Indonesia emissions trading system

Summary of insights: Focus Group Discussions Nov 2021 – May 2022

Abstract

This summary report provides an overview of Indonesia's carbon pricing policies and details on the design of its emissions trading system (ETS) for the power sector. It also provides a consolidated summary of the different country experiences shared during the four focus group discussions that were organised by Indonesia's Ministry of Energy and Mineral Resources, the IEA and the OECD between November 2021 and May 2022.

Foreword

In order to assist the efforts of the Indonesian Government's to develop a domestic ETS, the IEA, OECD CEFIM Programme and Indonesia's Ministry of Energy and Mineral Resources hosted a series of four technical focus group discussions or FGDs. Building on international experience and OECD/IEA experience, these FGDs provided a deep-dive into a variety of elements critical to the development of effective ETS schemes, each relevant to the Indonesian context. This series of FGDs brought together stakeholders from Indonesia and leading international experts to share their experience and lessons learned in the development, design and implementation of ETS. These events took place between November 2021 and May 2022.

The first FGD examined Indonesia's goals and early progress on the implementation of the ETS trial and different international approaches to designing and implementing ETS schemes in the power sector. During the discussion, country experts from China and Korea shared their respective countries' experiences designing and implementing such schemes as well as key lessons learned.

FGD II looked at how other ETS schemes have addressed some early challenges in the design and implementation phase including determining the emissions cap, how the price will be determined and evolve, and the options of recycling the revenues raised from the scheme. Experts from the European Union, Poland and the United Kingdom shared their experience in technical design to monitoring of ETS development as well as on stimulating industry participation.

FGD III focused on implementation at the ETS pilot and early phases with a focus on design elements that can enhance participation. This FGD also examined the impact of a carbon tax on the design and operation of the ETS. During the discussion, country experts from China, the United Kingdom and the European Union shared their insights as well as private sector perspectives on carbon tax versus ETS in carbon pricing policies.

FGD IV discussed regulation and the role of the financial sector in Indonesia's emissions trading scheme and also looked at linkages to international carbon markets. The discussion included an overview of the Paris Agreement Rulebook as outlined under Article 6. During the discussion, country experts from South Africa, Japan, New Zealand and South Korea discussed together with different Indonesian government agencies their experience on linking with other carbon markets, including institutional arrangements, monitoring and verification systems, and certification of carbon offsets.

Each of the four FGDs ended with a dialogue, convening representatives from government institutions, development partners and other relevant stakeholders to discuss opportunities that could be adapted to the Indonesian context.

Acknowledgements, contributors and credits

This summary report was prepared by the Clean Energy Finance and Investment Mobilisation (CEFIM) team of the Environment Directorate of Organisation for Economic Co-operation and Development (OECD) and the Environment and Climate Change Unit (ECC) of the Directorate of Sustainability, Technology and Outlooks in the International Energy Agency (IEA) in co-operation with the Ministry of Energy and Mineral Resources Indonesia (MEMR). Cecilia Tam and Hakimul Batih from the OECD and Kieran McNamara from the IEA co-ordinated the project. Jeremy Faroi from the OECD and Ermi Miao from the IEA were the other principal contributors to this report, which was reviewed by Sara Moarif (IEA).

The report is based on the valuable inputs and review from all the policymakers, experts, stakeholders who spoke at the Focus Group Discussions. Indonesian policymakers:

- Wanhar (Former Director of Electricity Engineering and Environment, MEMR)
- M Priharto Dwinugroho (Director of Electricity Engineering and Environment, MEMR)
- Emma Rachmawati (Director for Climate Mitigation, MoEF)
- Bayu Nugroho (Coordinator for Electricity Environmental Protection, Directorate General of Electricity, MEMR)
- Syofvi Roekman (Former Director of Human Capital and Management, PLN)
- Edi Broto Suwarno (Director of Capital Market Regulations, OJK)
- Ilham (Policy Expert of Climate Change, Deputy of Environment Management and Forestry Affairs, CMMIA)

International experts:

- Paul Dawson (Head of Regulatory Affairs, RWE Supply & Trading);
- Stefano De Clara (Head of Secretariat, International Carbon Action Partnership);
- Ted Jamieson (ETS Market Team, Ministry for the Environment New Zealand);
- Seoyoung Lim (Deputy General Manager, Department of Carbon Neutrality Korea).
- Luca Lo Re (Analyst, IEA);
- Francesca Manni (Director of Human Capital and Management, Enel);
- Sindisiwe Mashele (Director of Climate Change M&E-GHG Inventory & Systems, Department of Forestry, Fisheries and the Environment, South Africa);
- Tong Qing (Senior Researcher, Institute of Energy, Environment and Economy Tsinghua University);
- Marta Roslaniec (Chief Expert in Strategy, Analysis and Auctions, KobiZE, Poland);

- Insung Son (Research Fellow, Korea Energy Economic Institute);
- Dr. Danial Sturge (Practice Manager, Carbon Policy, Energy Systems, Catapult, United Kingdom);
- Noriko Tamiya-Hase (Deputy Director, Office of Director for International Co-operation for Transition to Decarbonization and Sustainable Infrastructure, Ministry of Environment Japan);
- Peter Vis (Senior Research Associate, European University Institute);
- Zhang Xiliang (Director of Institute of Energy, Environment and Economy, Tsinghua University).

This report was made possible through the generous support of Denmark to the OECD's Clean Energy Finance and Investment Mobilisation Programme and was supported through the IEA Clean Energy Transitions Programme (CETP).

Background and context

Governments around the world are implementing policies that are designed to support efforts to decarbonise the economy as part of a movement towards clean energy transitions. There is no single solution that can deliver a complete and effective decarbonisation in any given circumstance, as the choice of policies in any jurisdiction depends not only on domestic policy objectives and constraints, but also on local energy resources and market structures.

Nonetheless, an increasing number of countries and jurisdictions are introducing carbon pricing instruments as a means to limit and reduce emissions. In most cases, carbon pricing refers to measures that place an explicit price on GHG emissions, for example, a price expressed as a value per tonne of carbon dioxide equivalent (tCO2e). Pricing carbon emissions directly can induce changes in the behaviour of emitters, incentivising them to reduce carbon-intensive, harmful activities such as excessive, unproductive energy consumption. Carbon pricing can also be a source of revenue, which is an important advantage in times of constrained resources.

Different approaches to carbon pricing can be adopted. An emissions trading system (ETS) provides certainty in terms of environmental impact but the price varies. A carbon tax, in contrast, guarantees the carbon price for a period of time but provides an uncertain environmental outcome in terms of emissions reductions. Other price-based instruments that can work alongside explicit carbon pricing include offset mechanisms and results-based climate finance; internal or “shadow” carbon prices can also set by businesses or organisations. Given the scale and urgency of energy transitions, a broad range of carbon pricing approaches within a comprehensive set of policies and regulations will be needed.

By the end of 2021, there were 64 carbon pricing Instruments at various stages of implementation, of which 33 were carbon taxes and 31 were emissions trading systems. Around 21.5% of global GHG emissions are covered by carbon pricing instruments in operation (World Bank, 2022). These are implemented at different jurisdictional levels, from supranational (e.g., the EU Emissions Trading System) and national/federal (e.g., Ireland’s carbon tax) to subnational (e.g., California’s Cap-and-Trade Program). In additional to Indonesia, there is increased interest in carbon pricing in the ASEAN region. Singapore launched its carbon tax in 2019, and Indonesia, Thailand, Viet Nam, Brunei and many others have started exploring carbon pricing as a tool for meeting their GHG mitigation objectives.

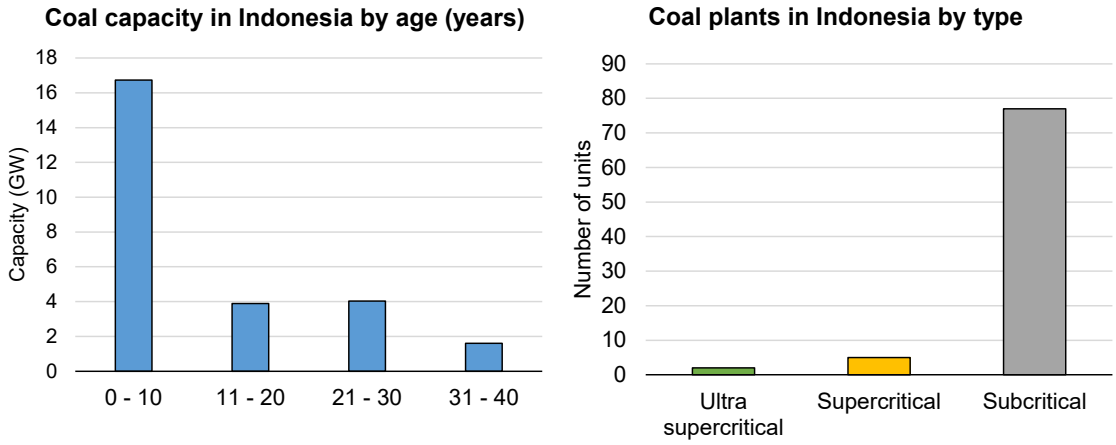
Indonesia’s GHG emissions profile

Indonesia’s economy expanded rapidly over the past half century, supported by coal and natural gas exports. The country is the world’s fourth-most populous country; seventh-largest economy; twelfth-largest energy consumer and the largest coal exporter (IEA, 2022). Over the 2000-21 period, CO_2 emissions from Indonesia’s energy sector increased by slightly more than two-times and GDP increased by a little more than two-and-a-half-times. The growth of CO_2 emissions has therefore been relatively tightly coupled to the growth of GDP.

Coal accounted for almost 75% of increased emissions, with increased oil and natural gas demand accounting for the remainder of the increase. The electricity sector drove about half the emissions increase, industry for about one-fifth, and the transport about 20% of the increased CO_2 emissions in this period. Nonetheless, despite economic growth and in the increase in emissions, Indonesia's per capita energy sector emissions remain half the global average (IEA, 2022).

As a key driver of energy-related emissions, decarbonising Indonesia's power system will form a cornerstone of the country's climate goal. Under its recently submitted enhanced nationally determined contribution (NDC), Indonesia aims to reduce its greenhouse gas (GHG) emissions by 31.89% (or 43.20 % with international support) by 2030 and achieve a net-zero emission target by 2060 or sooner (Government of Indonesia (GoI), 2022). As the country's second-largest greenhouse gas emitter, the energy (and power) sector can make a major contribution towards these emission reduction targets.

Figure 1: Coal fired power plant in Indonesia by age and efficiency in 2021



Note: included the 84 plants that are considered for ETS trial, accounting for 90% of emissions from coal-fired power plants

The development and implementation of a domestic ETS for the power and industry sectors is one of the key policy mechanisms to help meet its recently submitted enhanced NDC targets and foster low-carbon sustainable development. A voluntary and intensity-based pilot ETS for the power sector was implemented between April and August 2021, where participants traded allowances and offset credits stemming from renewable energy generation and energy saving solar lamps (LTSHE). In total, 84 coal-fired power plants, both publicly- and privately owned, were invited to participate, with 32 eventually taking part. According to government plans, the ETS is set to continue over the coming years and will be implemented along with the carbon tax. Until 2024, it will be implemented in only in coal-fired power plant. By 2025, the ETS will be fully implemented by means of a carbon exchange, and along with the carbon tax, will extended to other sectors, taking into account sector readiness, economic condition, stakeholder readiness, impact and/or scale.

Overview of carbon pricing in Indonesia

A study completed in late 2018 examined four market-based instrument options for Indonesia: an ETS for the power and industry sectors; energy efficiency certificates for industry; a cap-and-tax system; and a carbon offset mechanism. Based on the study and stakeholder consultations, an ETS scenario was selected for further development, and a voluntary pilot was conducted for the power sector in 2021.

A presidential regulation (reg. 98/2021) providing a national framework for carbon pricing instruments, including an Emissions Trading System (ETS), was signed in October 2021.[1] This regulation extends the "Government Regulation on Environmental Economic Instruments", which was introduced in November 2017 and provided a first mandate for an emissions (and/or waste permit) trading system to be implemented by 2025.

The Indonesia ETS will function as a hybrid "cap-trade-and-tax" system, with the ETS alongside a carbon tax initially scheduled to start in April 2022, and regulated by the broader "Law of the Harmonization of Tax Regulations in Indonesia". The new law stipulated that carbon taxes will be first implemented for coal-fired power plants in 2022, then gradually expanded to other sectors in 2025, depending on sector readiness. In order to mitigate the impact of rising global energy prices in 2022, a decision was made to delay the carbon tax on coal-fired power plants. Originally planned for 1 April, tax implementation was first delayed to 1 July, and currently the new implementation date is unknown, but should happen in 2022 to align with the mandate of the regulation. Once the mandatory ETS is in place, installations that fail to meet their obligations under the system will be subject to the carbon tax, at a rate linked to the price of the domestic carbon market.

Figure 2: Development of Indonesia's carbon pricing mechanism, 2006-2030

2016	2017	2021	2022	2025	2030
Ratification of NDC (Law 16/2016)	Regulation to implement ETS (Reg 46/2017)	Law to implement carbon tax (UU HPP) Voluntary ETS Trial for power sector start Presidential Reg 98/2021	April 1, initial planned start of the carbon tax for coal power plant July, 1st delay of start of carbon tax New start of the carbon tax has not been announced	Start of the mandatory ETS, gradual expansion of ETS and carbon tax to be followed	31.89% unconditional emissions reduction from BAU level

[1] Implementation of Carbon Economic Value for the Achievement of Nationally Determined Contribution Targets and Greenhouse Gas Emissions Control in National Development

Institutional arrangements

Policy co-ordination and regulation oversight of the carbon pricing implementation is the responsibility of Co-ordinating Ministry for Maritime and Investment Affairs (CMMIA), which chaired the steering committee, as mandated by the Presidential Regulation No. 98/2021 on the carbon pricing regulation. CMMIA is supported by other government ministries and agencies in executing its functions. The Ministry of Environment and Forestry (MoEF) will lead the substantive matters related to the nationally determined contributions (NDCs) and implementing regulations on carbon pricing instruments. The Ministry of Home Affairs (MoHA) will handle the regional co-ordination of ETS implementation. Meanwhile, the Ministry of Finance will lead the substantive financial and fiscal matters pertaining to the ETS and carbon tax.

For the design and implementation of carbon pricing instruments, regular collection, analysis, and use of reliable information and data on GHG emissions is critical. In 2015, Indonesia established the web-based Sign-Smart National GHG inventory system for reporting GHG emissions levels. The relevant minister, governor, mayor, and business actors in Indonesia are required to measure and report GHG emission levels at least once a year. Key challenges of implementing the Sign-Smart system are readiness gap among different sectors and provinces, integration among various related systems and budget availability for capacity building and system update and maintenance.

Monitoring, reporting and verifying (MRV) guidelines for the power sector were published in May 2018. The APPLE-Gatrik (electricity emissions calculation and reporting application) is a web-based tool for calculating and reporting GHG emissions from generating units to the Directorate General of Electricity (DJK) of MEMR. Around 5 700 power plants connected to the PLN grid will report to APPLE-Gatrik in 2020. The APPLE-Gatrik system was developed based on inputs from a study outlining the emissions profiles and marginal abatement cost curves of the power and industry sectors, in addition to completing the design and governance framework of an MRV system. Following this, an online GHG reporting platform for electricity generators and a pilot MRV programme for electricity generators in the Java-Madura-Bali grid (covering around 70% of Indonesia’s electricity demand) were launched in August 2018. The Ministry of Industry also developed an online GHG emissions reporting system.

Indonesia is also working on a registry system known as the Registry System for Climate Change Control (SRN) operated by the Ministry of Environment and Forestry (MoEF). This system serves as a registration of mitigation and adaptation actions, providing information to government entities, providing public access to data and information on actions and resources, as well as managing databases to assist the analysis and formulation of policy.

The registry system is expected to be fully operational by 2030, but data and information for reporting under the UNFCCC transparency framework could be available as early as 2024. Once operational, the carbon market will be automatically integrated into the national registry system.

According to statement from Co-ordinating Ministry of Maritime and Investment (Kemenkomarvest), Indonesia will conduct the carbon exchange as a primary and secondary carbon market with trading infrastructure, revenue usage regulation and

transaction administration under development. The carbon exchange will be operated through the Indonesia Stock Exchange (IDX) and authorised by the Financial Services Authority (OJK). Currently, Indonesia is still deciding whether to trade in the form of stock exchange or set up a separate entity for carbon exchange. However, regulation regarding carbon exchange in Indonesia is still under discussion.

The ETS Trial

A voluntary and intensity-based pilot ETS for the power sector was implemented between April and August 2021 with 32 coal-fired power units taking part. The government plans to continue the pilot programme with new phases before transitioning to a mandatory ETS by end of 2024. The current ETS trial in Indonesia is characterised as intensity-based cap-and-trade, with offsets. Once the carbon tax is implemented, the ETS will become cap-trade-and-tax. The main goal of the voluntary ETS trial is to improve inventory GHG emission measurement, reporting, and verification, raise awareness about carbon pricing, and put a coal-fired power plant emission cap in place.

The ETS trial was part of the Energy Efficiency Subroto Awards (PSBE) organised by the Ministry of Energy and Mineral Resources (MEMR)'s Directorate General of Electricity (DJK). The Energy Efficiency Subroto Awards is the highest award from MEMR.

Sectoral coverage and cap-setting

The voluntary ETS trial covered only direct emissions from the power sector with an intensity cap. Coal-fired power plants with a capacity greater or equal to 100 MW directly participate in the cap and trade, while renewable and other power plants participate indirectly by means of offsets.

Table 1: Coal-fired power plant emission caps by category

Power plant category	**Capacity (MW)**	**Emissions cap (tCO2/MWh)**
Coal-fired power plant	> 400	0.918
Coal-fired power plant	100 < x <= 400	1.013
Mine-mouth coal-fired power plant	100 < x <= 400	1.094

The 2019 intensity cap is calculated using the weighted average emissions of each plant category. Plants receive free allowance based on the intensity cap, which means that those that emit less than the average will have an allowance surplus, while those that emit more than the average will have an allowance deficit.

Meeting compliance: trade, offset and tax

During the trading phase, plants with an allowance surplus can sell their excess allowances only if they have made energy efficiency and emissions mitigation efforts, such as adding renewable energy. Plants can trade no more than 70% of their allocated emissions allowance. During the trial

phase, cap-trade-offset mechanism was implemented, while cap-trade-tax mechanism is planned for the full implementation phase.

Those with an allowance deficit can purchase allowances from other plants or use offset to achieve compliance. Coal plants that have not surrendered a sufficient amount of allowances or offsets under the scheme will be subjected to a carbon tax at a fixed price of IDR 30/kg CO_2 (USD 2/tCO_2) once the carbon tax is enforced. The carbon tax is then expected to act as a price ceiling for Indonesia's ETS market. During the full implementation phase, there will be no transaction restriction and offset. However, a greater understanding of the role of the ETS and carbon tax and how they would interact given current and future benchmarks is needed.

Plants yielding surplus allowances and those with deficits can both use offsets. The use of offsets is restricted to 30% of the emissions cap. There are two types of offsets: the international certificates and the Indonesian certificates. The international certificates are offsets from renewable energy mitigation actions in Indonesia or elsewhere that have carbon credit certificates from mechanisms such as ICER, CDM, VCS/VERRA, Plan Vivo, JCM, Gold Standard and others, with a commercial operation date in 2011 or later. It should be noted that those certificates need to be approved by MoEF. MEMR issues Indonesian certificates for mitigation actions, such as on and off-grid solar power plant and energy efficient public street-lighting projects that are registered in the Emission Reduction Book (PPE) but have yet to receive a carbon credit from another mechanism.

Focus group discussions: summary and insights

FGD I: ETS schemes in the power sector

The first FGD examined Indonesia's climate and energy goals and early progress with implementation of the ETS trial including the learning taken from the experience. The FGD also highlighted different international approaches to design and implementation of ETS schemes in the power sector. Country experts from China and Korea were invited to share their respective countries' experiences designing and implementing such schemes as well as key lessons learned. The session closed with a discussion between representatives from Indonesian government institutions, development partners and other relevant industry stakeholders on merits or otherwise of the ETS.

International approaches to ETS design in the power sector

The power sector is one of the most covered sectors by ETS around the world. The sector's emission reduction potential (e.g., power and heat generation accounts for 40% of global energy-related CO2 emissions) and availability of low-emission technologies often makes it an ideal candidate.

In fully liberalised power markets, the carbon price incentivises decarbonisation via sending signals throughout the different segments of the power production value-chain i.e., planning, investment, and dispatch, wholesale and retail markets. To illustrate, a carbon price can affect the business case for investing in high-emission power projects, the merit order in economic dispatch models (through increasing operating cost of high-emission plants) or reducing power consumption at the end-use level (through increased retail tariffs). In theory, a carbon price would play the central – if not singular – role in driving cost-effective emissions reductions. However, in practice, the role of the carbon price is limited by three main factors:

- Governments and regulators face constraints in implementing carbon prices at a level that would send a strong signal throughout the economy;
- Multiple objectives overlap and co-exist with emissions reductions within the energy transitions agenda;
- Market failures make it difficult for a carbon price signal to get through and play the role it is meant to.

As a result, governments develop packages of policies, of which carbon pricing may be only one (though important) element and hence its intended role may vary across jurisdictions. For instance, an ETS can be used as the main tool to drive down emissions, as a backstop for other policies or just as a means to raise revenues.

In the European Union, the ETS has not been the primary driver of emission reduction in the power sector. Nonetheless, the allowance costs have been high enough to favour coal-to-gas switching in the power sector before 2011 and since 2016. In the United Kingdom (UK), a moderate carbon price of about GBP 23/tCO_2 led to a dramatic shift in power generation, with the historical share of gas and coal in power generation falling dramatically. In the United States (US), California intended its cap-and-trade system to act as a backstop in case other mitigation policies underperformed. Since 2009, coal generation in California declined by 60%, although the effect of the cap and-trade Is believed to have been relatively modest compared to other mitigation policies.

Similarly, the US Regional Greenhouse Gas Initiative (RGGI) – the largest regional emissions trading system, operating in ten states – determined a regional cap on emissions from regulated power plants within RGGI states; the cap then tightens every year so as to provide a transparent and predictable CO_2 reduction pathway. Since inception, RGGI states' emissions have reduced by more than 50% or twice as fast as the United States as a whole, and raised over USD 4 billion to invest in local communities. However, studies suggest that the system has had minimal impact as a direct driver of CO_2 emissions reduction.

Indonesia needs to carefully assess interactions between ETS design and other energy-related policies such air pollution control, renewable energy and energy efficiency promotion, economic restructuring and power sector reform

Box 1: Lessons learned from ETS implementation in China and Korea

China started operating its national ETS scheme in 2021 after initiating the development of regional ETS pilots in 2013. The national ETS currently covers the power sector (responsible for 40% of China's energy sector CO_2 emissions), and is expected to eventually expand to eight sectors, which accounts for around 70% of the country's energy sector emissions – and around 8 500 entities. China's national ETS currently adopts an intensity-based design, which can be characterised as a tradable performance standard, where allowances are allocated according to actual production levels and predetermined emissions intensity benchmarks, without a predetermined cap on total number of allowances. This approach is sometimes also called an intensity-based cap.

Over 60% of China's power generation comes from coal and 70% of power is used for industry. As heat and electricity tariffs are currently heavily regulated in China (as in Indonesia), the country's ETS was designed to take into account both direct (e.g., from burning fossil fuel) and indirect (e.g., use of electricity and heat) emissions in order to incentivise industries to reduce emissions from power consumption (e.g., by switching to low-carbon sources or lowering consumption). The final design for tackling indirect emissions will also account for ongoing reforms to China's power market, with coverage of indirect emissions potentially less essential depending on speed of reform.

Korea offers similar insights. The country was the first East Asian nation to implement an ETS scheme in January 2015. The cap-and-trade system covers six sectors, six greenhouse gases and has around 700 participants (as of 2021). In the power sector, South Korea ETS operates in a liberalised wholesale power market; however, similar to

Indonesia, the ETS carbon price does not influence dispatch (it is not factored in fuel cost assessment) and retail tariffs are regulated. To work around the inability to pass on the carbon price to end-users, the Korean ETS was extended to take into account indirect emissions associated with the power and heat consumption of large industrial users (by increasing the allocation of their emission allowances). In additions, there are ongoing discussions about introducing an environmental dispatch mechanism, which would account for CO_2 costs in the ranking of generation units. Although the final details are yet to be released, the mechanism is expected to strengthen the ETS impact on wholesale electricity generation.

Lessons for Indonesia from international experience

Similar to China, Korea and other countries, Indonesia's power market is heavily regulated, which could potentially affect the transmission of price signals throughout the power production value-chain. For instance, a carbon price would have little to no impact on the merit order in the absence of a non-economic dispatch model or on power consumption when retail tariffs are regulated (as is the case in Indonesia). An ETS scheme in Indonesia's context would thus have to be adapted to fit the country's power market design. In this regard, the ETS implementation experience of other countries with partially or fully regulated power markets, can provide interesting insights and key lessons for Indonesia.

As Indonesia continues to roll out its cap-and-tax system, it will be important to set the tax price right as global experience shows. Gradually and transparently increasing the carbon price over time will be important to ensure price signals are strong enough to incentivise change. For instance, Singapore was the first South East Asian nation to implement a carbon tax – while initially set at the low end of the spectrum (USD 5 per tonne of CO_2, with no exemptions, every covered sector and entity must pay this amount, with no reductions or deductions for any reason [including competitiveness]) the country is intending to gradually increase the carbon price to about USD 10 to USD 15 between 2023 and 2030.

Another key consideration for Indonesia is the use of revenues generated from ETS auctions or carbon taxes. These can then be used for multiple purposes e.g., investing in further climate mitigation action or to address distributional impacts, such as providing compensation for low-income households. Design of ETS auction also highly depends on country's power market structure. As highlighted in the session, it wasn't possible to move China ETS to auctioning in the same way the EU ETS has as a result of the current market structure, alternative ways along with power market reforms are under consideration.

FGD II: Implementation of an ETS: from technical design to monitoring

Key factors to take into account when designing an ETS include determining the and coverage of the system, setting the cap, distribution of allowances and establishing price stability. The ability to monitor and regulate across emissions sources will also be important as is the cost of doing so; this will be influenced in part by existing regulatory structures and policies. Thought should also be given to the potential for non-price barriers to limit carbon price pass-through; exposure to international markets; and the potential for co-benefits. The second FGD discussed how ETS schemes elsewhere addressed some early challenges in the design and implementation phase. These challenges included determining the emissions cap and the various options available to recycle the revenues the scheme may raise. Experts from the European Union, Poland and the United Kingdom were invited to share their experience in technical design, monitoring of ETS development, and stimulating industry participation.

Determining the scope, cap, price setting and allowance distribution

Defining the scope

The scope of an ETS defines the boundaries of the policy and it has implications for the number of regulated entities, the share of emissions facing a carbon price, and effort sharing between the ETS covered and uncovered sectors to meet economy-wide emissions reduction targets. Many ETS tend to cover only CO_2 at the outset. This is the largest GHG and one that can be accurately measured and allow regulators to concentrate on the largest installations. Important factors to take into account include the jurisdiction's emissions profile (and its expected evolution) and what this implies for the potential for emissions reductions.

Determining the cap

Most ETS tend to work on the principle of 'cap-and-trade'. The ETS cap sets a limit on the total amount of emissions that can be produced by the regulated entities, which is then reflected in the number of allowances issued over a specified time period. The cap is determined in advance and can decline over time. It can also provide certainty on the quantity of emission reductions, rather than on a carbon price. An ETS allows flexibility to meet the cap by means of trading; this is why industry is generally supportive compared to alternative policy options. In an effective ETS, a facility wanting to stay within the cap will need to implement internal mitigation actions to reduce its emissions and not solely rely on purchased emission allowances, especially where there is certainty the emissions cap will become more constraining over time.

Policy makers can determine the cap of an ETS in different ways and this choice affects the predictability of emissions reductions. One way of determining a cap is by means of an absolute emissions reduction target (or "mass-based" target). This cap would fix a maximum number of emissions in the ETS expressed in absolute form (e.g., in tCO_2-eq); only one variable (the quantity of emissions reductions) is concerned. This mechanism provides certainty on the performance of

the ETS, and is applied to existing systems, such as California, the European Union, Korea, RGGI and the Tokyo Metropolitan Government.

An alternative approach, and the one adopted in Indonesia, is to set an intensity cap based on the unit's weighted average emissions intensity of a specific period. This means that the target is expressed in the emissions per unit of output (e.g., tCO_2-eq/MWh). China has also adopted an intensity-based cap, which changes according to the actual production levels. Intensity-based targets are selected where there is greater uncertainty about future levels of output and demand growth, which is sometimes the case in emerging market and developing economies.

The choice of the type of cap depends on the intended role of the ETS, and the relative importance to policy makers of predictable emissions reductions. The key takeaway is absolute mass-based caps provide certainty on the emissions reductions performance of a system while intensity-based caps offer flexibility in the face of uncertain economic output, but less predictability of emissions reductions.

Determining the allowance price

Under an ETS, the market determines the allowance price. When an economy is growing emissions rise and increase the level of abatement necessary to meet the cap and prices should rise. Conversely, when the economy is slowing or in recession, the price should fall. Expectations about the allowance market are also a driver for price formation. Exogenous shocks, regulatory uncertainty and market imperfections also influence prices. Regulated entities can manage price volatility in various ways and many ETS designs take this into account. Mechanisms such as temporal flexibility, regular auctions, offsets and linkage, and derivative trading provide them with ways to smooth price fluctuations. In some systems, measures have been put in place to better manage prices; the EU ETS put in place a market stability reserve that can intervene on the volume of allowances to ensure prices remain at a certain level. The UK also introduced a fixed carbon price at a time when EU ETS prices were low. In Indonesia's system, the carbon tax will operate as a carbon price ceiling if it can be used to comply with all allowance obligations.

Allocation of allowances

Decisions on allowance allocation depend on policy objectives There are a number of approaches to allowance allocation; these can be auctioned to participants, or allocated for free. In both cases, the allocation can be based on historic emissions (grand-parenting), production (output-based) or performance (benchmarking). Challenges of free allowances include how to manage carbon rent of some entities, and for auctioning managing concerns on costs and carbon leakage, and how to manage revenues raised via auctions. The allowance allocation mechanism affects the efficiency of the ETS by influencing the incentives faced by participants to lower emissions.

There are a wide range of different approaches to auctioning across various existing systems (e.g., some have partial auctioning, Korea about 3% and EU ETS much higher, RGGI over 90%). The percentage of auctioned allocations has changed overtime, and most systems start with free allocation of allowances and transition to auctioning as the system matures, aiming to reach greater shares of auctioning overtime. The power sector is a typical candidate for auctioning, as it is often less prone to carbon leakage than other ETS sectors, while manufacturing sectors have typically

received some form of free allocation, at least in initial years. The strategic use of auction revenue can be a powerful selling point for proceeding with an ETS.

In addition to being a source of revenue, auctioning is simple and fairer, as it can limit political influence and it reduces the risk of market distortions. Over USD 103 billion has been raised worldwide via auctions and the utilisation of these revenues depends on political objectives. Revenues can be used to build political support for an ETS among the public and other constituencies through recycling for income support or to covered entities for investment in emissions reductions, can contribute to general public budget, or be ear-marked for special programmes. Revenues may be set aside to invest in adaptation or other climate actions or even used to soften the distributional effects of the carbon price on disadvantaged groups. EU auctioning revenue is handled by Member States with a minimum of 50% spent on climate action on top of investment in renewable energy deployment. In RGGI, around 80% has been invested in projects that directly benefit consumers. In California, revenues serve a different purpose: nearly 80% is spent on transport and sustainable communities.

Most ETS use free allowances in industries considered at risk of carbon leakage and that experience competitiveness concerns. In addition to free allocation, all existing ETS schemes use other measures aimed at reducing the extra costs that an ETS can bring for some industries. Nevertheless, to achieve climate goals, most ETS have shifted to using performance-based criteria to allocate free allowances (as in the EU), and also to phase down free allocation over time in favour of allowance auctioning.

The impact of an ETS in a system dominated by coal-fired power

Poland provides an example of the effect from introducing the ETS to a coal-dominated power system. Poland is Europe's second-largest producer of coal and coal, which in 2020 accounted for around 85 of total energy supply and almost 70% of electricity generation.

From the outset, the country found the EU ETS a very difficult process especially for data collection from installations. Poland also had problems with the final allocation mechanism and the country also had problems with different benchmarks. Poland is more reliant on coal, therefore was not in good position from the outset. Poland also had many state-owned enterprises, so foregone revenue from free allocation is used for system modernisation, excellent idea but system was too complicated and only around 60 or 70% of revenues were used for modernisation.

Nonetheless, in Poland's experience, the ETS has been a cost-effective way to reduce emissions; auctioning revenues can go to state budget or are allocated towards efforts to modernise the energy sector. Poland has significant heating and industry sectors that need improvement. With the EU ETS, Poland could delay introduction of full auctioning in the electricity sector as a lower-income member state, and benefits from an EU programme funded by centralised auctioning revenue to help modernise energy systems.

Conversely, the EU ETS involves a lot of complex documentation and regulation. Furthermore, EU prices were very high in the first half of 2022, around EUR 80 range (or 14 times higher compared to the beginning of the ETS). This creates a significant problem for CO_2-intensive power generators in Poland, and small installations are struggling with some bankruptcies owing to the high price.

Looking to the future, Poland's reliance on coal for electricity and district heating today means they will need to experience significant reductions in coal use, which offers the highest potential to reduce GHG emissions 90% from BAU (replacing with nuclear, gas and some renewables).

Adapting the ETS to external changes and shocks

The responsiveness of allowance prices to economic conditions may be considered an advantage of an ETS: underlying economic activity is a main driver of energy demand and thus emissions, allowance prices tend to be lower during economic recessions and higher during periods of economic growth; this feature may help stimulate economic recovery and maintain political support for an ETS during downturns, while spurring greater emissions reductions during periods of robust growth.

Mechanisms that promote both flexibility and certainty of a carbon price are fundamental to ensure that emissions trading systems can respond to unexpected or unintended impacts of domestic companion policies and other external factors, such as an economic crisis or even the Covid19 pandemic.

Box 2: Leaving the EU ETS and going it alone: the case of the United Kingdom

The United Kingdom (UK) left the European Union on 31 January 2020. As a result, and following a public consultation, a UK Emissions Trading Scheme (UK ETS) replaced the UK's participation in the EU ETS on 1 January 2021. As the UK played a role in developing the EU ETS, the introduction of a UK scheme provides continuity of emissions trading for UK businesses.

The UK ETS matches the EU scheme in scope, with a slightly more ambitious cap and trajectory; the cap will be adjusted in 2023 or 2024. The free allocation of allowances to eligible installation operators and aircraft operators continued, to reduce the risk of carbon leakage for UK businesses.

In the event of excessive market instability, including persistently high price levels or volatility, the UK ETS Authority will actively consider at the earliest opportunity actions in response to how the markets are functioning. The UK ETS has important design features to guard against instability in the early years of the market including an Auction Reserve Price (ARP) and the Cost Containment Mechanism (CCM). The UK ETS auction regulations set the ARP (the minimum price for bids in UK ETS auctions) at GBP 22.00. At the other end of the scale, the CCM is intended to mitigate sustained high prices. The CCM is more responsive than its equivalent in the EU ETS, providing a useful tool for the UK ETS Authority to intervene if prices are elevated for a sustained period.

FGD III: Incentivising participation in voluntary phase of ETS scheme and impact of carbon tax on ETS

This third FGD provided an overview of Indonesia's ETS and carbon tax regulation and the results of the implementation in 2021 during the voluntary phase. It also looked at how the Beijing ETS system in China and the EU ETS have been implemented in their pilot or early phases, and how a carbon tax impacts the implementation of the ETS. During the discussion, experts from China and private sector participants from the EU and UK shared their respective countries' experience with the ETS in its early period. A dialogue, convening representatives from government institutions, development partners and other relevant stakeholders, was held in the last session to discuss how lessons from other country experience could be adapted to the Indonesian context.

Lessons drawn from ETS pilot or early phase and expansion to other sectors

There have been good successes with the pilot ETS set up by a number of provinces and big cities in China starting in 2013. This has helped the national government to design its own ETS by learning from the different experiences of the various systems. These were constructed based on a variety of different rules reflecting different local situations of the different provinces and big cities. Over 2000 power plants are covered by China's national ETS and this is the first year of the national scheme which appears successful despite the pandemic. The central government began capacity building programmes in 2017, well before Covid and the start of the national ETS. This has helped to facilitate knowledge around issuing allowances and buying and selling China certified emission reductions (CCER), which is the only permitted offset in the national market

The Beijing ETS is one of a number of regional ETS pilots developed in China in preparation for the national ETS. The Beijing ETS covers only CO_2 and currently applies for all entities with emissions above 5 ktCO2/year, in the initial phase the threshold was 10 ktCO_2 but was lowered in 2016. This increased the number of entities from 490 to 900. Beijing has developed its own emission reporting guidelines as well as an online reporting system.

In the Beijing ETS, CO_2 allowances cover three sources of emissions: i) direct emissions from combustion of fossil fuels, ii) indirect emissions from electricity and heat consumption; and iii) industrial process emissions, although in the case of Beijing this covers only two cement plants. CCERs and a small amount (5%) of local offsets are allowed up to 5% of the cap in order to prioritise emission reductions by covered entities. Given the experience of the EU ETS that suffered from over allocation of emissions the Beijing ETS is based on a hybrid approach. The following three allocation methodologies are applied: for existing companies they are based on i historical emissions and historical emissions intensity, and for new comers a benchmark methodology is applied to set emission allocations.

The Beijing power market has one specific feature: more than two-thirds of its electricity consumption is imported from power plants located in other provinces. This helps to reduce risks of carbon leakage and accounts for indirect emissions for electricity imported to Beijing from other provinces. The service sector which accounts for 80% of Beijing's GDP is also included in the ETS. Sectoral emissions caps are set with energy conservation targets. To avoid over allocation supply

and demand trends are taken into account when setting the allowances. Local benchmarks are set for new entrants with 92 benchmarks covering 52 industrial categories. With more than seven years covering the compliance period of the Beijing ETS, the experience of the Beijing ETS can provide helpful lessons for other regions or countries developing their ETS and is also informing the development of China's national ETS. The design and implementation of an ETS will need to pass through a period of learning by doing.

In China, the electricity tariff is fixed and the cost of the carbon price cannot be passed through the tariff. There is a possibility that some double counting may exist as both direct and indirect emissions are covered. This however should be limited as power companies have been assigned carbon intensity reduction targets, while consumers, manufacturers and the service sector have been assigned electricity reduction goals. Detailed monitoring, reporting and verification (MRV) guidelines for different sub-sectors covering different sources of emissions are available in China. This is important to facilitate the implementation of an ETS and for building capacity among stakeholders.

Carbon tax impacts on ETS design and implementation

Carbon pricing provides environmental transparency, technology flexibility, economic transparency and harmonisation. It is also complex to design and administer. A carbon tax is seen as better suited for markets that are initiating carbon pricing or with weaker institutional frameworks.

While other markets have chosen to first implement either a carbon tax or ETS, in some cases with the other added gradually, Indonesia has decided to implement the two in parallel. During this voluntary phase, Indonesia is trying a variety of options to price carbon and is looking at international experience as it advances in its ETS design and implementation. Some stakeholders voiced concerns that implementation of the ETS has been rather abrupt without adequate time to prepare data for reporting. The voluntary ETS period runs until 2024, which should allow participants adequate time to familiarise themselves with the data and reporting protocols. The adoption of both a carbon tax and ETS is intended to signal to the international community that Indonesia is preparing the market for carbon pricing.

Box 3: ETS and carbon taxes: the private-sector perspective

The UK has both a carbon tax and an ETS. This is similar to Germany and the Netherlands that have a carbon tax as well as the EU ETS.

In those jurisdictions, utilities try to manage future electricity generation over a two- to five-year period. This covers not just buying coal and gas to produce electricity, but also includes hedging for future CO_2 prices. Under an ETS, this can easily be managed through the market by buying forward contracts on the carbon price to stabilise margins and hedge against any future changes. Under a carbon tax, it is not feasible to hedge against future policy changes such as an increase in the carbon tax and this leaves margins at risk. The ability to hedge against a future change in the carbon price under an ETS provides more certainty for market players and is preferred to a tax by the private sector. In the UK, the carbon price support (carbon tax) was introduced to raise the

carbon price at a time when the price was low, and as the carbon price has risen significantly this measure has become less relevant.

Rising level of ambitions on EU climate policy is welcomed by the private sector as this will help to strengthen compliance. The expansion of the EU ETS to the maritime sector and to hydrogen production is also seen as a positive development. More of the EU ETS revenues could be used to support and invest in decarbonisation efforts. By providing a price on CO_2, the EU ETS has been a key driver for utilities to transition from coal to gas and then into renewables.

To ensure a just transition in the implementation of an ETS, the design must provide safe guards for industrial competitiveness as well as safe guards for employment through reskilling and upskilling programmes.

FGD IV: Regulation and linkages to international carbon markets

The fourth and final FGD addressed two topics; 1) regulation and the role of the financial sector in Indonesia's emissions trading system, and 2), linkages to international carbon markets. An IEA expert provided an overview of the terms of Article 6, which will set out the rules for international co-operation through carbon markets. An expert from Indonesia's Co-ordinating Ministry of Maritime Affairs provided some perspective on linking international carbon markets with the carbon market and plans to expand Indonesia's ETS to other sectors. An expert from the Investment and the Financial Services Authority of Indonesia highlighted the role of the financial sector in the ETS, and outlined plans for regulating trading activities including certification and registry of carbon credits. In addition, country experts from Japan, Korea and New Zealand shared their experiences on linking with other carbon markets, including institutional arrangements, monitoring and verification systems, and certification of carbon offsets.

Regulatory fundamentals for carbon pricing and trading: measurement, reporting, verification and certification

Carbon pricing systems can be highly effective tools for promoting the transition to clean energy and decarbonisation, but they frequently have more stringent measurement, reporting, verification (MRV), and certification requirements compared to command-and-control systems such as performance standards and technology mandates. Implementation of a robust MRV system is a prerequisite for a functioning carbon market. International experience demonstrates that regulators and policymakers can make incremental improvements as they gather more information and gain experience over the course of implementation.

Since implementing its regulation in 2017, South Africa has accumulated five years of experience in GHG reporting. The three key elements in the establishment of an effective MRV system in South Africa were: 1) determining reporting boundaries, 2) providing guidance on the validation process and 3) performing a competent authority review. The South Africa GHG emissions reporting systems takes into account economy-wide emissions with corporate reporting on environmental impacts from all facilities. Each reporting entity needs to register and report on an annual basis and follow the guidance provided by the Ministry of Forestry, Fisheries and Environment on material requirements, processes and detailed methodologies, which are aligned with IPCC guidelines.

In addition, South Africa also published technical guidelines for validation and verification of GHG emissions, which sets out that data collected from entities need to be checked and verified by accredited verifier, and reviewed by competent authority or independent verification process. During the review process, the competent authority will check the reported data against historical and statistical trends, compare it with an expected range and value based on different pieces of information, identify gaps and undergo other checks and analysis to ensure data and information provided are credible.

Linkages to international carbon markets

One important advantage of emissions trading is that it can be used to connect systems across borders to jointly reduce emissions with potentially more cost-efficient options. Carbon markets can be linked directly and indirectly; however, compatibility questions and potential regulatory and governance consequences need to be carefully taken into account. The implementation of international carbon trading under Article 6.2 will require co-operation by relevant ministries across different countries, considering which emissions reductions can help countries to achieve and even increase the ambition of the respective NDCs.

Article 6 and the Paris Agreement Rulebook

Article 6 was conceived as a way for countries to achieve or enhance their NDCs by means of voluntary co-operation. Countries tend to focus on domestic measures in order to achieve their NDC mitigation targets. With enhanced international co-operation, Article 6 could potentially help countries to reduce the cost of NDC implementation and facilitate the removal of 50% more emissions at no additional cost. Article 6 has both market-based and non-market-based approaches and provides an accounting framework for voluntary co-operative approaches.

What is Article 6?

	Market-based		**Non-market based**
	Article 6.2	Article 6.4	Article 6.8
What is it?	Accounting framework for voluntary co-operative approaches involving the use of Internationally Transferred Mitigation Outcomes (ITMOs) towards NDCs; Bilateral /multilateral transfers of ITMOs between Parties (no UNFCCC supervision, accounting rules agreed under	Mechanism to contribute to the mitigation of GHG emissions and support sustainable development Involve public and private sector; Under international oversight through the UNFCCC; Has to deliver an Overall Mitigation of Global	Non-market-based approaches to promote mitigation and adaptation ambition

	UNFCCC at COP26)	Emissions (OMGE) Has to provide a Share of Proceeds (SOP) to the Adaptation Fund	
What was agreed at COP26?	Robust accounting framework – application of corresponding adjustments at first transfer (for NDCs use) or at authorisation (for other purposes) No banking of ITMOs across NDC implementation periods SOP and OMGE encouraged on a voluntary basis	Mechanism established – aligned with 6.2 accounting Mandatory SOP at 5%, OMGE at 2% Transition of Kyoto activities and units	Establishment of "Glasgow Committee for Non-Market Approaches"

At COP26, and after five years of negotiations, the Article 6 rulebook was adopted. Many more details items were deferred to the work programme. The current challenge facing Article 6 development is how to implement new rules without compromising environmental integrity. Many items are still being discussed, such as reporting requirements, implementation of article 6.4 and matters of additionally.

Current approaches to linking and Article 6

The international carbon market was developed within the UNFCCC framework when Kyoto Protocol was agreed, under which some countries gained experience in international emissions trading and market mechanisms, with Kyoto links built into the design of some domestic carbon markets.

Enthusiasm for international carbon markets was high after implementation of the Kyoto protocol but waned somewhat until the increased ambition that came with the Paris Agreement. Since the signature of Paris Agreement, there is renewed interest in the international carbon market allows for co-operation to achieve NDCs. Korea, for example, plans to use voluntary co-operation under Article 6 as a supplementary measure to achieve its NDCs. It's Carbon Neutrality Act established a legal basis for implementing international co-operation in addition to many of the mitigation

strategies such as the use of the Korean ETS. In May 2022, the Korean Ministry of Environment signed a Memorandum of Understanding with the Ministry of Environment and Tourism of Mongolia to implement arrangements for co-operation on Article 6, and is looking at expanding such co-operation with other countries.

Box 4: New Zealand's approach to linking and Article 6

New Zealand's ETS is in operation since 2008 and covers a broad range of emissions excluding agriculture. The Kyoto link was originally seen as an integral part of the ETS with unlimited holding, trading and banking as the New Zealand ETS started off without a cap. In 2020, the government established a domestic emissions budget, with emissions reduction plan, and other legal and regulatory instruments to ensure the environmental integrity and effective supply management of emissions in the ETS. The emissions cap is now set five years ahead and will reduce over time. Details on the treatment of international linkages and credit under the current cap design is provisional, but it is likely that any units used for exchange with other countries or any imported mitigation will be subtracted from the total amounts to be auctioned. Auction prices rose continuously in 2021 and 2022 and should this trend persist, the cost containment reserve trigger price of NZD 110 in 2026 will apply.

New Zealand's experience during the Kyoto period, was to some extent, a loss of policy control. It is important, therefore, for NZs future in these markets that they build in the flexibility to make changes and ensure that any linkage agreement or co-operative agreement under Article 6 allows for the management of the domestic ETS and domestic price. Under the linking agreement, both parties should be responsible for the environmental integrity of the system with accurate emissions accounting and reduction reporting. Oversupply would take time to work out of the system. Overall, the benefit of international co-operation needs to be balanced with domestic policy objectives.

Fewer countries have experience in bilateral co-operation in emissions trading and crediting mechanisms. One of the key examples is Japan's Joint Crediting Mechanism (JCM), a project-based bilateral offset crediting mechanism. JCM now has 17 partner countries including Indonesia. The JCM project offers several financing programmes including the JCM model projects, the ADB trust fund and the F-gas recovery and subsidy project. Indonesia is the leading country under the JCM scheme with the largest number of approved methodologies and registered projects and second-largest pipeline project. Renewable and energy efficiency projects have been the main focus to date.

Registration is an important aspect for cooperation using carbon markets. Under the JCM, Japan and partner countries each have their own registry, but registries need to share the same minimum requirements and common specifications. Credits from JCM are traded domestically, but international trade is not yet feasible as registries are not linked at the moment. Agreement on an Article 6 rule could help in building the needed linkage by allowing the international transfer of emission reductions. Adjustment of the JCM guidelines to align with Article 6 rules are under way, starting with the establishment of the JCM Promotion and Utilisation council domestically, and consultation with partner countries.

Next Steps

This summary provides an overview of Indonesia's carbon pricing policies and details on the design of its emissions trading system (ETS) for the power sector. It also provides a consolidated summary of the different countries' experiences which covers designing and implementing the schemes, technical design to monitor ETS development and stimulating industry participation.

Although there have been many lessons learned from the experiences of different countries in implementing ETS, experiences on how to expand ETS to other sectors, including selecting sub-sectors, have not been discussed in this series of FGDs. Therefore, future technical assistance and study to intensify ETS in the power sector (with a capacity of < 100 MW) and expansion of ETS in other sectors, for example, in the industrial sector, will assist Indonesia in designing and implementing ETS in Indonesia.

Abbreviations and acronyms

ASU	air separation unit
ATR	autothermal reforming
BEV	battery electric vehicle
BF-BOF	blast furnace-basic oxygen furnace
CAES	compressed air energy storage;
CAPEX	capital expenditure
CCGT	combined-cycle gas turbine
CH3OH	methanol
CNG	compressed natural gas
CO	carbon monoxide
CO2	carbon dioxide
CCS	carbon capture and storage
CCUS	carbon capture, utilisation and storage
CNG	compressed natural gas
CSA	Central and South America
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAC	direct air capture
DRI	direct reduced iron
DRI-EAF	direct reduced iron-electric arc furnace
EAF	electric arc furnace
EOR	enhanced oil recovery
FC	fuel cell
FCEV	fuel cell electric vehicle
FLH	fuel load hours
FT	Fischer-Tropsch

Glossary

bbl	barrel
bbl/d	barrels per day
bcm	billion cubic metres
bcm/yr	billion cubic metres per year
cm/s	centimetres per second
gCO2	gram of carbon dioxide
gCO2/kWh	grams of carbon dioxide per kilowatt hour
GJ	gigajoule
Gt/yr	gigatonnes per year
GtCO2	gigatonne of carbon dioxide
GtCO2/yr	gigatonnes of carbon dioxide per year
GW	gigawatt
GWh	gigawatt hour

References

Government of Indonesia (GoI). (2022). Enhanced Nationally Determined Contribution (NDC) Republic of Indonesia.