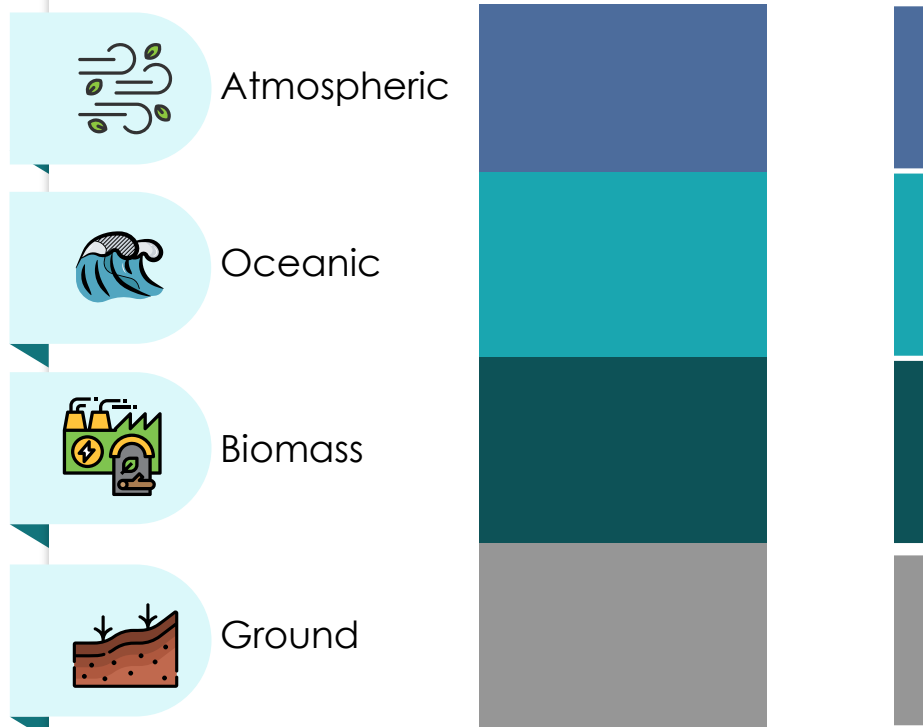


Sources/Notes: 1) Ten-year historical mean of EU Natural Gas TTF. 2) 20-year historical mean (Methanex). 3) EU PtX modelling (MPP, 2024). 4) Conventional ethanol from corn (IRENA). 5) Capex from LanzaTech (EIC presentation, 2022; IEA Bioenergy, 2020); Depolymerisation estimation is based on published data: Singh et al. (2021). Gasification and pyrolysis based on BEIS, NREL and Systemiq PCC model.

4A. Sustainable primary carbon is constrained (biomass), or still emerging (DAC, ocean-based capture)....

Sources of primary carbon supply

Illustrative



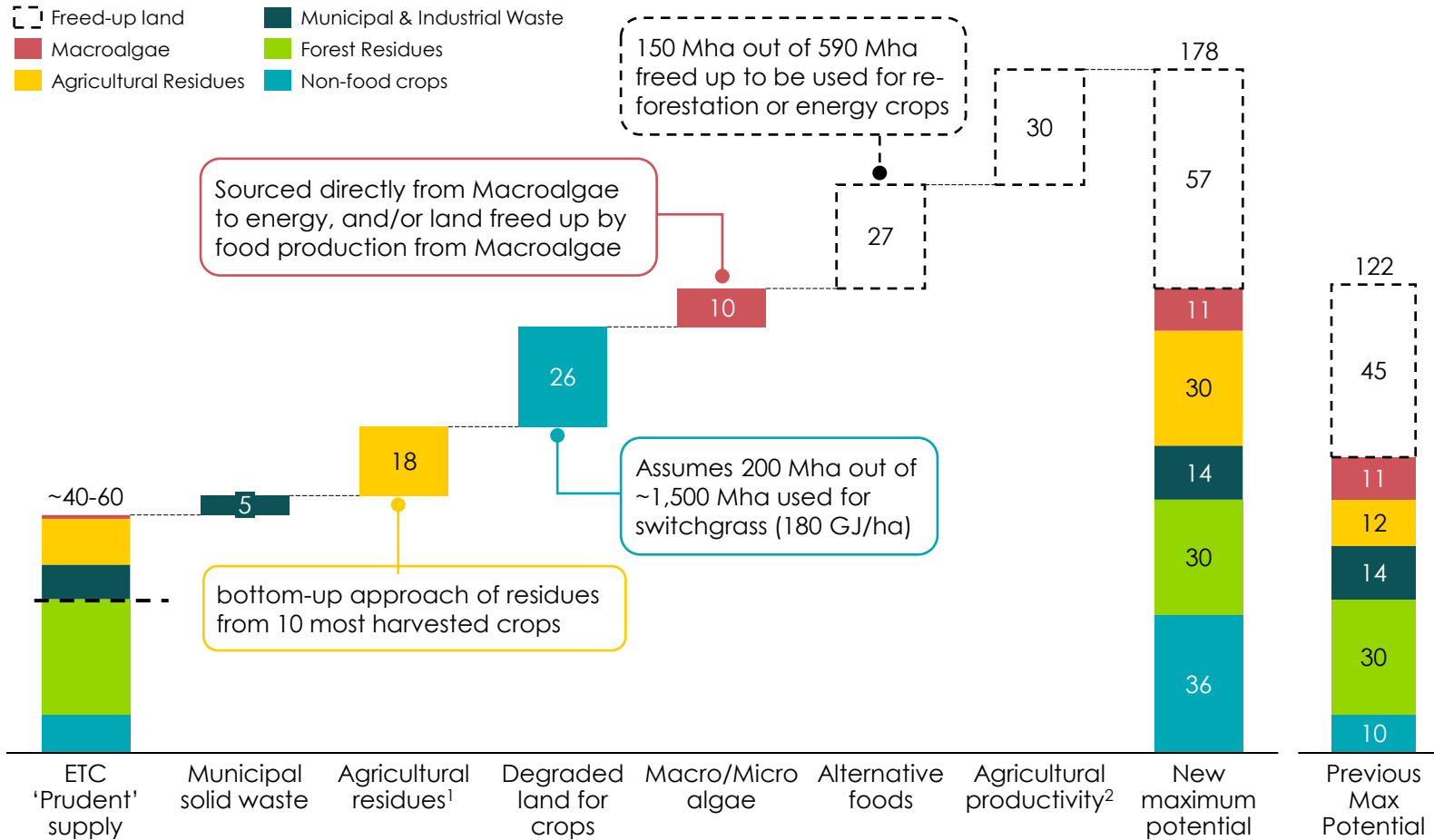
Status

- DAC technologies still emerging and **expensive at 480 \$/tonne¹** projected for 2030.
- Ocean-based capture **still at TRL 6**, with only small numbers of plant at pilot²
- Sustainable biomass³ that does not encroach on food production and nature **limited to 40-60EJ⁴**
- Carbon capture required to allow for fossil carbon to be sustainable, but **does not address upstream emissions**

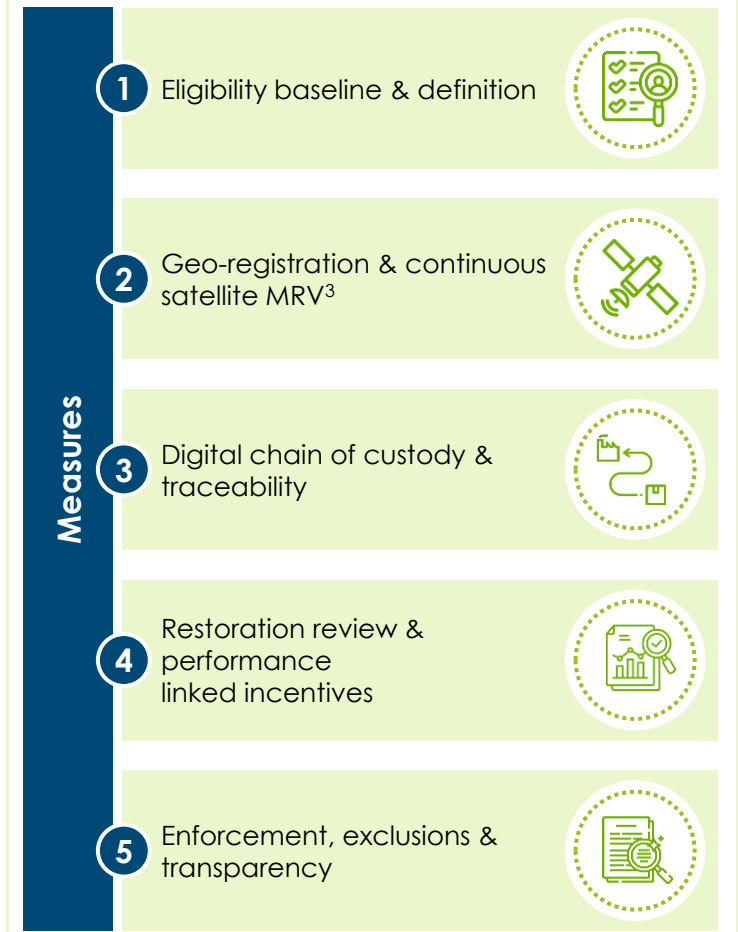
Notes/sources: 1) Revised ETC projections (2025) 2) Prince Aleta (2024) Direct ocean capture: the emergence of electrochemical processes for oceanic carbon removal 3) The term 'sustainable biomass' is used to describe organic material that is renewable, has a lifecycle carbon footprint equal or close to zero (including considerations for the opportunity cost of land), and for which the cultivation and harvesting practices used are mindful of ecological considerations such as biodiversity and health of the land. 4) SYSTEMIQ analysis for ETC (2021).

4B. ... but there is potential upside to biomass availability due to biotech and use of degraded land for crops, if land-use is governed appropriately

Biomass supply potential, EJ primary biomass



Indicative measures to manage degraded land-use for biomass



Notes/sources: 1) From total unprocessed residues, 70% are left on ground and a recoverability of ~50% is assumed. Production from 2023 is taken and extrapolated to 2050 using the same CAGR for the 2003 – 2023 period. 2) 0.9 CAGR taken from 2019 to 2050 plus an additional 12% increase by 2050 due to technological advancements yields a total of 40% increased productivity. This frees up 640 million ha, which is split in the same way as freed land from Alternative Proteins or Macroalgae, yielding additional 30 EJ
Sources: Systemiq Analysis (2025) using FAO data, ETC analysis; ETC (2021), Bioresources Within a Net-Zero Emissions Economy: Making a Sustainable Approach Possible.

5. Linear end-of-life solutions, such as CCS and landfill to waste are being advanced

Emerging point-source capture technologies



Calcium looping: Captures CO₂ using a looping cycle of limestone-based reactions

Suitable for cement:

High tolerance in impurities and integration with existing infrastructure¹

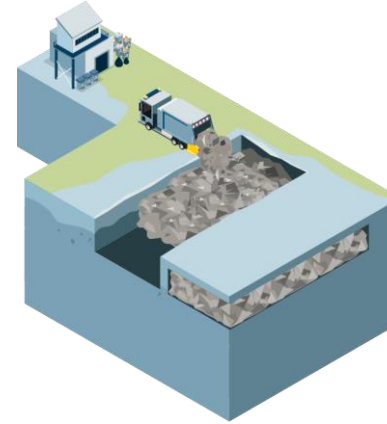


Process modification: Captures CO₂ and utilizes it in the power production process via Allam-Fetvedt Cycle

Suitable for power: Enables 99% capture rate and fully integrates CO₂ capture within its core thermodynamic process

They can both be economically viable in 2030 with carbon price of 90 \$/tCO₂

Advanced landfilling technology



Pre-landfill material recovery and biological treatment (MRBT)

Waste is stabilised via aerobic processing (e.g. composting) to reduce methane-generating potential before landfilling.³

- Advanced landfill **reduces emissions from MSW by 90%** compared to managed landfill, and it could be implemented at a **marginal additional cost** of ~\$30/tWaste
- It is almost as effective as incineration + CCS but can be more affordable with higher TRL

Notes/sources: MRBT = Material Recovery and Biological Treatment. MSW managed to advanced landfill abated 1.9 tonnes for incremental \$30/t waste. Incineration + CCS abates 1 tonne for incremental \$130/t waste. This results in cost of abatement equal to \$16 per tonne for advanced landfill and \$130 per tonne for incineration + CCS.

1) Arias et al. (2024) 2) FutureBridge (2022) Allam- Fetvedt Cycle 3) "Reducing waste management's contribution to climate change" (Zero Waste Europe, 2024).

6. Deep-tech innovation is required to fill the gap

Promising but early-stage technologies



Many of the most impactful solutions remain in early stages of development and deployment,



MOE/Electrowinning

TRL

5



o-CDR

6



Cultivated meat

4



Mineralisation

6

Barriers to scaling



Barriers across technical, environmental, economic, and policy dimensions. Such as:

- Capacity and scalability constraints
- High costs and immature supply chains
- Environmental and safety concerns
- Need for supportive and adaptive policy frameworks

Building diverse and adaptive portfolios



No single solution can address the full challenge. The optimal mix will depend on geography, sector, and time horizon.

- Balance cost, readiness, and resource efficiency
- Stay responsive to evolving constraints and opportunities
- Combine near-term deployment of available options with investment in long-term innovation



We have number of communications assets and launching a major report on Carbon Molecules before COP



Report finalization

Now

Integrating member and expert feedback



Report launch

Late Oct/early Nov

Executive summary and Long report launch



COP activities

Mid-November

Promotion of report key messages at events



Energy productivity



Agenda

• Key messages from the report

- The productivity potential in final energy to useful energy
- The productivity potential in primary energy to final energy
- Wider impacts: Implications for living standards, costs and resources
- Implications for COP28 target: doubling the energy productivity rate in the next 2 decades
- Long term energy growth: rebounds, AI and limitless long term potential
- Key priorities to seize the productivity improvement opportunity
- Next steps and Comms plan



Key messages

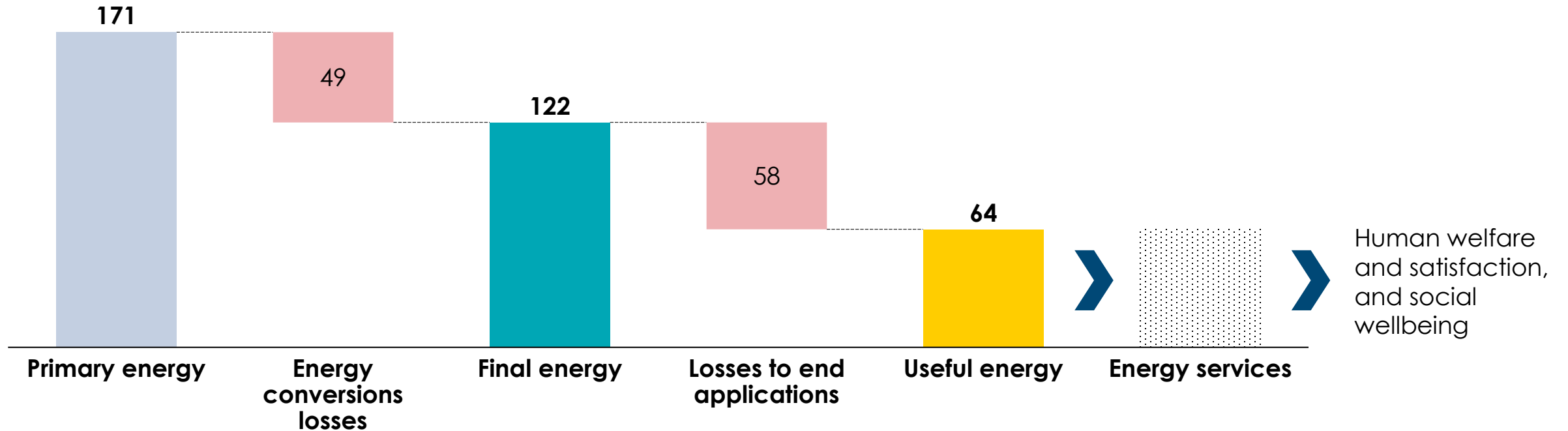
- Between now and 2050, the **world could expand energy services and double global GDP while reducing primary and final energy demand, through deploying energy productivity levers**
- **Electrification and electrical equipment efficiency are the biggest drivers for energy productivity. The greatest opportunity is therefore in building and road transport sectors, through electrification of heating, cooking and vehicles.**
- **The COP28 4% per annum efficiency target is achievable for two decades** thanks to impact of electrification ramp-up, provided **policies are enacted now**
- **Energy demand could however increase at a faster pace than expected due to** rebound effects, AI and new future energy applications
- To seize opportunity, countries should: (i) **Develop national policy frameworks** which identify opportunities by sector (ii) Implement policies to improve final energy productivity, with strong **focus on electrification and equipment/vehicle efficiency** and (iii) Set clear plans to for **power sector decarbonisation**



Global energy flows can be measured in primary, final, and useful energy

Global energy flows

000 TWh, 2023



E.g.

- Crude Oil
- Coal
- Refining losses
- Heat losses in generation
- Electricity
- Diesel
- T&D losses
- Energy to wheel losses
- kWh of heat to spaces
- kWh of kinetic energy to car wheels
- Warm or cooled spaces
- Kilometers travelled

Source: Systemiq analysis for ETC



Useful energy increases by 2050 while GDP doubles, while primary and final energy demand decreases thanks to productivity levers

NZ Energy demand with Productivity levers

Energy in 000 TWh; GDP in constant 2021 Bn.US\$

Shift away from Extraction....



Towards Electrification...

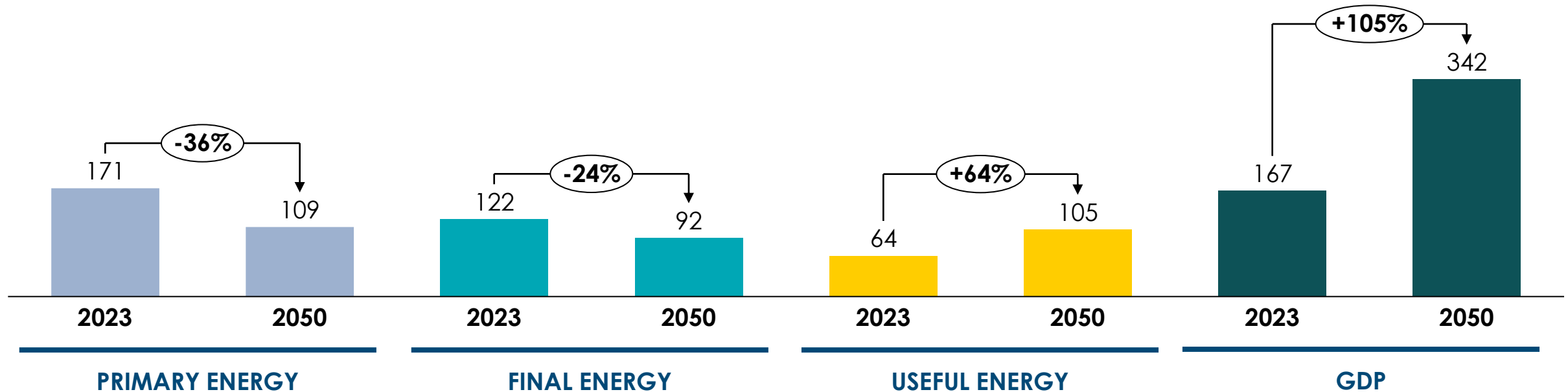


For greater energy services

Fewer losses in refining & power conversion

Fewer losses in the delivery to end use applications

More energy end use



Source: IEA (2025) World Energy Outlook; MPP (2023) Hard-to-Abate Sector Transition Strategies; ETC (2025) Achieving Zero-Carbon Buildings; ETC(2023), Fossil Fuels in Transition; BNEF (2023) Vehicle Outlook; Systemiq (2022); Planet Positive Chemicals; Systemiq analysis for ETC.

Agenda

- **Key messages from the report**

- **The productivity potential in final energy to useful energy**

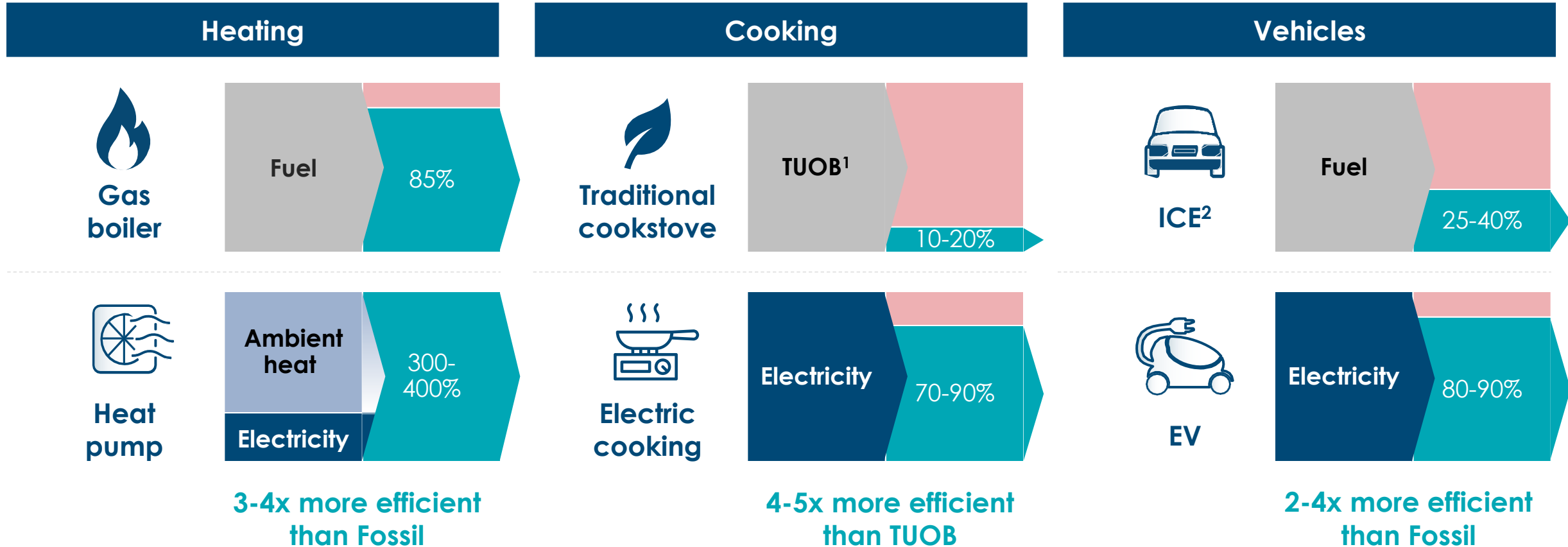
- The productivity potential in primary energy to final energy
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Electrification is energy efficiency – heat pumps, electric cooking and EVs use 2-5 times less energy than alternative technologies

Average efficiency from appliances and vehicles incumbent fuel vs electric

Useful Energy Losses



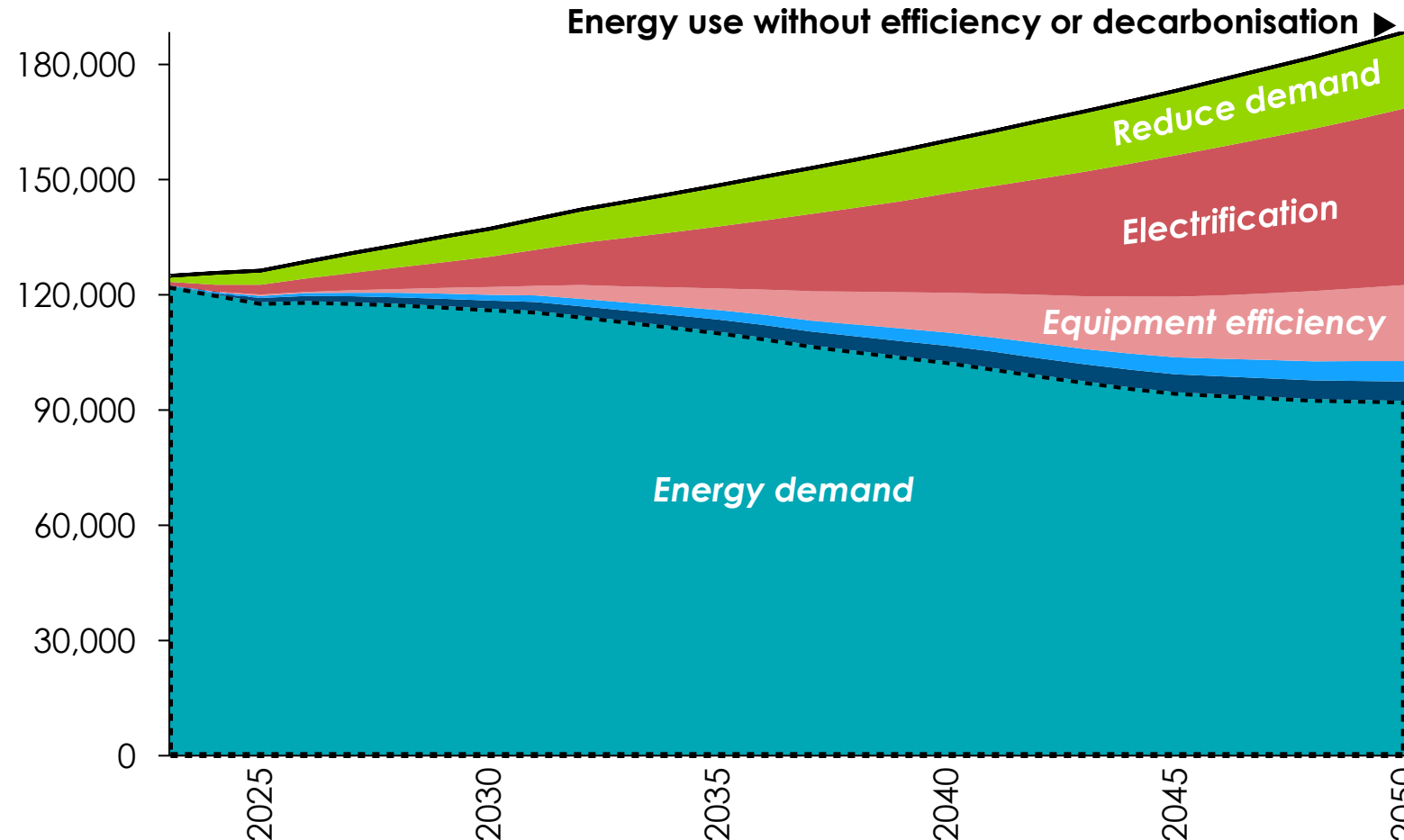
1. Traditional use of biomass; 2. Internal combustion engine
 Source: RMI (2024), *Clean Tech Revolution*; ETC (2025) *Achieving Zero-Carbon Buildings*

Overall, final demand could fall by ~50%, with all productivity levers combined

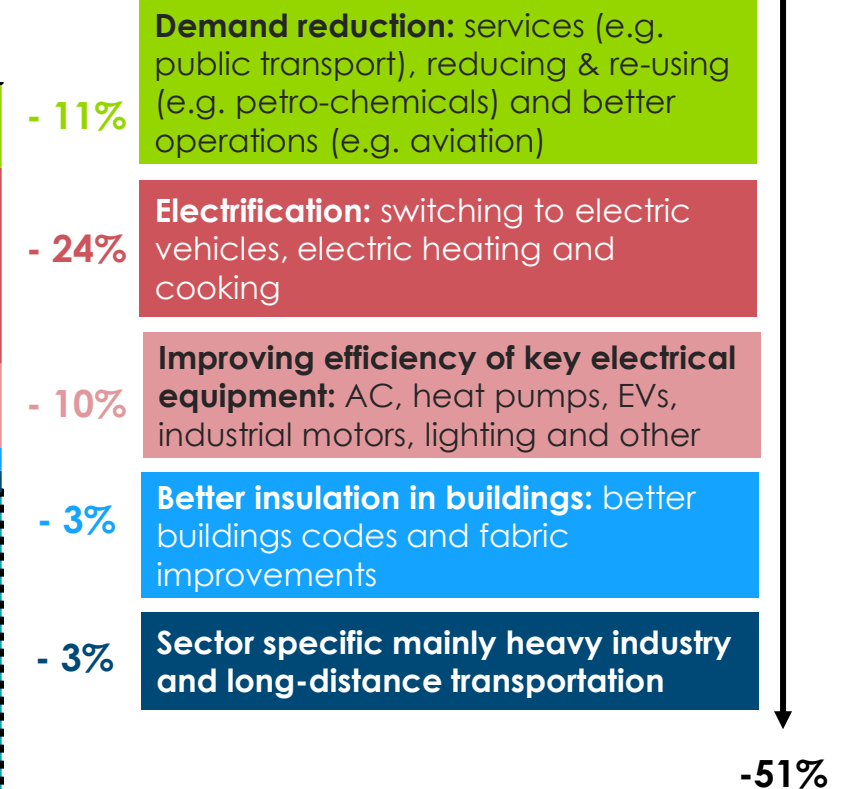
Final Energy demand vs. Productivity levers

TWh

% Reduction potential compared to 2050 Energy use without efficiency or decarbonisation



Key actions



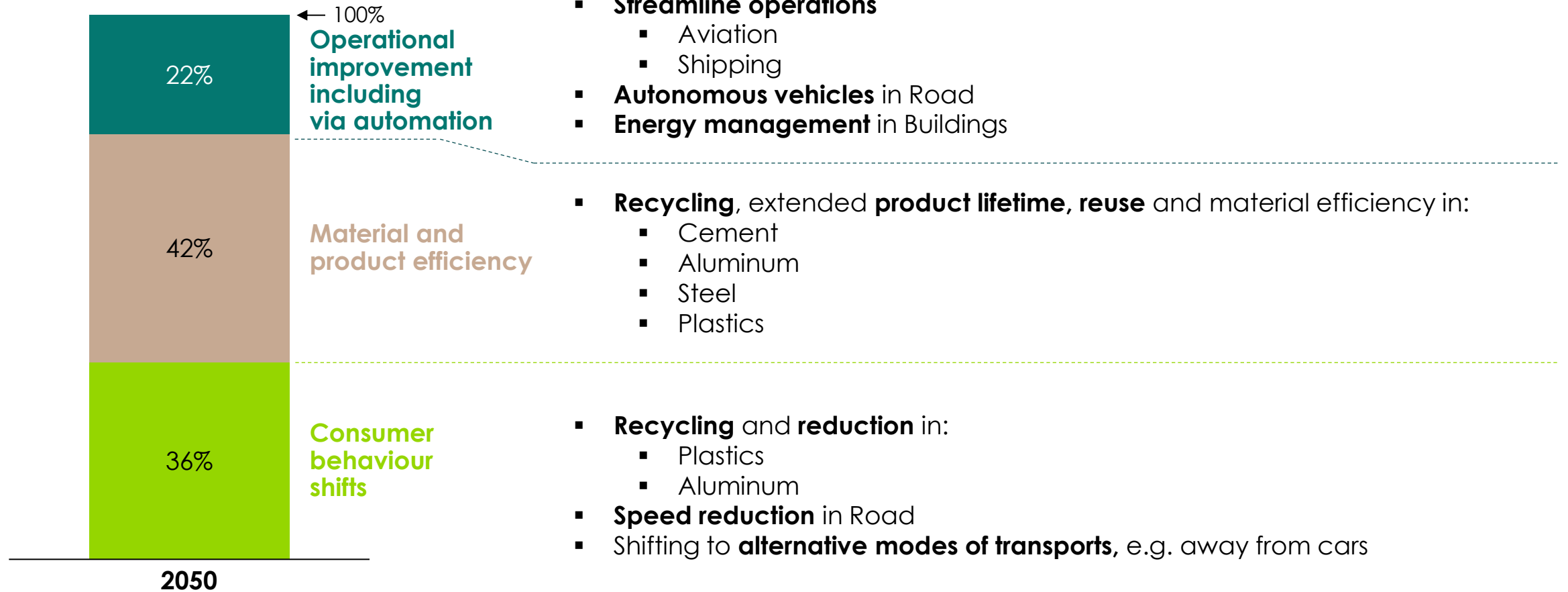
Source: IEA (2025) World Energy Outlook; MPP (2023) Hard-to-Abate Sector Transition Strategies; ETC (2025) Achieving Zero-Carbon Buildings; ETC(2023), Fossil Fuels in Transition; BNEF (2023) Vehicle Outlook; Systemiq analysis for ETC.

Only 36% of demand reduction depends on end consumer behaviour change

Demand reduction deep-dive

%

Drivers



Source: Systemiq analysis for ETC

Realizing the potential of more efficient electrical equipment and vehicle will depend on standards & labelling programmes coupled with stock turn-over

Key electrical equipment

Efficiency potential

Level of impact

Air conditioning and Heat Pumps

- ACs currently vary between **3 to 12 in seasonal energy efficiency rating (SEER)**
- Additional opportunity to further **increase best in class efficiency** of ACs and Heat Pumps (which are essentially the same technology)

Electric Vehicles

- Improvements such as Reducing vehicle weight (including via lighter batteries), improving aerodynamics, and increasing powertrain efficiency could **cut the energy required per kilometer travelled by as much as 50% by 2050**

Industrial motors

- IE5 standard, are **40% more efficient than 2 generations before**, the IE3 standard, yet 3/4 of world motors in 2021 were still at IE2 or below

Light bulbs

- LED light bulbs use **80% less electricity than incandescent bulbs** - and this remain a massive opportunity in developing economies

Refrigerators

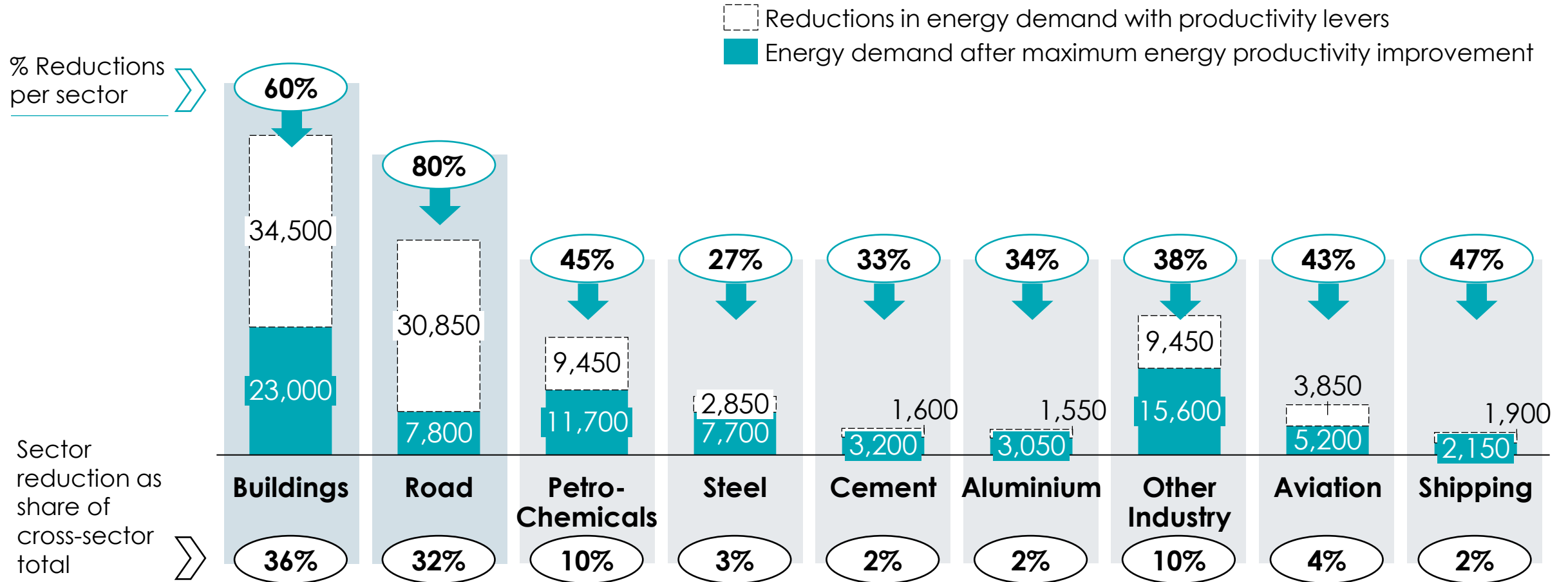
- High efficiency refrigerators use **25% less energy than typical models**



Buildings and road transportation hold the biggest opportunity: together they hold ~70% of the potential productivity gain in final energy demand

Final energy demand in 2050

TWh



Note: Does not include fuel switch nor CCS for Net-Zero

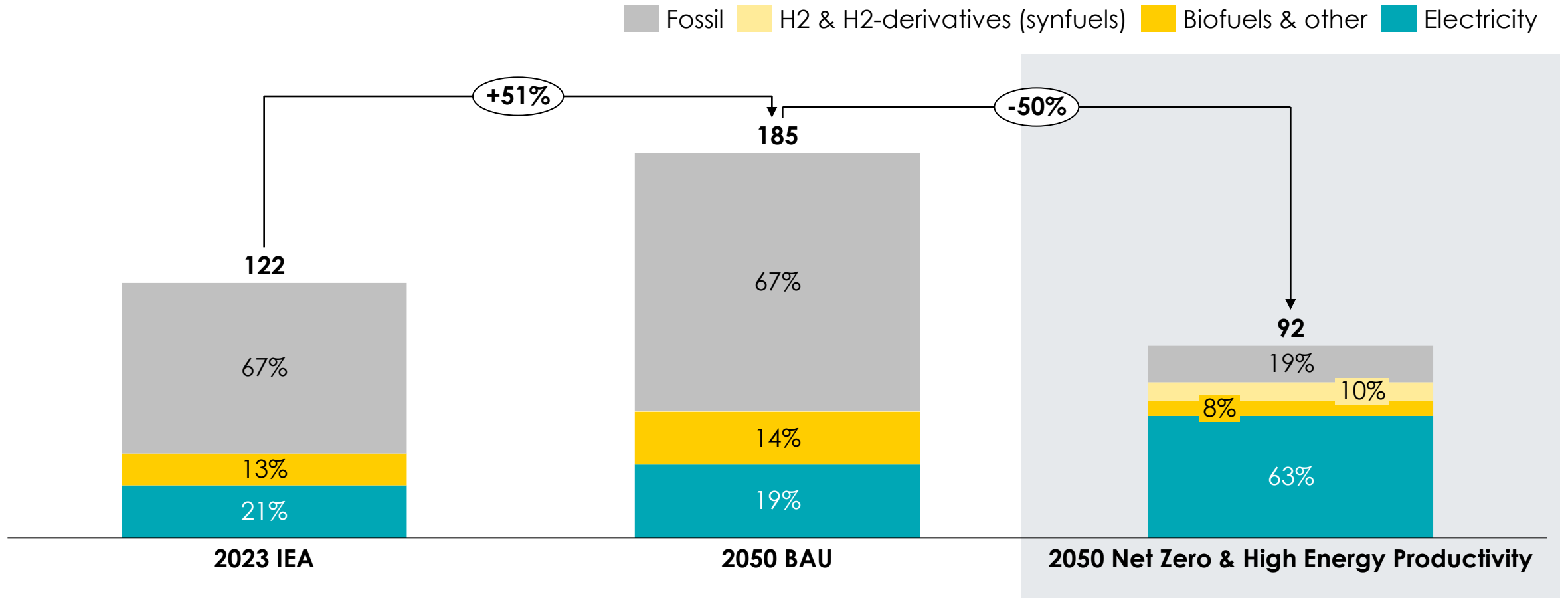
Source: IEA (2025) World Energy Outlook; MPP (2023) Hard-to-Abate Sector Transition Strategies; ETC (2025) Achieving Zero-Carbon Buildings; ETC(2023), Fossil Fuels in Transition; BNEF (2023) Vehicle Outlook; Systemiq analysis for ETC.



Electrification, together with other productivity levers, triples the share of electricity in final energy demand

Global Final Energy demand

000 TWh

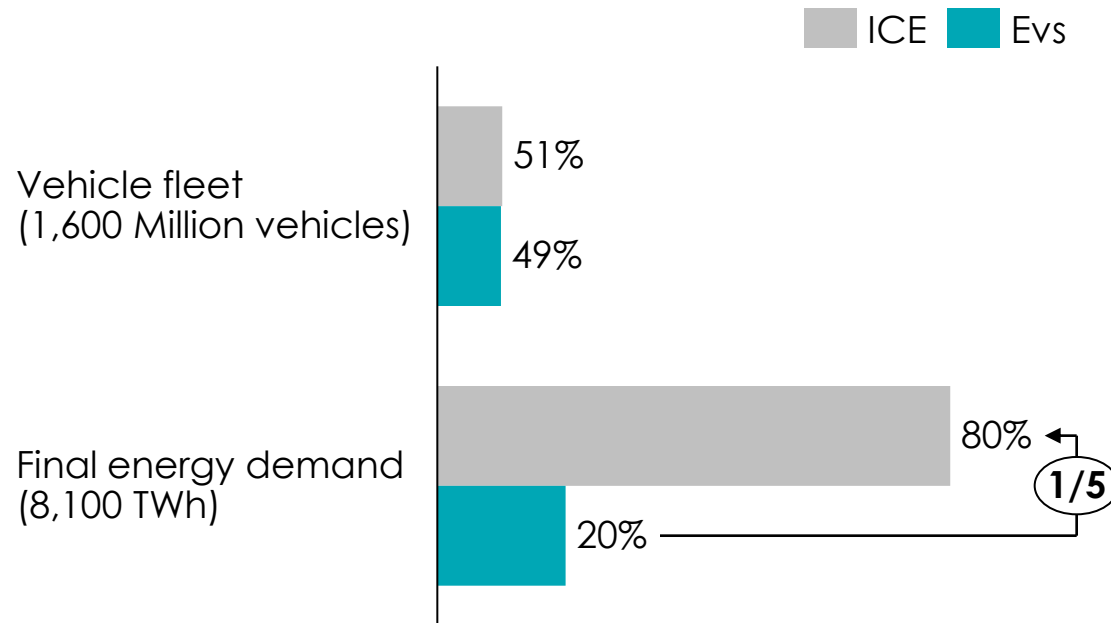


Source: IEA (2025) World Energy Outlook; MPP (2023) Hard-to-Abate Sector Transition Strategies; ETC (2025) Achieving Zero-Carbon Buildings; ETC(2023), Fossil Fuels in Transition; BNEF (2023) Vehicle Outlook; Systemiq analysis for ETC.

The electricity conundrum: despite higher penetration, electricity accounts for disproportionately lower final energy demand, due to its higher efficiency

Case study: Passenger road transport in 2037

Billion Km; TWh



In 2037, **80% of final energy demand** will still come from ICEs, despite ICE's being just half the **global fleet** for passengers



Source: Systemiq analysis for ETC; BNEF (2023) Vehicle Outlook;

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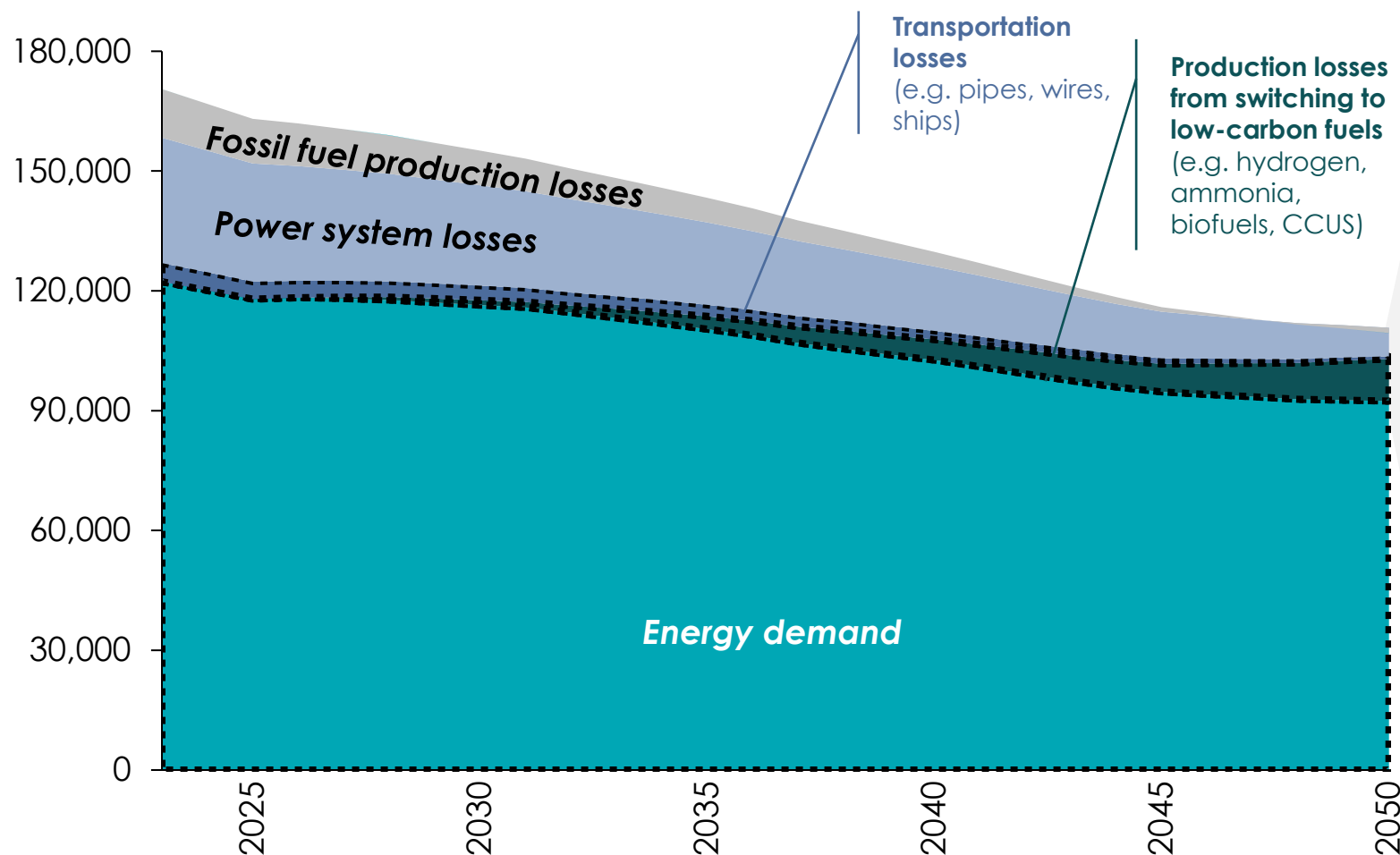
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The phase down of fossil fuel consumption, along with the switch from thermal generation to renewables, are main drivers of lower primary energy demand

Primary energy demand

TWh



Reductions on primary energy losses driven by:

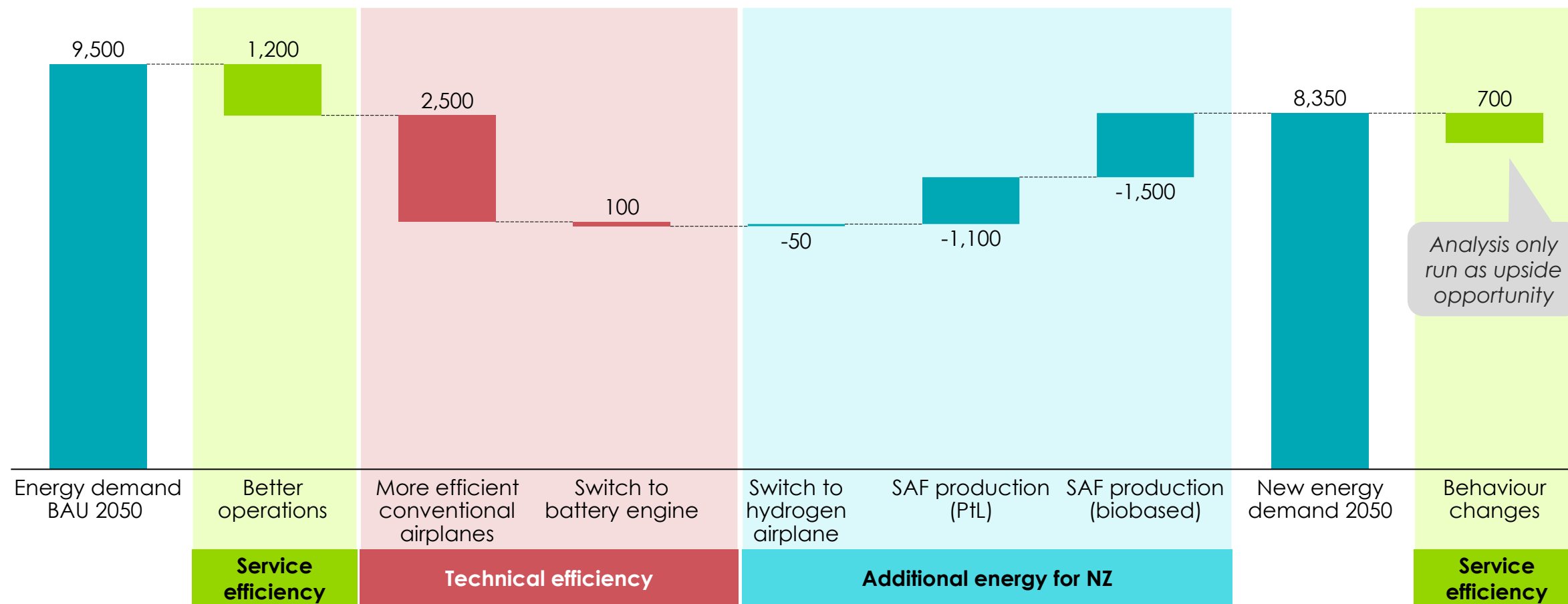
- **Growth of renewables in the power system**, which are more efficient than fossil generation
- **Lower fossil fuel conversion losses** (e.g. in refining) decline as fossils phase down

Source: IEA (2025) World Energy Outlook; MPP (2023) Hard-to-Abate Sector Transition Strategies; ETC (2025) Achieving Zero-Carbon Buildings; ETC(2023), Fossil Fuels in Transition; BNEF (2023) Vehicle Outlook; RMI (2024) The Incredible Inefficiency of the Fossil Energy System; Systemiq analysis for ETC.

In aviation, making conventional airplanes more efficient is single most important lever

Primary energy demand in 2050 and impact of productivity levers

TWh



Source: Schäfer, A. (2019). "Technological, economic and environmental prospects of all-electric aircraft". *Nature Energy*. 4 (2): 160–166., MPP analysis

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Useful energy increases by 2050 while GDP doubles, while primary and final energy demand decreases thanks to productivity levers

NZ Energy demand with Productivity levers

Energy in 000 TWh; GDP in constant 2021 Bn.US\$

Shift away from Extraction....



Towards Electrification...

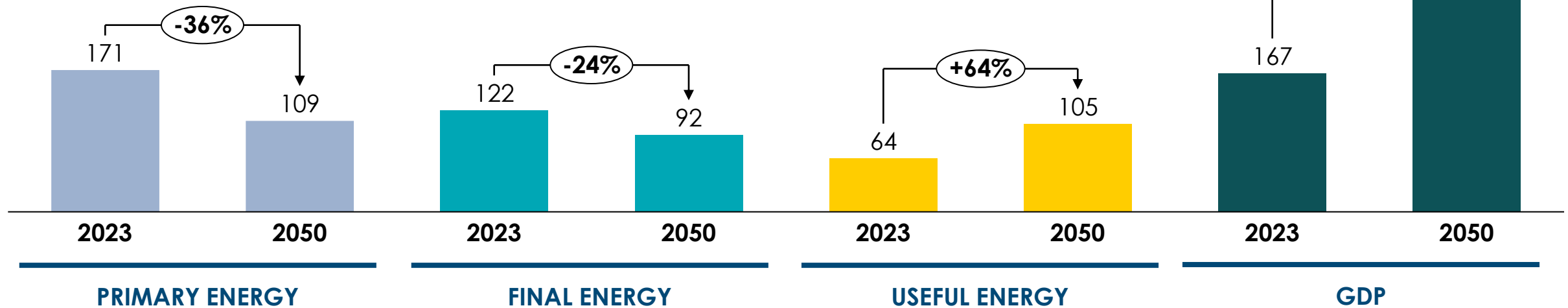


For greater energy services

Fewer losses in refining & power conversion

Fewer losses in the delivery to end use applications

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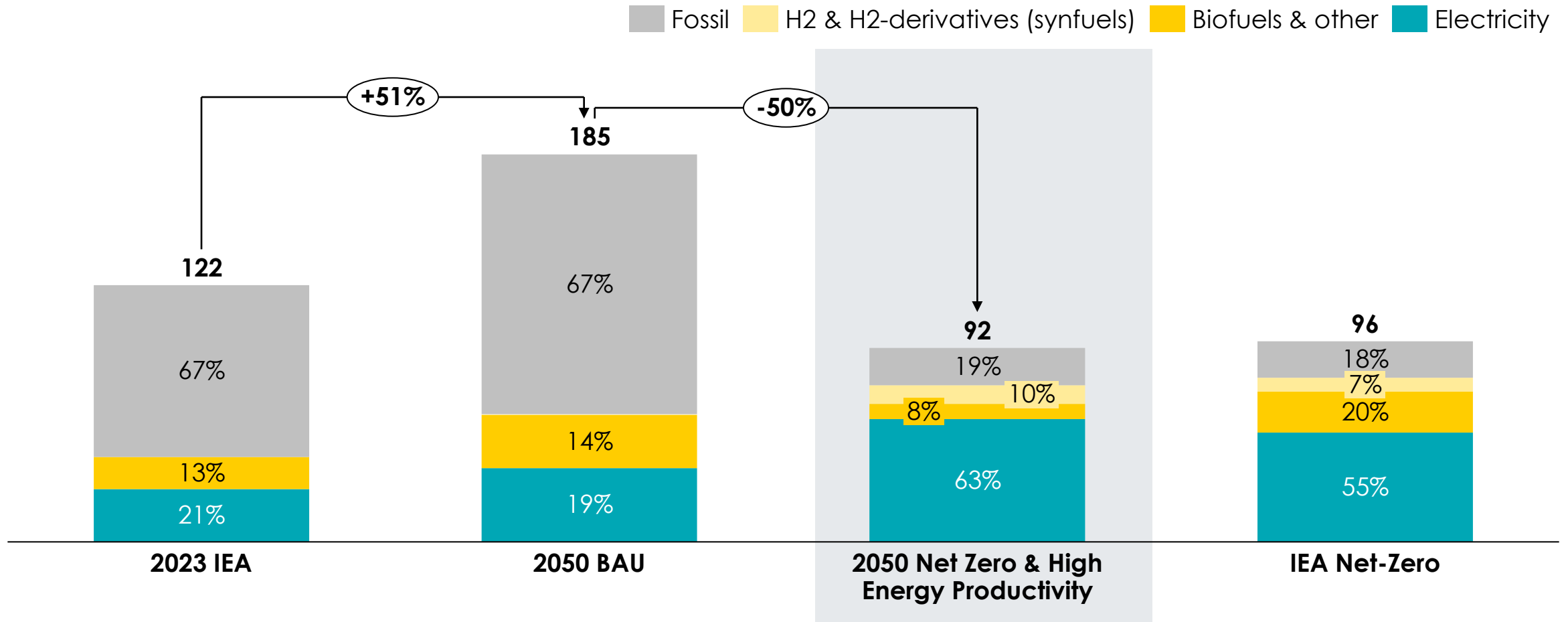


Source: IEA (2025) World Energy Outlook; MPP (2023) Hard-to-Abate Sector Transition Strategies; ETC (2025) Achieving Zero-Carbon Buildings; ETC(2023), Fossil Fuels in Transition; BNEF (2023) Vehicle Outlook; Systemiq (2022); Planet Positive Chemicals; Systemiq analysis for ETC.

Reaching net-zero whilst maximising energy productivity gains can lead to lower energy demand without compromising on living standards

Global Final Energy demand

000 TWh



Source: IEA (2025) World Energy Outlook; MPP (2023) Hard-to-Abate Sector Transition Strategies; ETC (2025) Achieving Zero-Carbon Buildings; ETC(2023), Fossil Fuels in Transition; BNEF (2023) Vehicle Outlook; Systemiq analysis for ETC.

The cost-effectiveness of improving energy productivity will vary by sector with passenger EVs, heating and electrical equipment closer to affordability

Cost profile by sector

Context

- ✓ Upfront cost & opex comparable to alternative
- ✓ Higher upfront cost vs alternative, but lower opex



Passenger Road transportation

- Passenger EVs already have a lower total cost of ownership than ICE, and will soon be cheaper to buy upfront (as in China)



Household appliances and insulation

- Regulations for appliance efficiency are likely to impose minimum costs
- Improving building insulation will impose some cost upfront in new buildings



Heat pumps in homes and light industry

- Installing heat pumps to replace boilers in existing homes and industrial applications will have significant upfront costs



Source: Systemiq analysis for ETC.

In addition to electrification, productivity levers can reduce investment and land needed for renewable generation, and strengthen energy security



Investments

- Improved energy productivity could **reduce the total investment required** to build a zero carbon economy **by ~ \$0.6 trillion per annum over the next 25 years**



Resources

- Improved energy productivity could reduce the land **area requirements for solar PV and wind turbines from around 0.6 to around 0.4 million km²**. This reduction would be equivalent to Ecuador's land size.



Imports

- Reducing energy demand will **improve energy security by cutting reliance on imports**. Through energy productivity levers, German energy imports could be reduced by 25% by 2035, cutting the import bill by €20 billion,

Source: Eurostat, BNEF Data Viewer LCOE, MPP (2023) Hard-to-Abate Sector Transition Strategies; ETC (2025) Achieving Zero-Carbon Buildings; ETC(2023), Fossil Fuels in Transition; BNEF (2023) Vehicle Outlook; ETC (2024), Material and Resource Requirements for the Energy Transition, Clean Energy Wire (2025) Fossil fuel imports to Germany go down as costs increase, Systemiq analysis for ETC.

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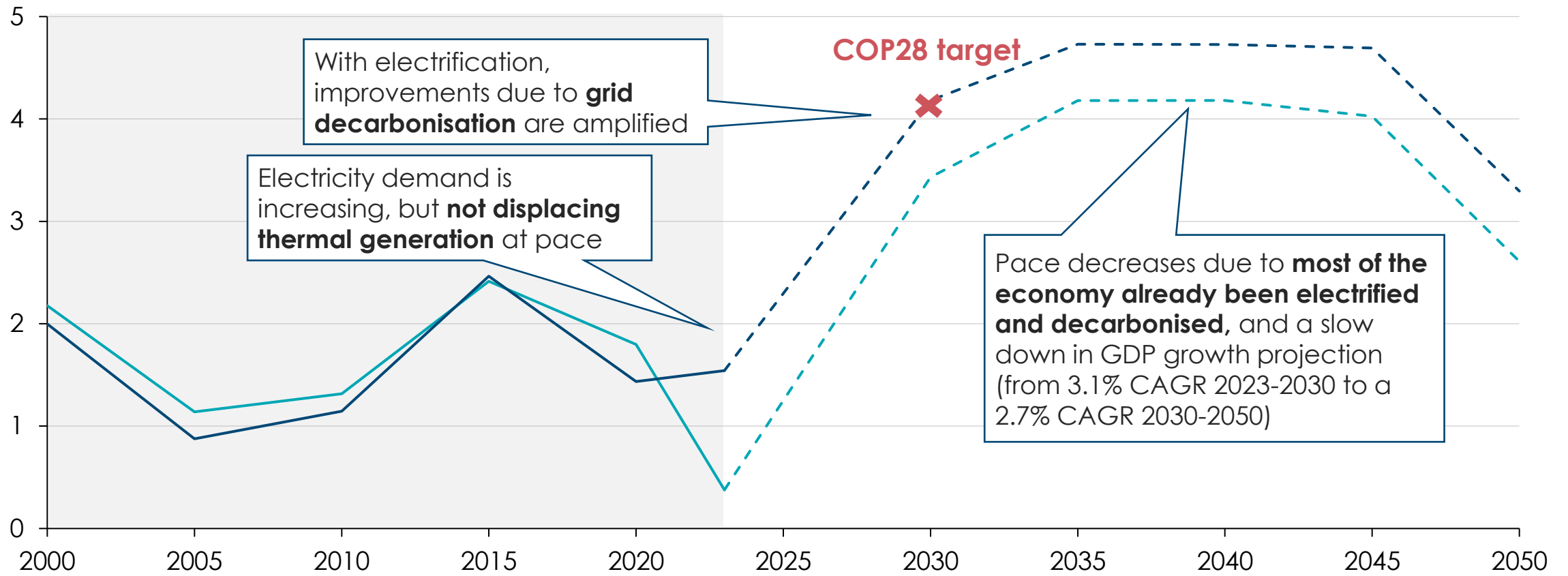


Realising COP28 targets for a 4% improvement in energy intensity by 2030, will depend on immediately accelerating efforts in energy productivity

5-Year CAGR Energy productivity improvement projection

%

— Final Energy — Primary Energy



Source: Systemiq analysis for ETC, Our World in Data, World Bank, IMF Real GDP Annual Growth, IEA World Energy Outlook 2024



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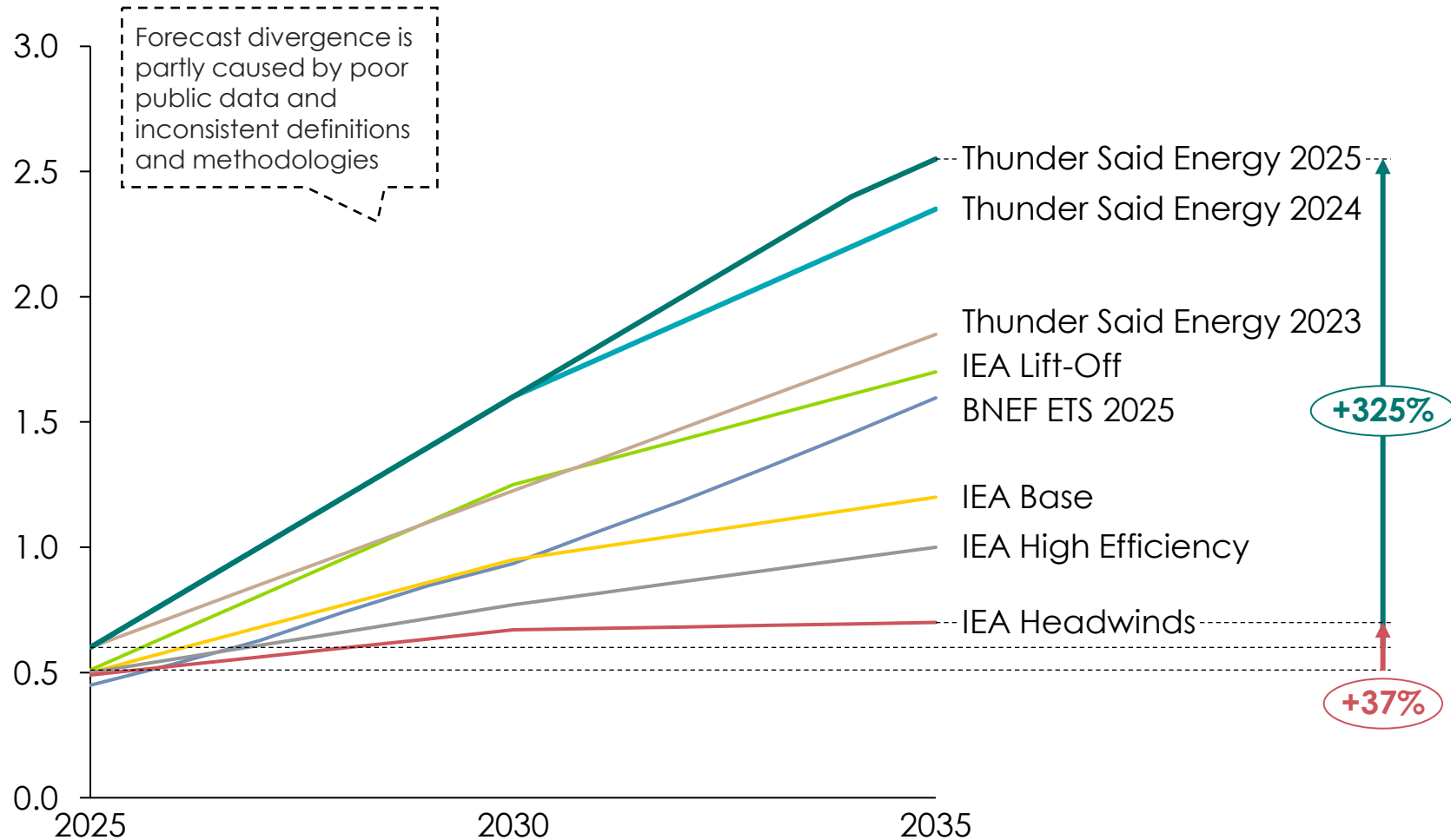
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The long run picture: rebound effects, AI and future energy applications will likely increase energy use

Global data centre annual demand projections by scenario

'000 TWh/year



- **Beyond electrification and the next 25 years**, energy demands will likely return to strong growth – as energy use increase human welfare
- **Rebound effect, AI and new energy uses** could result in higher energy use in the next 25 years
- Energy productivity improvements should be pursued **while planning for growing energy supply systems**

Sources: BNEF (2025), *New Energy Outlook*; IEA (2025), *Energy and AI*; Thunder Said Energy (2025), *AI energy: industrial demand and the Jevons effect?*

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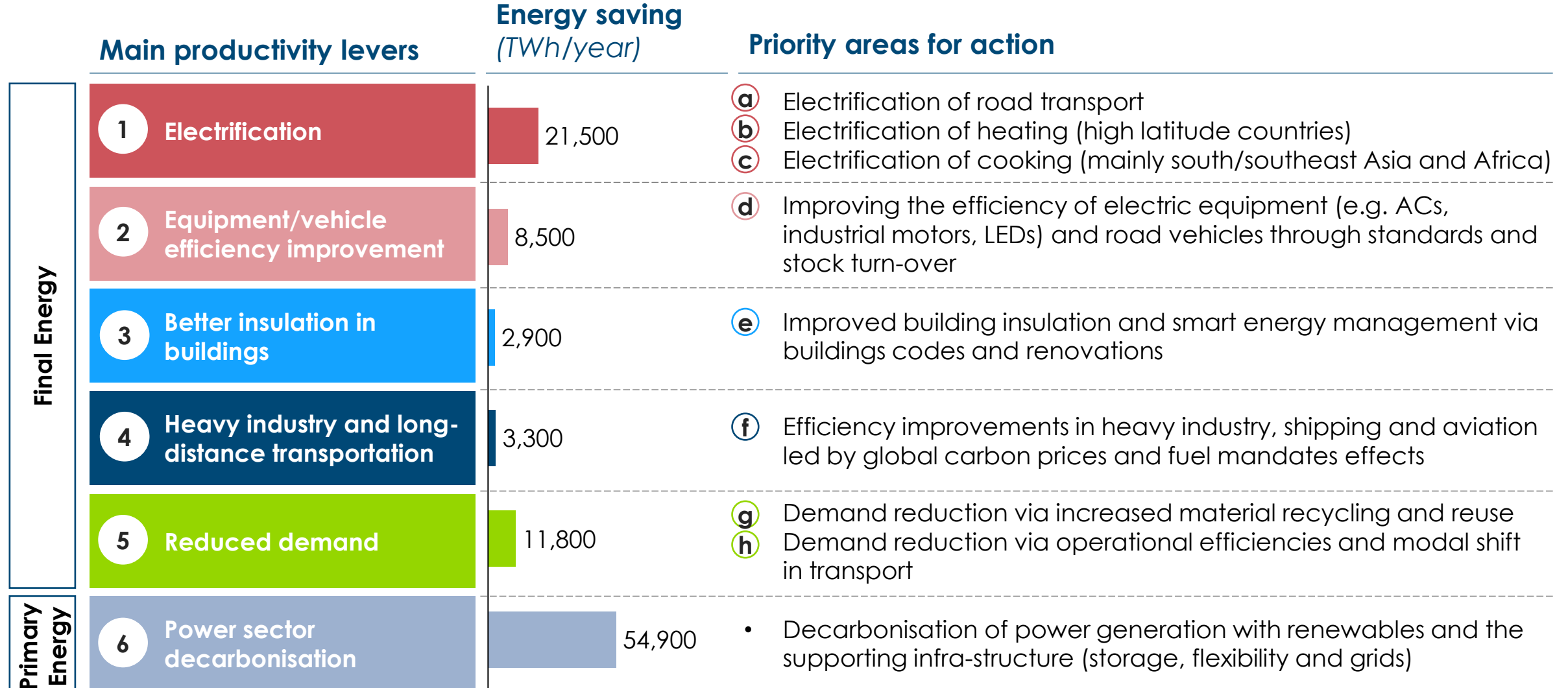
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To maximise energy productivity levers, several priority areas



Source: Systemiq analysis for ETC

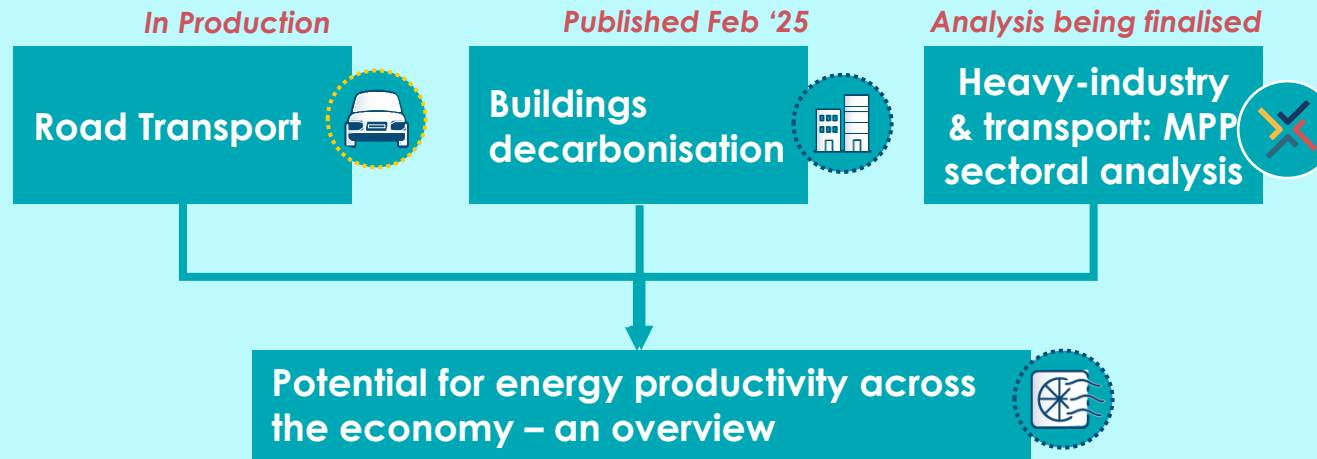
Agenda

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- **Next steps and Comms plan**



Energy productivity work builds on three detailed areas

2025 ENERGY PRODUCTIVITY SERIES



The overview of energy productivity potential will draw on three inputs:

- **Road transport**, covering both passenger and freight aspects.
- **Buildings**, encompassing both in-use structures and those under construction.
- **Industry and long-distance transport**, consolidating insights from the Mission Possible Partnership (MPP) analysis.



Campaign Objectives

- **Position the ETC as an authoritative voice on how to achieve the COP28 energy efficiency target, framing energy productivity as a critical enabler for climate ambition.**
- **Drive Policy Action:** Encourage key governments, especially those with high potential in road transport and building electrification and use COP30 as a springboard for countries to set national energy productivity roadmaps.
- **Secure media & stakeholder buy-in:** Generate influential coverage that reshapes how policymakers, business leaders, and the public perceive energy efficiency — not as “doing less” but “doing more with less.”



Clarify the COP28 Commitment: Define what “doubling the rate of energy efficiency improvement” means in practice, addressing ambiguity on primary vs. final energy and sectoral approaches.



Establish the terminology: “energy productivity” – why this is a useful additional term when discussing efficiency.



Show Feasibility & Benefits: Highlight key levers to achieving 4% annual productivity gains for two decades.



Highlight heat pump and EV efficiency growth as the biggest opportunity: (i.e. potential for 100+% efficiency gains); additional industry efficiency gains.



Emphasise co-benefits: lower system costs, land savings, and energy security.



Insights Briefing Launch Campaign Plan – Staged roll out – Phase 1

Media

- **10 targeted media briefings** under embargo with top-tier energy/business & sector journalists
- **Op-ed** placement in FT / Bloomberg Opinion, framing energy productivity as a key lever of the transition.
- **Press release distribution** to media contacts.
- Media engagement/broadcast **campaign around COP30**

Digital

- **Social media campaign** using exhibits from the report.
- Social media amplification throughout COP30
- **Publish key messages summary** on the website.
- **Wedge chart animation** on overall productivity potential (also to be used for journalists' briefings).

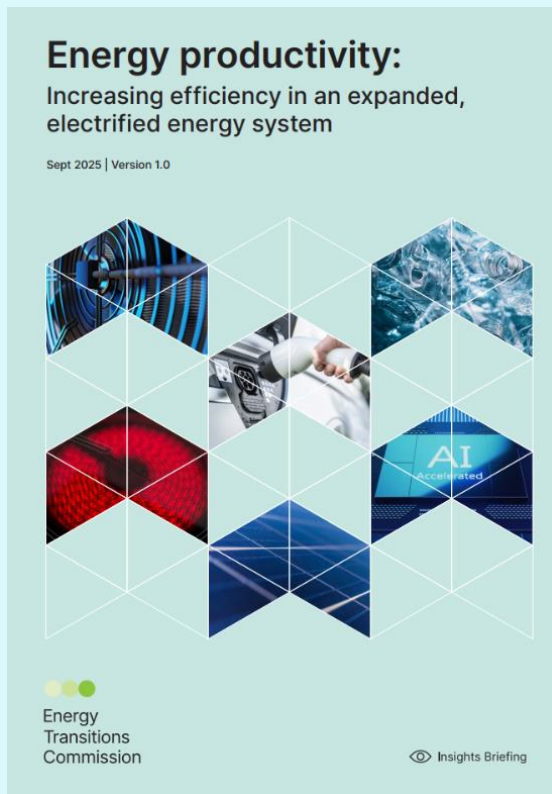
Member and Partner Engagement

- **Bilaterals** with members and partners (Schneider Electric, QCF, WMBC, WRI, Octopus, Volvo, Arup)
- **Amplify via strategic partners' channels** (WBCSD, Climate Group, Ember, RMI).
- **Arm ETC Commissioners with key messages** for panels and discussions at NYCW and COP30.
- **Partner collaboration** with Mission Efficiency at COP30.

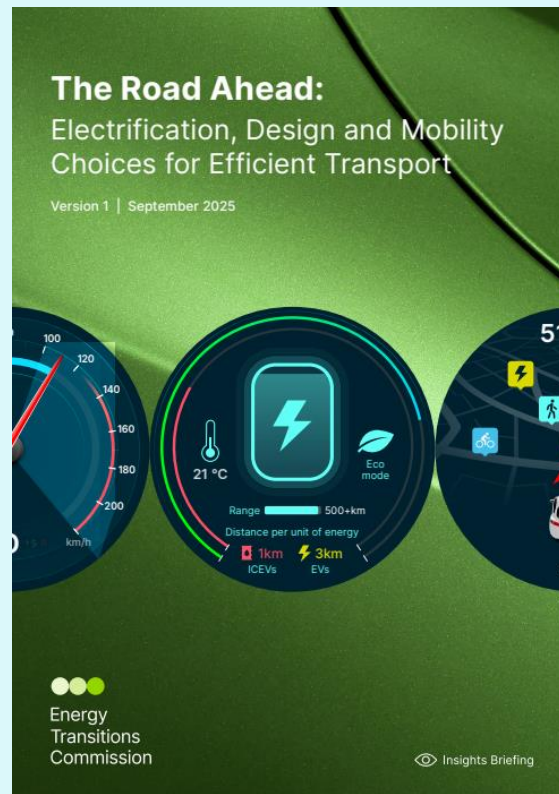


Insights Briefing Launch Campaign Plan – Staged roll out

Phase 1 - October Energy Productivity Insights Briefing



Phase 2 – December Electrification of Road Transport



Phase 3 – early 2026 Harder to Abate Annex

