ASEAN Policies and Initiatives Towards Carbon Neutrality

The 37th Energy Conservation Workshop (ECAP37)
ASEAN-Japan Energy Efficiency Partnership (AJEEP)
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Outline

01 ASEAN CN Target, APAEC Framework and Policies

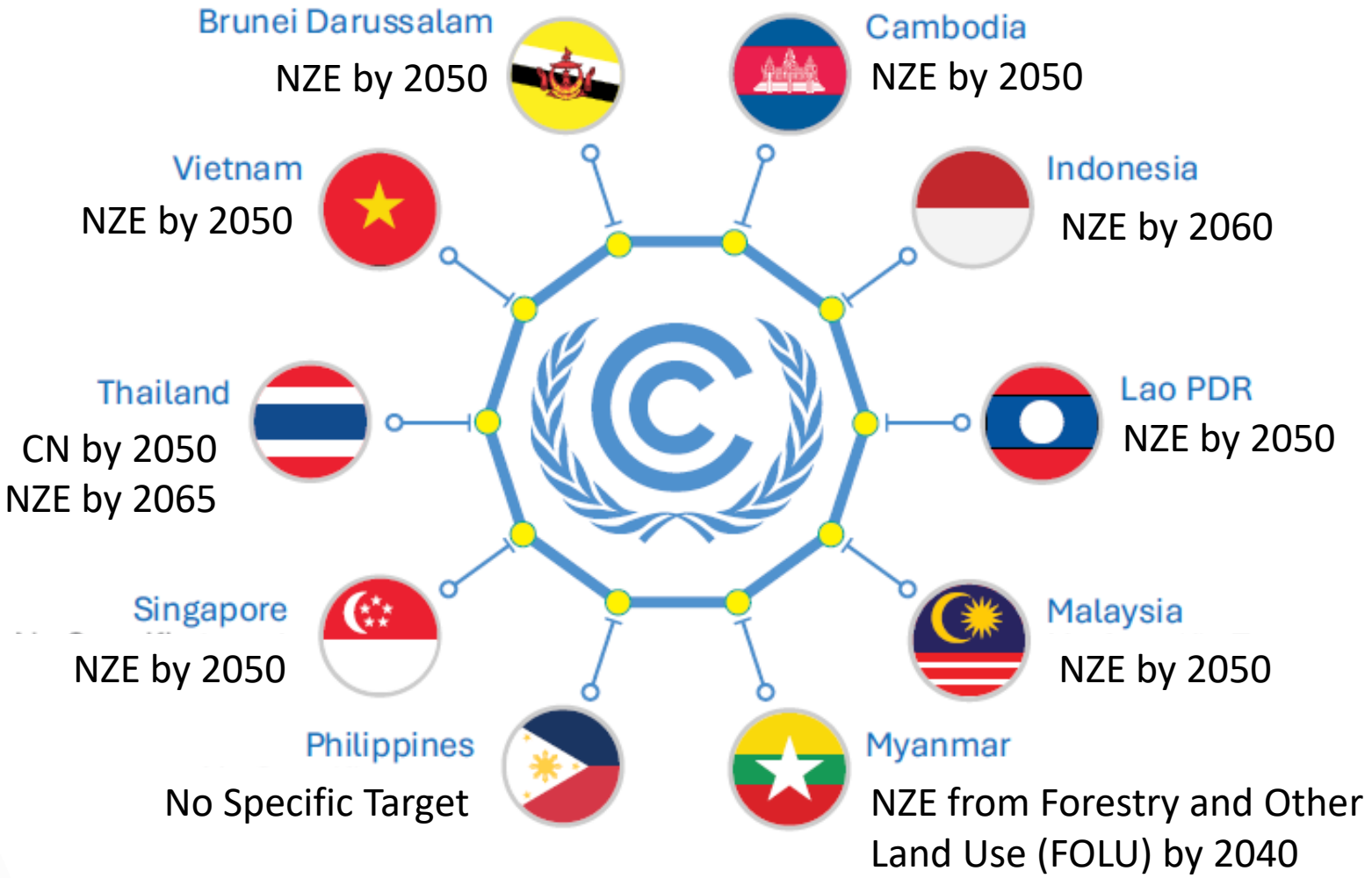
02 ASEAN Energy Landscape in Industry and Transport Sector

03 Select Study: Net Zero Roadmap for the Steel Industry

04 Other Initiatives

05 Way Forward

ASEAN Carbon Neutrality Target



Net Zero / Carbon Neutrality Target AMS
Source: The 8th ASEAN Energy Outlook, 2024

Overview of ASEAN EE&C APAEC 2026-2030

ASEAN Community Vision 2045:
Resilient, Innovative, Dynamic, and People-centred ASEAN

ASEAN Economic Community (AEC) Strategic Plans 2026-2030

ASEAN Energy Future 2045
Guided by 20-year Theme/Vision: Secure, Resilient, and Interconnected Low-Carbon ASEAN Energy Future
(adopted during Special SOME 2025 (Jan 2025))

APAEC 2026-2030
Guided by 5-Year Theme: **Advancing Regional Cooperation in Ensuring Energy Security and Accelerating Decarbonisation for a Just and Inclusive Energy Transition**
(adopted during 42nd AMEM (Sep 2024))

Programme Areas of APAEC

PA 1. ASEAN Power Grid	PA 2. Oil & Gas Connectivity, Security and Sustainability	PA 3. Coal and Carbon Management	**PA 4. Energy Efficiency and Conservation**	PA 5. Renewable Energy	PA 6. Regional Energy Policy and Planning	PA 7. Civilian Nuclear Energy

Main content of APAEC 2026-2030 Document for Public *(Endorsed by 43rd AMEM in Oct 2025)*

Overview of ASEAN EE&C APAEC 2026-2030

Background

APAEC Drafting Committee Meetings and Consultations has been conducted throughout Jan 2024 – Aug 2025, with total 6 ADC Meetings has been completed including several additional consultation sessions within SEB/SSN as well as consultations with externals experts and partners

https://aseanenergy.org/publications/asean-plan-of-action-for-energy-cooperation-apaec-2026-2030/

Key Highlights of APAEC 2026 – 2030

20-year theme	Secured, Resilient and Interconencted Low-Carbon ASEAN Energy Future *(adopted during Special SOME 2025)*
5-year theme	Advancing Regional Cooperation in Ensuring Energy Security and Accelerating Decarbonisation for a Just and Inclusive Energy Transition *(adopted during 42nd AMEM in 2024)*
APAEC Aspirational Targets	• 30% RE Share in TPES by 2030 • 45% RE Share in Installed Power Capacity by 2030 • 40% EI Reduction in TPES (based on 2005 level) by 2030

APAEC 2026-2030 Key Strategies across Programme Areas

1. ASEAN Power Grid (APG)

Strengthen APG planning and implementation to enhance regional energy security and connectivity, through infrastructure development, advancing market frameworks, and a coordinated regional cooperation framework

2. Oil and Gas Connectivity, Security, and Sustainability

Enhance energy connectivity, energy security measures and accessibility in sustainable practices within the oil and gas sectors in order to meet regional energy demands responsibly

3. Clean Coal Transformation

Promote a responsible and cleaner coal value chain that aligns with carbon neutrality goals and development

4. Energy Efficiency and Conservation (EEC)

Enhance the adoption of EE&C for decarbonising end-use sectors through emerging innovative solutions, enhanced regional cooperation, and policy and standards harmonisation

5. Renewable Energy (RE)

Accelerate the scale-up of RE deployment on power system transition, energy supply and end-use sectors towards a low-carbon ASEAN vision and across the ASEAN countries

6. Regional Energy Policy and Planning (REPP)

Strengthen regional energy policy, planning and interconnectivity to accelerate a just and inclusive low-carbon energy transition

7. Civilian Nuclear Energy (CNE)

Equip decision-makers with critical insights to position CNE as a low carbon fuel option for ASEAN's growing energy demand

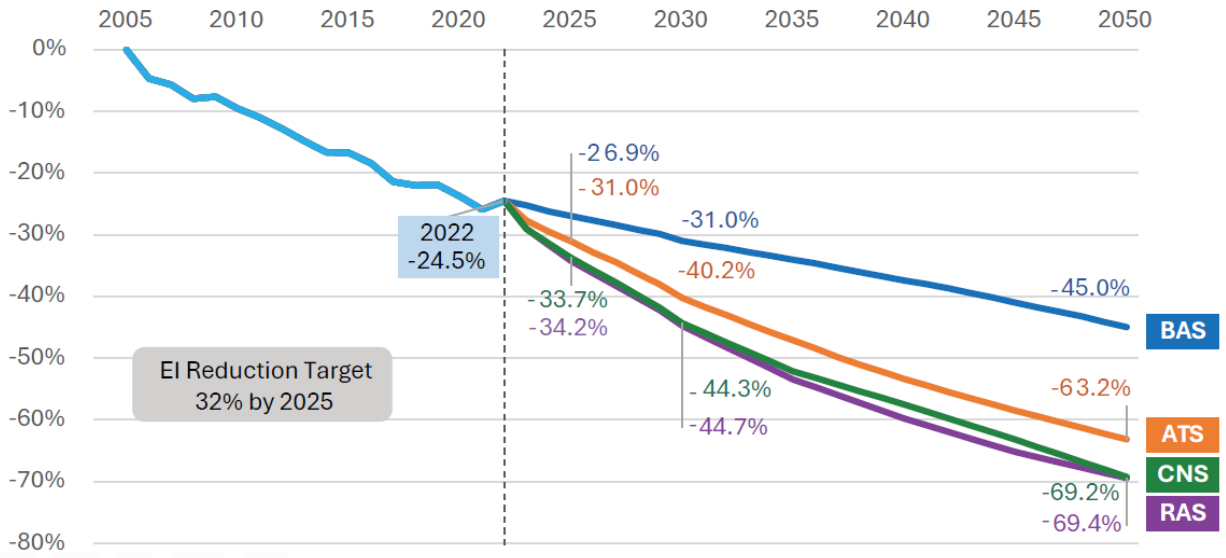
APAEC 2026-2030 Outcome-based Strategies

Outcome-based Strategies

APG	OGCSS	CCTR	EE&C	RE	REPP	CNE
Strengthen APG bodies' capacity and coordination	Enhance role of TAGP	Advance responsible coal value chain	Increase the adoption of energy efficient appliances and equipment	Accelerate RE deployment for low carbon future	Advance ASEAN's energy profile	Promote role of nuclear energy
Enhance APG Planning and Infrastructure	Strengthen regional collaboration in O&G sector	Pave the pathway for coal in ASEAN's Carbon Neutrality	Accelerate the adoption of EE&C to encourage the realisation of ZEB	Accelerate RE integration for ASEAN's power sector	Bridge financial and investment gaps for ASEAN's energy transition	Enhance effective communication strategies for CNE
Expand Cross Border Power Trading	Pursue Green Diversification and Decarbonisation in O&G sector	Theme for ECAP37	Enhance EE&C to drive decarbonisation in the industry and agricultural sector	Advance RE applications in end-use sectors (transport, industry and building)	Advance cross-sectoral collaboration for a just and inclusive energy transition	Strengthen regional and international collaboration for nuclear energy
Drive a low carbon APG			Enhance fuel economies in the transport sector and promote electrification		Effective Implementation of APAEC	
			Promote innovative strategies to catalyse the accelerated adoption of EE&C technologies and measures			

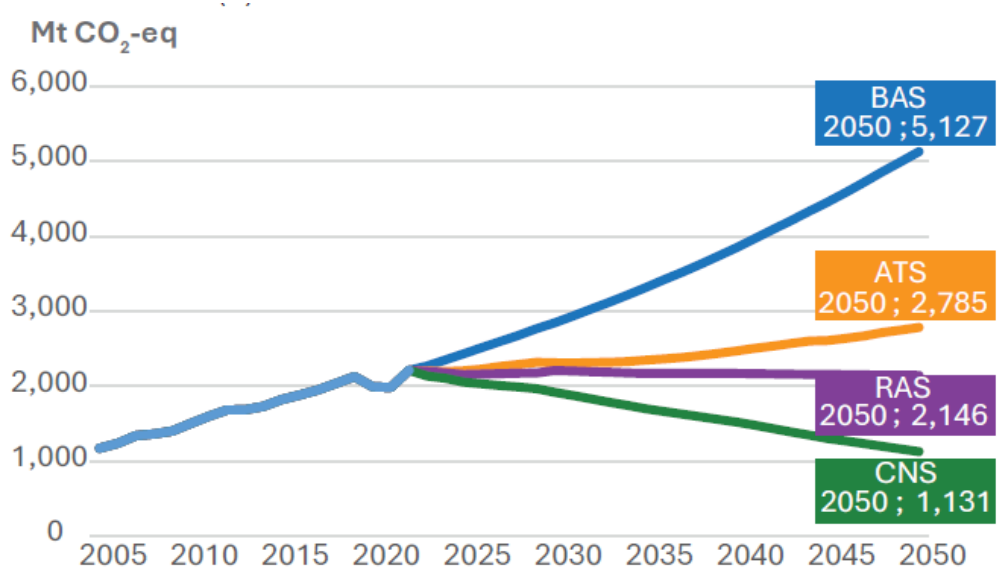
Energy Intensity (EI) Reduction and GHG Emission in ASEAN

EI = Total Primary Energy Supply / GDP



- EI has reduced by 24.5% in 2022 compared to 2005 figure
- To achieve APAEC Phase II target reduction by 32% in 2025 requires coordinated efforts across sectors

GHG Emission in ASEAN across scenarios



- GHG emission is doubled by 2022 compared to 2005 level
- Dominated by electricity generation, industry, transport
- Fuel switching will be essential to drive efforts towards net zero

Varying level of Policies in Energy Efficiency, Collective Action Required

Countries	Target
ASEAN	**40% Energy Intensity Reduction by 2030**
Brunei	Reduction of Total Energy Consumption (TEC) to 63% based on 2010 level and Energy Intensity to 45% based on 2005 level
Cambodia	15% of energy Intensity reduction in industry sector by 2030
Indonesia	Energy Elasticity < 1 by 2025 ; 1% of energy intensity reduction per annum up up to 2025
Lao PDR	10% of total final energy consumption reduction by 2030, compared to BAU
Malaysia	Aim to increase residential energy efficiency savings to 10% and industrial/commercial energy efficiency savings to 11%
Myanmar	To reduce 20% of energy consumption from BAU by 2030
Philippines	At least 10% of energy saving on electricity from all sectors by 2040, based on 2016 BAU
Singapore	Energy Intensity reduction by 35% in 2030, compared to 2005 level
Thailand	Reduce energy intensity (TFEC/GDP) by 30% in 2036, compared to 2010
Vietnam	8-10% of energy saving in the period of 2025-2030

Source: Author, adapted from ACCEPT and other numerous reports

Carbon Pricing in ASEAN

Countries	Status
ASEAN	**ASEAN Economic Community Strategic 2026-2030 ; ASEAN Alliance on Carbon Market (AACM) ; ASEAN Common Carbon Framework (AACF) ; Need to harmonise MRV, Registry Infrastructure**
Brunei	Introduce carbon pricing applicable to all industrial sectors and power utilities emitting beyond a carbon emission threshold limit by 2025 (Strategy 6 – BNCCP)
Cambodia	No policies in place. To develop MRV guidelines
Indonesia	ETS ; Operational in Power Sector since 2023 ; International Carbon Trade ; GR 110/2025 ; In Industrial sector > single threshold emission -> emission allowance -> carbon trade
Lao PDR	No policies in place. Coordinate with multi-sectoral policy framework
Malaysia	Intend to introduce carbon tax in Iron, steel, and energy sector by 2026
Myanmar	No policies in place. Strengthen GHG inventory report. VCM projects
Philippines	Under discussion for ETS
Singapore	Carbon Pricing Act 2018 ; Tax for facilities emitting over 25 ktCO2e/year ; USD 35/tCO2 in 2026 ; targeting 50 largest emitters
Thailand	Draft Climate Change Act : ETS, CBAM to avoid carbon leakage
Vietnam	Pilot ETS in 2025 (steel, cement, thermal power), full implementation by 2029

Source: Author, adapted from ACCEPT and other numerous reports

ASEAN Strategies to CN

Accelerate Green Value Chain Integration
Cooperation Framework and remove barriers to bring green products to market

Credible and Common Standards
Taxonomies and definition on GHG reporting, carbon credit, and EE

Regional Circular Economy Supply Chains
Agreed definition and facilitate trade deals

Attracting and Deploying Green Capital
Pathways to attract necessary capital to region

Connect Green Infrastructure Market
Interconnectivity for green technologies and decarbonisation

Green Talent Development and Mobility
Ensure regional access to skills needed for CN journey

Interoperable Carbon Markets
Credilble and interoperable with each other and global market

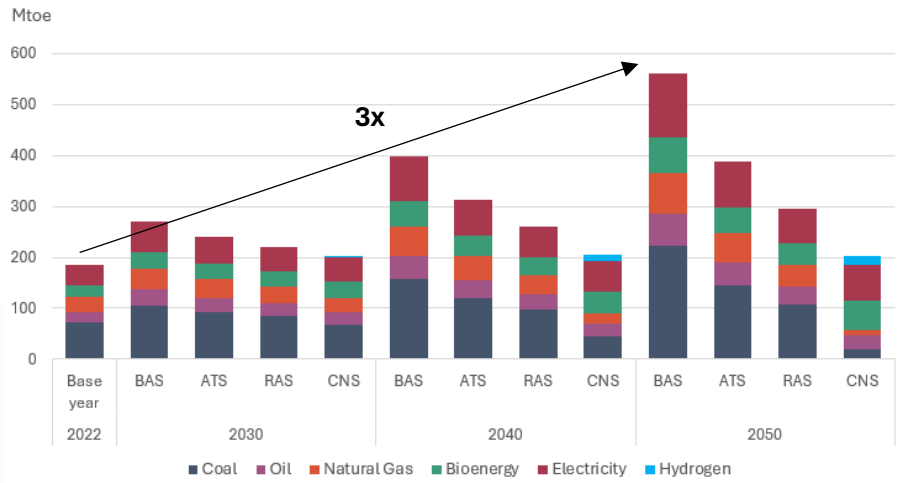
Green Best Practice Sharing
Best practices in R&D, tech, and transition

Source: ASEAN Strategy for Carbon Neutrality, 2024

ASEAN Energy Demand in Industry Sector

Source: The 8th ASEAN Energy Outlook, 2024

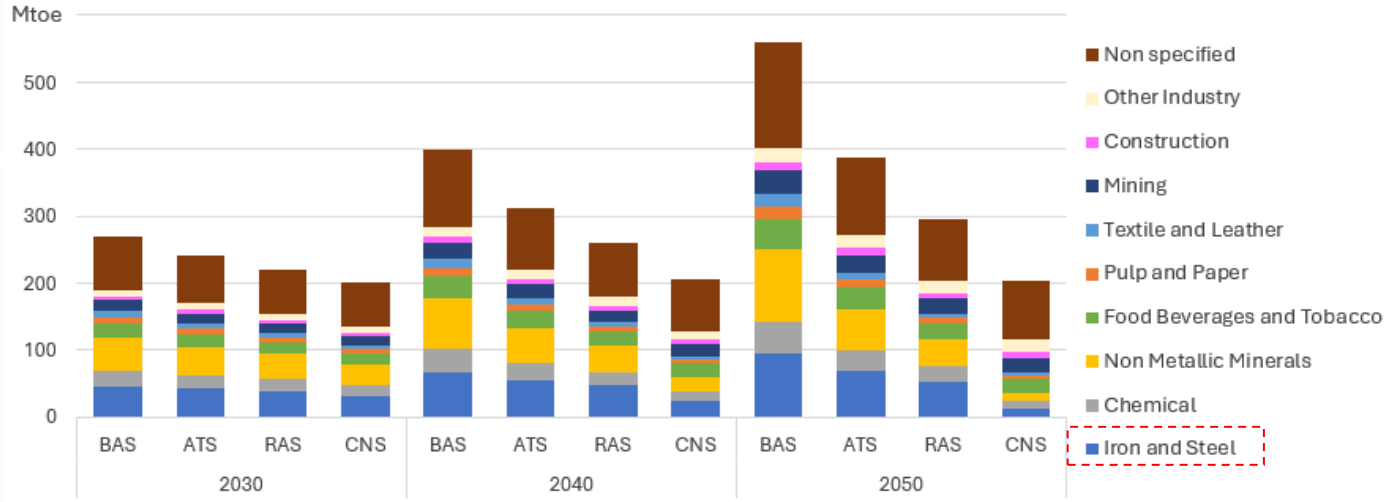
Industrial Energy Consumption by Fuel Across Scenarios



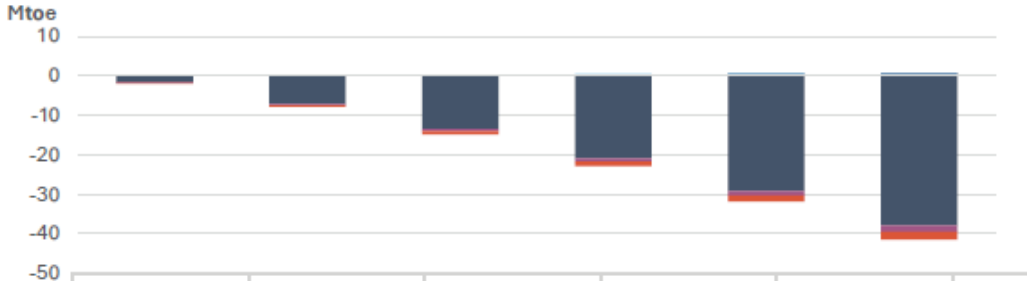
In the **Baseline Scenario**, industry demand is expected to reach 561 Mtoe in 2050, increasing by **3 times** as compared to figures in **2022**

Coal dominates with nearly 40% share, followed by electricity and natural gas.

TFEC by Industrial Sub-Sector Across Scenario



Fuel Shifting in Iron and Steel Industry Demand, CNS



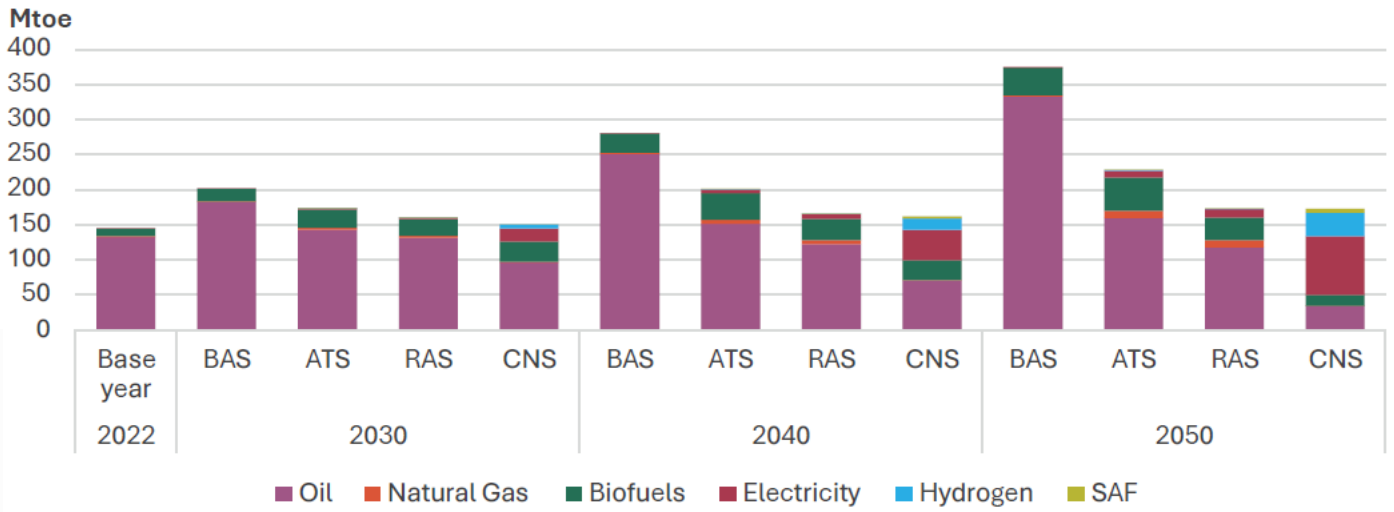
	2025	2030	2035	2040	2045	2050
Hydrogen	0.00	0.02	0.03	0.05	0.07	0.09
Electricity	0.00	0.02	0.03	0.05	0.07	0.09
Bioenergy	0.03	0.11	0.21	0.33	0.46	0.06
Natural Gas	-0.10	-0.38	-0.71	-1.09	-1.52	-1.98
Oil	-0.07	-0.30	-0.56	-0.85	-1.17	-1.49
Coal	-1.76	-7.13	-13.49	-20.86	-29.11	-37.94

- To achieve the Carbon Neutrality Scenario (CNS), coal consumption must be significantly **reduced by 2050**, by nearly **38 Mtoe compared to the regional aspiration target scenario**.
- This transition will involve increased electrification and fuel switching, leading to greater use of hydrogen, electricity, and bioenergy.

ASEAN Energy Demand in Transport Sector

Source: The 8th ASEAN Energy Outlook, 2024

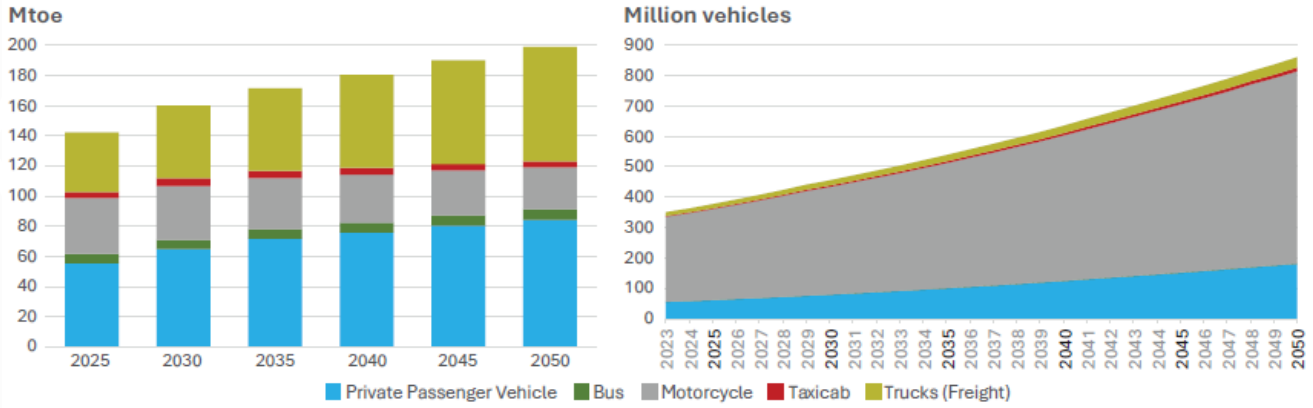
Transport Consumption



- Under the **Carbon Neutrality Scenario**, electrification in the transport sector is projected to account for nearly 49% of the sector's total final energy consumption (TFEC) by 2050.
- **Hydrogen** is anticipated to contribute around 19% of the total energy mix by 2050, while the share of sustainable aviation fuel (SAF) remains modest at approximately 3.2%

(a) TFEC Projection by Vehicle Type in Road Transport

(b) Number of Vehicles per Vehicle Type in Road Transport



Note: End-use details (sectoral demand by vehicle type) cannot be reported for the historical year (2022). These details only appear at the beginning of the projection year (2023) and thereafter.

- Private **Passenger Vehicle and Trucks (Freight)** are two main energy consumers in the sector under ATS
- In term of numbers, motorcycle dominates the road transport in ASEAN, highlighting the region as one of the largest market for two and three wheelers

Net Zero Roadmap Steel : Indonesia and Vietnam

Five Decarbonisation Pillar

1. Material Efficiency and Demand Management

- Circular Economy
- Material Efficiency
- Demand Reduction

2. Energy Efficiency and Electrification of Heating

- Coke dry quenching
- Heat recovery from sinter cooler
- Integrated casting and rolling
- Scrap preheating in EAFs
- Electrification of rolling and finishing

3. Fuel Switching and Cleaner Electricity

- Increased use of natural gas instead of coal
- Increased use of renewable energy in the electricity supply

4. Transition to Low-Carbon Iron and Steelmaking Technologies

- Scrap EAF
- Natural gas and green hydrogen DRI
- Electrolysis of iron ore

5. Carbon Capture, Utilisation, and Storage

- Post-combustion CCS (e.g. top-gas recycling in BFs with CCS, DRI with CCS)
- Carbon utilisation: Carbon to ethanol & carbon to chemical

Production Share in Vietnam and Indonesia

Figure: Steel Production and Trade in Vietnam, 2014-2023

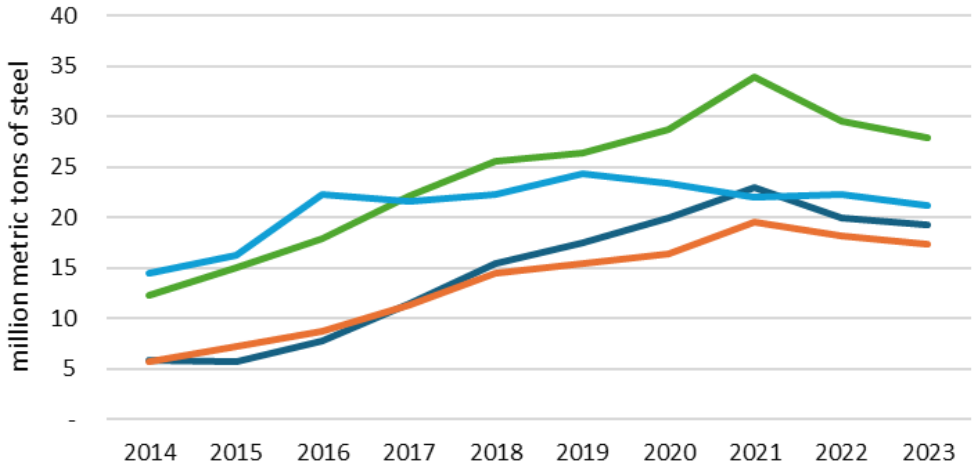
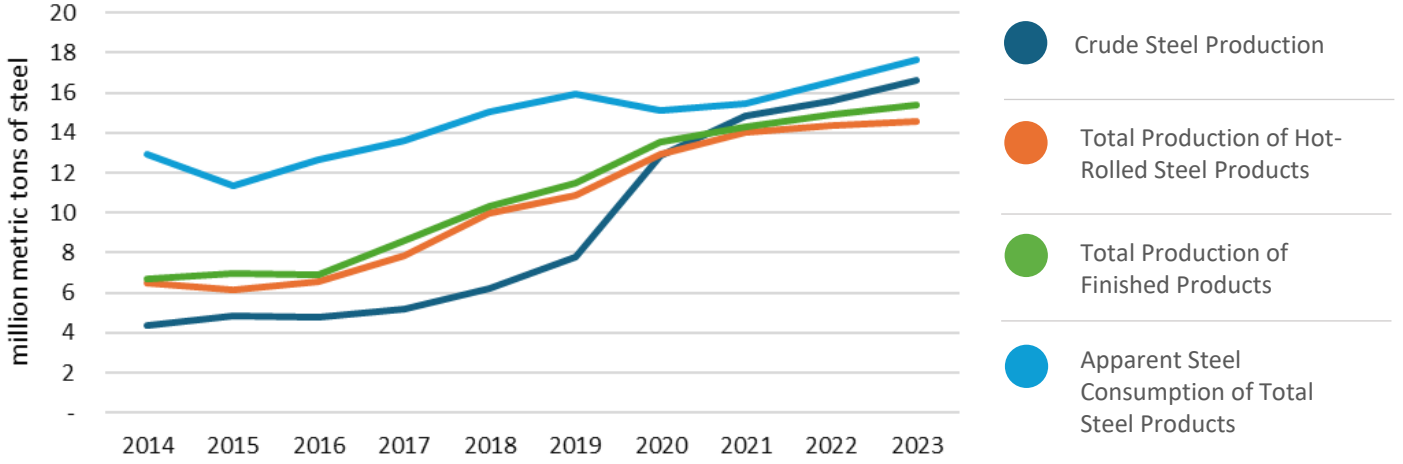
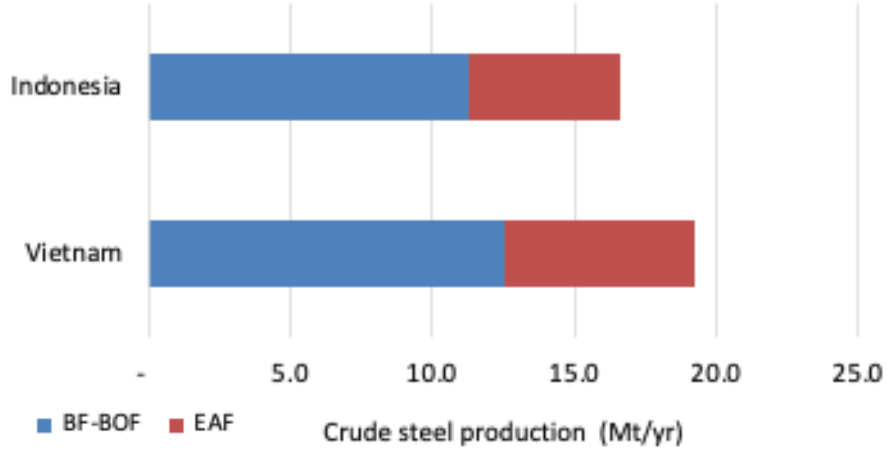


Figure: Steel Production and Trade in Indonesia, 2014-2023



Source: SEAISI Statistical Yearbook

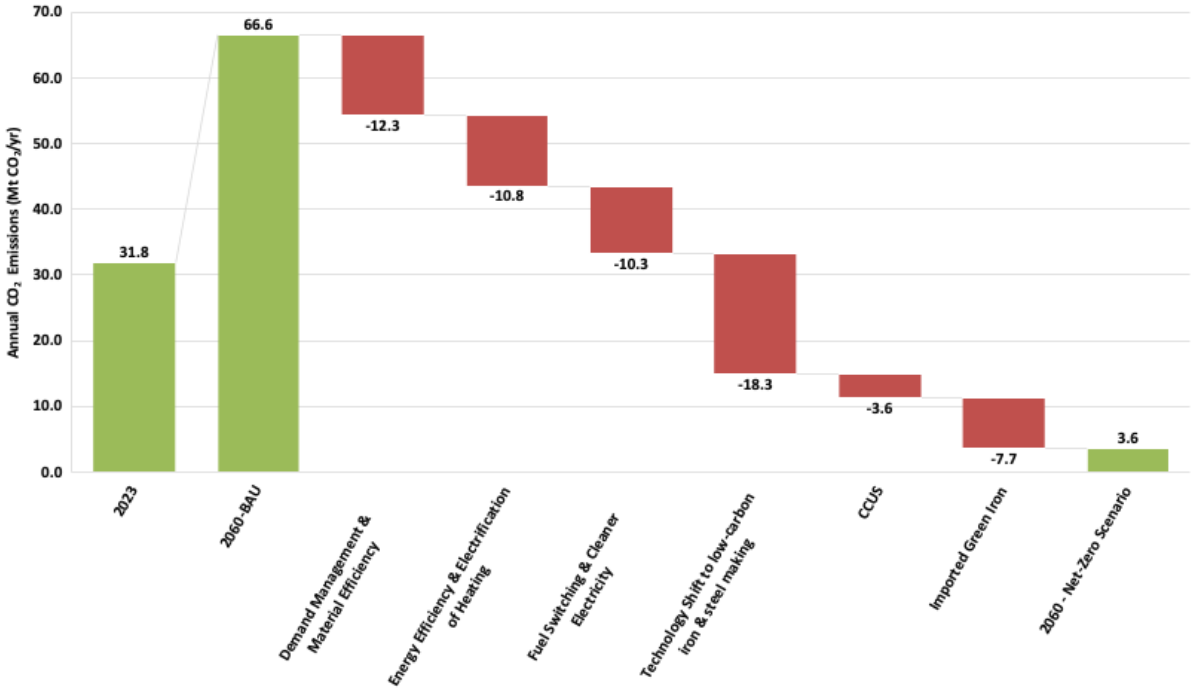
Figure: The share of BF-BOF vs. EAF steel production in 2023

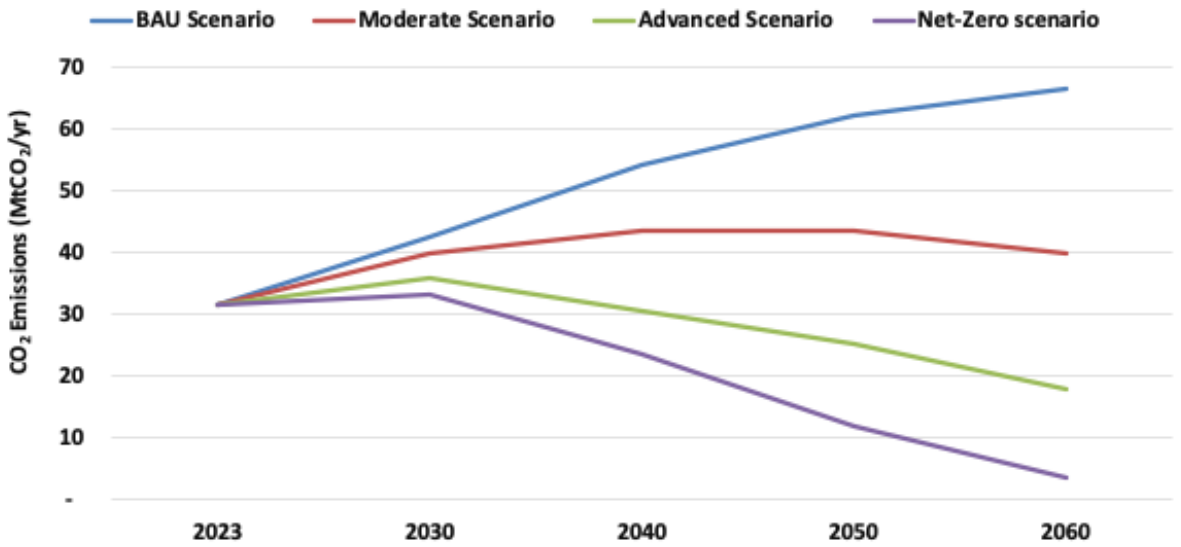


Source: SEAISI Statistical Yearbook

- **Production Growth:** Both countries show strong growth in steel production from 2014–2023, but Vietnam's output remains higher overall, reflecting a more mature and export-oriented steel industry, while Indonesia's growth accelerated sharply after 2019 due to new capacity investments.
- **Consumption and Trade:** Vietnam's apparent steel consumption is lower than its total production—indicating a net exporter position—whereas Indonesia's production is only beginning to meet domestic demand, highlighting its ongoing import-substitution phase.
- **Production Technology: Both countries still relies on BF-BOF Steel routes to produce their steel**. But, Vietnam numbers on **EAF (Electric Arc Furnace)** routes is still higher than Indonesia, indicating more efforts towards the green steel production.

Decarbonisation Pathway: Case for Vietnam

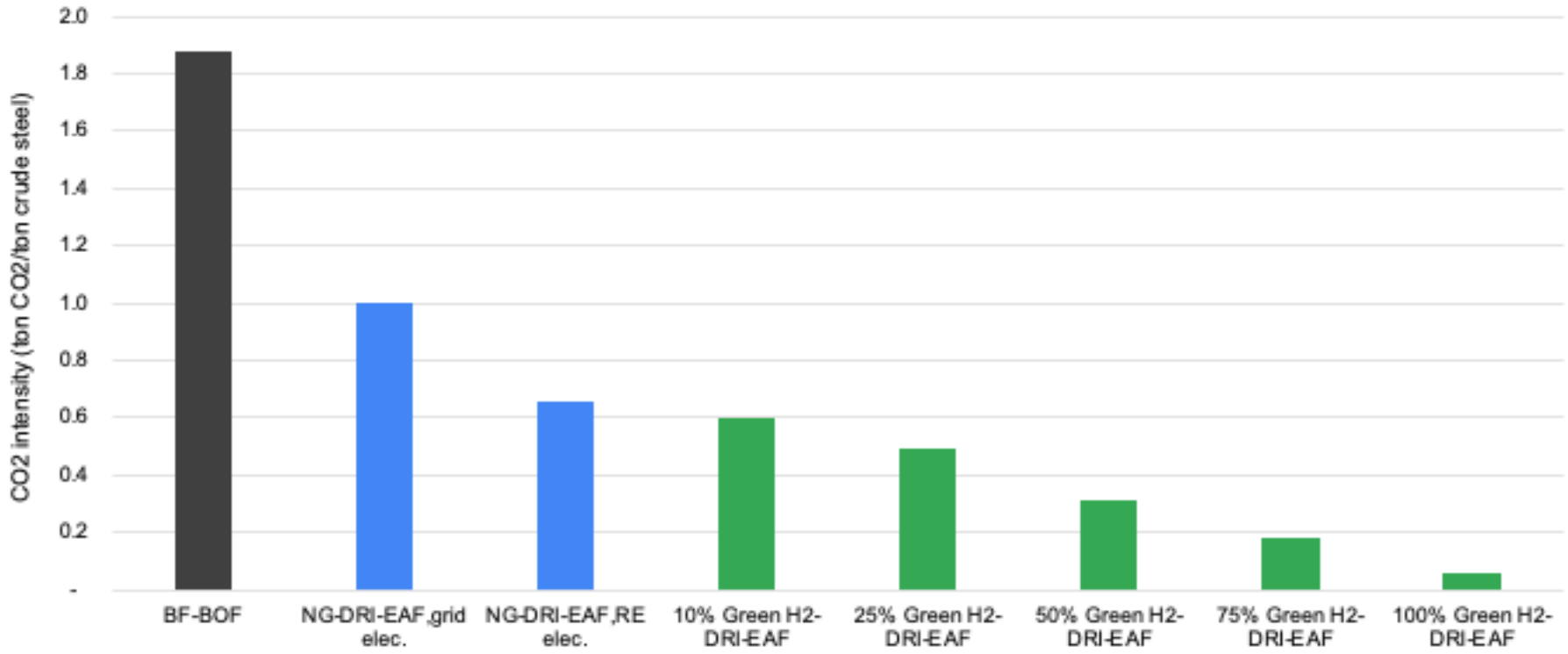




- Without intervention (BAU), steel sector emissions could more than double from **31.8 $MtCO_2$ in 2023** to **66.6 $MtCO_2$ by 2060**.
- Demand efficiency, electrification, cleaner fuels, low-carbon technologies, CCUS, and green iron imports together can cut emissions by over **90%**.
- **Net-zero pathway:** Under the **Net-Zero scenario**, emissions steadily decline to about **3.6 $MtCO_2$/year by 2060**, compared to continued growth in BAU and moderate scenarios.

Pillar 4: Transition to Low-Carbon Technologies

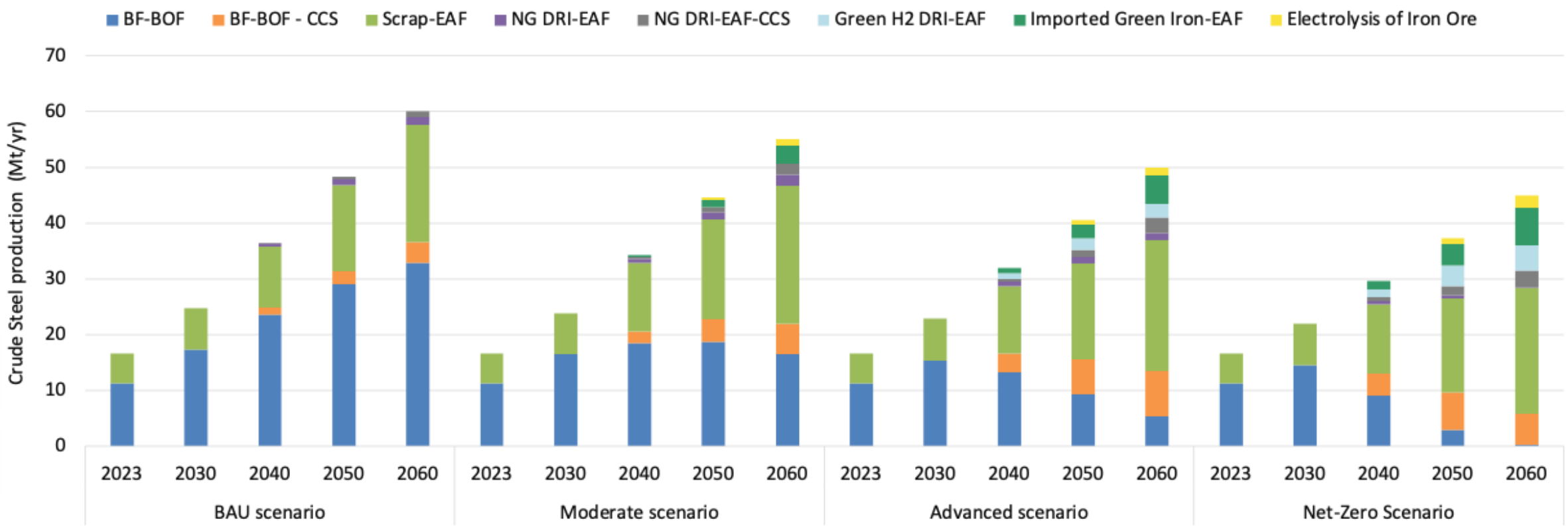
Figure. The CO2 intensity of different new primary crude steel production plants in Vietnam and Indonesia



Note: this is for crude steel production and does not including rolling and finishing.

Pillar 4: Transition to Low-Carbon Technologies

Figure. Crude steel production by technology type under each scenario in Indonesia, 2023-2060



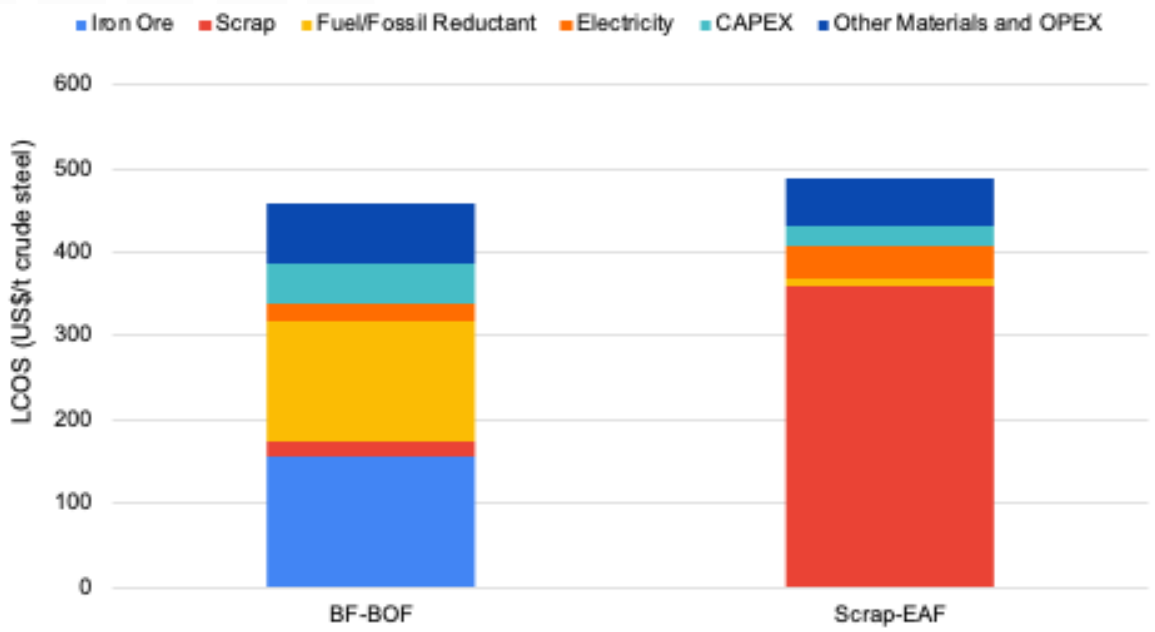
Source: this study

Pillar 4: Transition to Low-Carbon Technologies

Electric Arc Furnace (EAF)

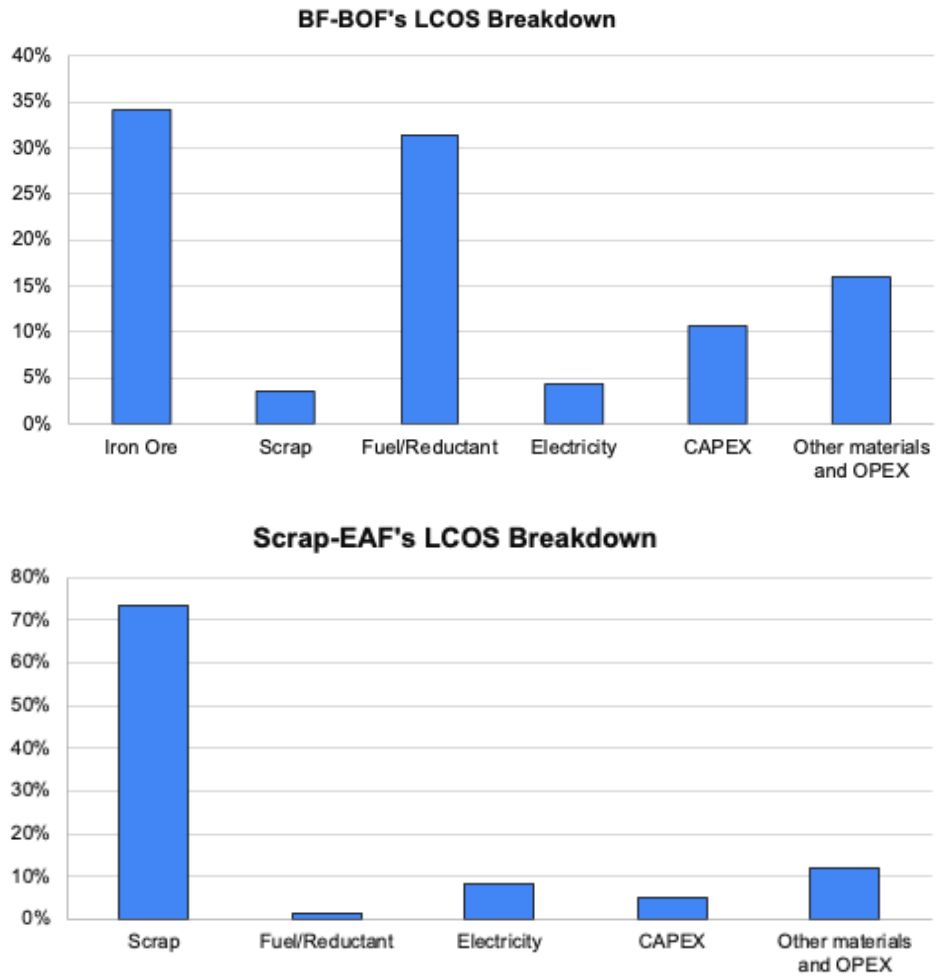
We evaluated the economic feasibility of EAF steelmaking compared to the traditional BF-BOF route using the Levelized Cost of Steel (LCOS) metric

Figure. Breakdown of LCOS components by steelmaking route in Vietnam



Source: this study

Figure. Share of cost components in BF-BOF and scrap-EAF LCOS in Vietnam



Source: this study

Pillar 4: Transition to Low-Carbon Technologies

Green Steel Premium

Green Steel Premium		
Country	**For Automotives** if \$5/kg H_2 is used:	**For Construction** if \$5/kg H_2 is used:
Vietnam	• Up to \$285 per passenger car	• Up to \$793 for the cost of a typical 50 m^2 residential unit in Vietnam
Indonesia	• Up to \$298 per passenger car	• Up to \$828 for the cost of a typical 50 m^2 residential unit in Vietnam

Action Plan in each country

Material Efficiency and Demand Mgt:

Steel Use Guideline for construction, Steel Efficiency into GPP, Production High-strength steel, Design Standard, Industrial Symbiosis for scrap reuse, set material efficiency as KPI targets for companies

Low Carbon Steelmaking

Restrict new BF-BoF, redirect investment towards EAF, Strengthen Scrap Collection and Standard, Incentives for EAF adoption, Guideline Hydrogen-ready DRI Plant Development, Green Iron Imports, Integrate RE to EAF, Green Steel Certification and Carbon Credit System, Enviro Product Declaration (EPD)

Fuel Switching and Cleaner Electricity

RE expansion considers industry's needs, Corporate RE PPAs, Modernise Grid. Retrofit burners/combustion to be Hydrogen-ready

Energy Efficiency and Electrification

Mandate Audits in Steel Plants and Establish Efficiency Baseline, WHR Programme, Electrification roadmap for low-med temperature (rolling and finishing), Phase out subsidies for fossil fuel heating

A Call for Collaborative Action for Steel Market in the Region

Green Steel Definition and Standard
Aligning with global and regional goal, along with clear roadmap of the implementation following the region's capacity for transition. Target kgCO2e/t crude steel, Clear definition on scope 1,2,3 emission and boundaries for calculation guidelines Through MRA.

Trade Remedies
Consider moratorium on new BF-BoF, lift anti-dumping duties within the region, and review anti-dumping policies for products coming outside of the region.

Data Reliability and Availability – Plant Level : Disclosure and Reporting
Important to monitor the progresses. Platform like ASEAN Energy Database System can be leveraged.

Transition Finance
Redirect investment from BF-BoF to EAF or DRI-ready plant, green steel premium/incentives for Public Procurement use for market certainty, Public Private Partnership (VGF/Guarantee).

Scrap Market Collection and Standard
Identification of scrap availability within this region, drawing opportunities to be self-sufficient with standardized collection and sorting method. Scrap specification (ISRI), through MRA. Allow import scrap steel, with clear use for EAF, not as waste.

Powering with RE in ASEAN

APG and Cross-border REC.

Other Initiatives

GCF-KDB Programme: Support Innovative Mechanism for Industrial Energy Efficiency Financing

- USD 100 million credit guarantee mechanism -> de-risking for banks in financing EE projects
- SBLC, interest rate is capped at 8% p.a (loan in USD)
- Technical Assistance and Due Diligence -> EE Assessment, Audits, E&S Risk Categorization (IFC Standard)

Energy Savings Insurance

- Reduce perceived risks of EE by guaranteeing performance of EE projects
- Engagement with banks, insurance companies, and tech providers. Create ecosystem in Indonesia

Industrial Regional Database Development

- Benchmarking energy intensity (SEC) across key industrial sectors in ASEAN
- Track progress and share best practices
- Proposed initial sectors to benchmark: cement, steel, textile (subject to agreement with AMS)

Conduct Market Study of Motors

- Pathway towards harmonization of MEPS for Motors

Way Forward

Adopting and Harmonising MEPS for Equipment

- Industrial motors, boilers, compressed air system are a few technologies that could propel efficiency improvement in Industrial sector

Addressing Financial Barriers with De-risking Instruments

- Credit guarantee and Energy Savings Insurance (ESI) with potential for replication across ASEAN
- Strengthening ESCO financing and Measurement and Verification (M&V)

Promoting EE Actively Across Sectors

- Explore potential to work with Industrial Park/Zone to identify project pipelines
- Capacity building and study for energy efficient technologies for specific sectors

Developing Industrial Benchmark Database and Interoperable Carbon Mechanism

- Benchmark energy-intensive industrial sub-sector to track and align progress across regions
- Develop regional MRV framework for carbon credits

ASEAN Centre for Energy
One Community for Sustainable Energy

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