



CASE
for Southeast Asia

No more fuel to the fire:

From energy crisis to transition in Southeast Asia

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In the context of CASE

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able Cities (ICSC) in the Philippines, the Energy Research Institute (ERI) and Thailand Development Research Institute (TDRI) in Thailand, and Viet Nam Initiative for Energy Transition (VIET) in Viet Nam, to facilitate the energy transition in Indonesia, the Philippines, Thailand, and Viet Nam.

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Executive Summary

The current energy crisis represents a turning point for Southeast Asian economies and underpins a need for more ambitious energy transition pathways and a revised approach to energy security. The widespread lockdowns that emerged in the wake of the pandemic planted the first seeds for today's energy crisis, while the unexpectedly strong rebound of global demand in 2021 exposed economies to more severe bottlenecks. Russia's invasion of Ukraine in early 2022 exacerbated the global energy supply crunch and added layers of geopolitical uncertainty with lasting effects on energy diplomacy and trade for Southeast Asia.

Southeast Asia is heavily reliant on energy imports to sustain growth in the economy and energy needs; most ASEAN countries are net importers, although not directly from Russia, and each is dependent on either coal, gas, or oil from overseas.

The combination of restricted supply chains, extreme price volatility and faltering domestic production has acutely exposed the region's energy security vulnerabilities. In the Philippines, high fuel prices, low gas production and unavailable coal generators put severe stress on the power system, while Viet Nam experienced acute shortages of coal and a doubled import bill. Thailand began new fossil fuel exploration and reverted to already phased-out fuels in the face of untenable gas prices. For Indonesia, despite being less exposed to import risks as an energy exporter, the crisis inflicted significant costs in foregone export revenue and supplier reputation.

The governments of Viet Nam, Indonesia, Thailand, and the Philippines have focused their policy responses on minimizing price impacts on consumers and securing short-term energy supply. Price interventions have ranged from rebates, direct fuel subsidies, tax reductions, and electricity tariff freezes. Some of which may yet constrain public budgets if extended into 2023 or beyond. In parallel, the four jurisdictions have worked individually to secure upstream fossil fuels by increasing import quotas, reducing import duties, or rolling back energy transition measures.

A new paradigm of energy security is required that reflects the climate-compatible energy systems of the future. While nearly all ASEAN countries have targeted net-zero economies by mid-century or shortly after, direct policy responses have not sought to address long-term energy security risks, or the structural changes required for a clean energy transition. Even despite the recently revised long-term energy plans with increased renewable targets, short- and mid-term plans still rely on fossil fuel dependence, retaining the prevalent risks to energy security.

The crisis highlights the urgency to accelerate the fossil fuel phasedowns rather than to rely on projected increases in coal, gas and oil consumption to 2030, which is still shaping several long-term plans in the region. A more ambitious mid-term fossil phase-down transition strategy is imperative if the region is to heed the signs of the current crisis to improve energy system resilience. Countries eyeing a shift to natural gas, such as Viet Nam and the Philippines, or a continued reliance on it, such as Thailand, should critically re-evaluate whether the required upfront investment in gas infrastructure and increasing exposure to global LNG markets are strategically sound and economically viable.

Energy efficiency, fuel switching, and behavioural change in end-use sectors form a critical backbone of energy system resilience and independence and should be backed by ambitious structural policies in all four countries. Energy demand from industry, buildings and transport sectors are expected to grow substantially in the four countries—future risks to the economy and energy system will prevail for the countries if energy demand is not tempered. Priorities to target long-term structural change have not yet materialized in the jurisdictions, but as evidence points towards prolonged energy crisis effects, governments should move quickly to prioritise early action.

Prioritizing rapid deployment of domestic renewable energy sources in the short term is needed to shield countries against future supply-side risks. Thailand, Indonesia, and the Philippines introduced new support measures for renewable technologies in 2022 while Viet Nam presented an ambitious long-term transition pathway to develop into a regional renewable energy hub. Despite these commendable developments, the measures, except for Indonesia's new tariff design to support renewable energy investment, are either temporary fixes or long-term visions. Governments should prioritise a scale-up of renewables in the short- to mid-term through front-loading investment and focusing on network and operational upgrades.

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List of Acronyms

| | |
|--------------|--|
| ASEAN | Association of South East Asian Nations |
| bpd | Barrels per day |
| BMWK | Bundesministeriums für Wirtschaft und Klimaschutz |
| CASE | Clean Affordable Secure Energy for South East Asia |
| DMO | Domestic Market Obligation |
| DOE | Department of Energy |
| EGAT | Electricity Generating Authority of Thailand |
| ERC | Energy Regulatory Commission |
| ERI | Energy Research Institute |
| ETP | Environmental protection tax |
| EVN | Viet Nam Electricity |
| FDI | Foreign direct investment |
| FiT | Feed-in-tariff |
| GHG | Greenhouse Gases |
| GOI | Government of Indonesia |
| ICSC | Institute for Climate and Sustainable Cities |
| IESR | Institute for Essential Services Reform |
| IPP | Independent Power Producers |
| LNG | Liquefied natural gas |
| MOIT | Ministry of industry and trade |
| RPS | Renewable Portfolio Standards |
| TPES | Total primary energy supply |
| VIET | Viet Nam Initiative for Energy Transition |
| VRE | Variable renewable energy |

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1

Introduction

The global energy crisis originated from the convergence of multi-faceted global developments: governments have insufficiently prepared for the transition towards domestically independent energy systems over the last several decades; global supply chains were unable to respond adequately to the rapid onset of and recovery from the COVID-19 pandemic; the Russian invasion in Ukraine further amplified existing vulnerabilities.

As the world entered the COVID-19 pandemic lockdown, global energy demand fell as transport and industry activity slowed to a standstill (IEA, 2021b). Following the historic drop in demand, fossil fuel markets, and particularly the oil market, all but crashed. In 2021, global energy systems were unprepared for a worldwide rebound in energy demand. Economic recoveries coincided with extreme and prolonged cold winter conditions in the northern hemisphere and led to a surge in electricity and primary energy demand with significant rebounds for oil, natural gas, and coal demand (BP, 2022; IEA, 2022g). While the global economy was still reeling from labour shortages, a supply chain crisis and diplomatic tensions affecting energy trade, Russia's invasion of Ukraine in 2022 added a layer of geopolitical risk to global energy markets that were already in turmoil.

The energy crisis indirectly affected Southeast Asia's energy economy with high energy prices and constrained supply; while not directly dependent on Russia for energy exports, most countries in the region are net importers of fossil fuels. Southeast Asia was only starting to recover economically from the global pandemic when it was hit by yet another challenge: how governments manage their unique energy system and energy security risks have a long-standing influence on their energy transition and future ability to absorb shocks.

In this brief, we analyse the implications of the crisis with a focused view on selected major economies in Southeast Asia: Indonesia, the Philippines, Thailand, and Viet Nam, the countries of focus in the CASE project. In [Section 2](#), we explore the impacts of the energy crisis globally and in Southeast Asia and discuss their implications for a shifting energy security paradigm. [Section 3](#) dives into the specific national circumstances of the above countries and details the key responses of governments in the context of their long-term energy strategies, while [Section 4](#) synthesizes observed similarities and differences in the four countries and brings forth policy implications for the countries to transition out of the crisis.

2

Exposed system vulnerabilities require a new energy security paradigm

Global shocks are severely compromising economies and energy systems

Years of underinvestment in upstream energy production and insufficient preparation for the low-carbon energy transition—highlighted by a lack of clean energy recovery packages in response to the COVID-19 pandemic—impeded an adequate response and compounded the factors leading to the current crisis.

The energy crisis has exposed the risk of deep global dependencies on fossil fuels and underscored that energy security, a primary objective of governments, warrants diversification from them. [Figure 1](#) shows us how the evolving energy crisis has induced severe impacts on the global economy, and where governments have sought to address the newly exposed system vulnerabilities with a swathe of implemented measures.

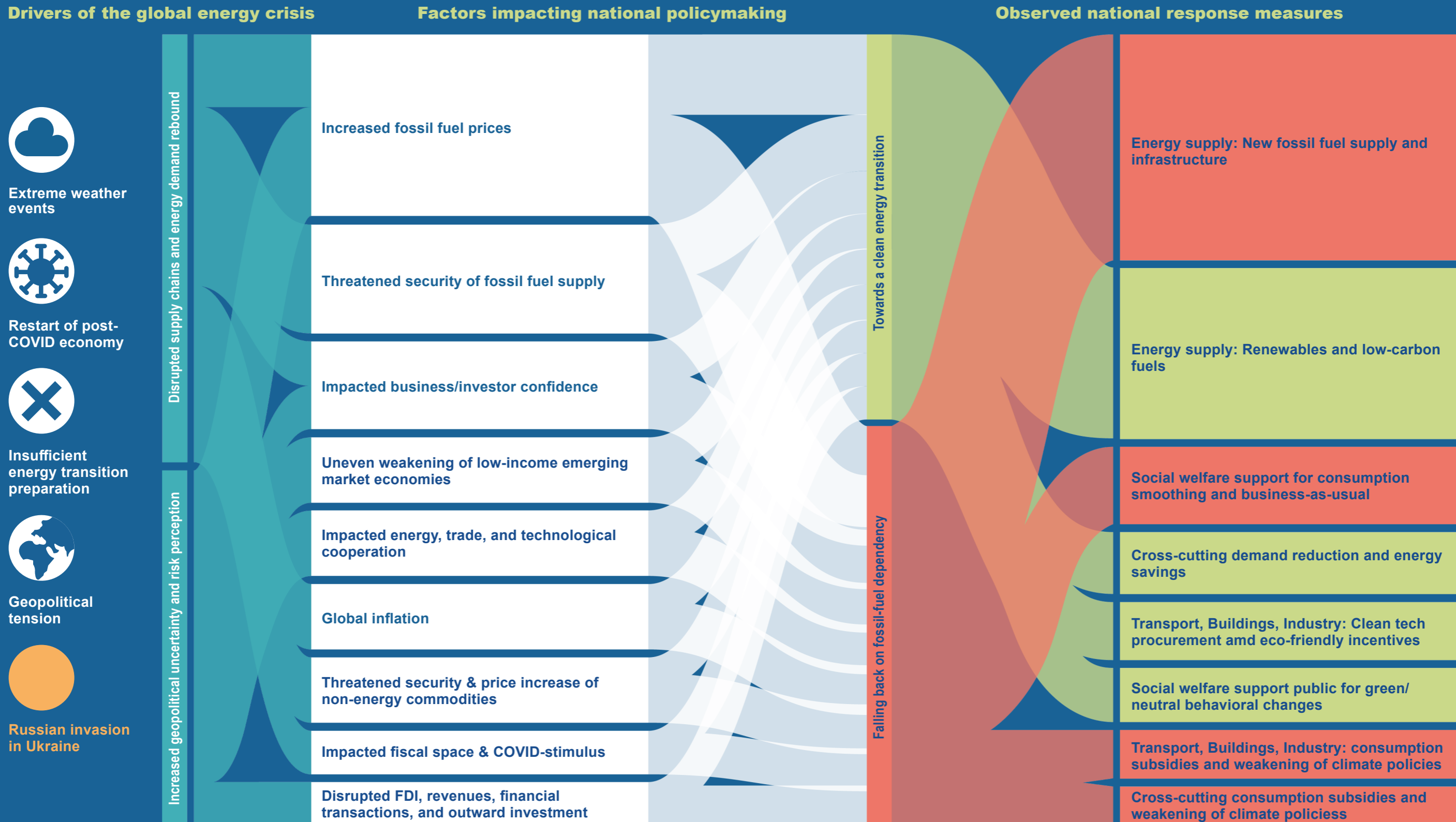


Figure 1

Tracking the factors, impacts, and global responses to the evolving global energy crisis

Note: From left to right, the illustrative diagram shows the key fundamentals underlying the energy crisis, the secondary impacts affecting policymaking (height and shade indicate its severity), and observed government responses categorised into their implications on energy transition and objectives (height indicates the frequency of responses). Observed national responses build off of the work of Climate Action Tracker (2022a) and extended until September 2022.

Source: Produced by authors.



From the beginning of the crisis in 2020, **energy prices for coal, gas, and crude oil have been steadily rising** at the highest rate since the 1973 oil crisis. Prices began to skyrocket in 2022 after Russia's invasion of Ukraine: crude oil futures surpassed USD 130 per barrel of crude oil in March while gas and coal prices reached uncharted territories across Asia and Europe, almost exceeding USD 70 per MMBtu and USD 460 per tonne in Q3 (Figure 2).

The Russian invasion further raised energy prices due to the **threatened security of fossil fuel supply, as a collective group of countries implemented sanctions (e.g., EU, US, UK) on Russia's energy sector** and major shipping routes were disrupted from the war (BBC News, 2022). As Russia was the single largest exporter of fossil fuels in 2021, exporting 25% and 11% of the world's natural gas and crude oil, supply concerns prompted the IEA to rally members to commit to the largest stock release in its history (BP, 2022; IEA, 2022e). Russia retaliated to sanctions by cutting gas sup-

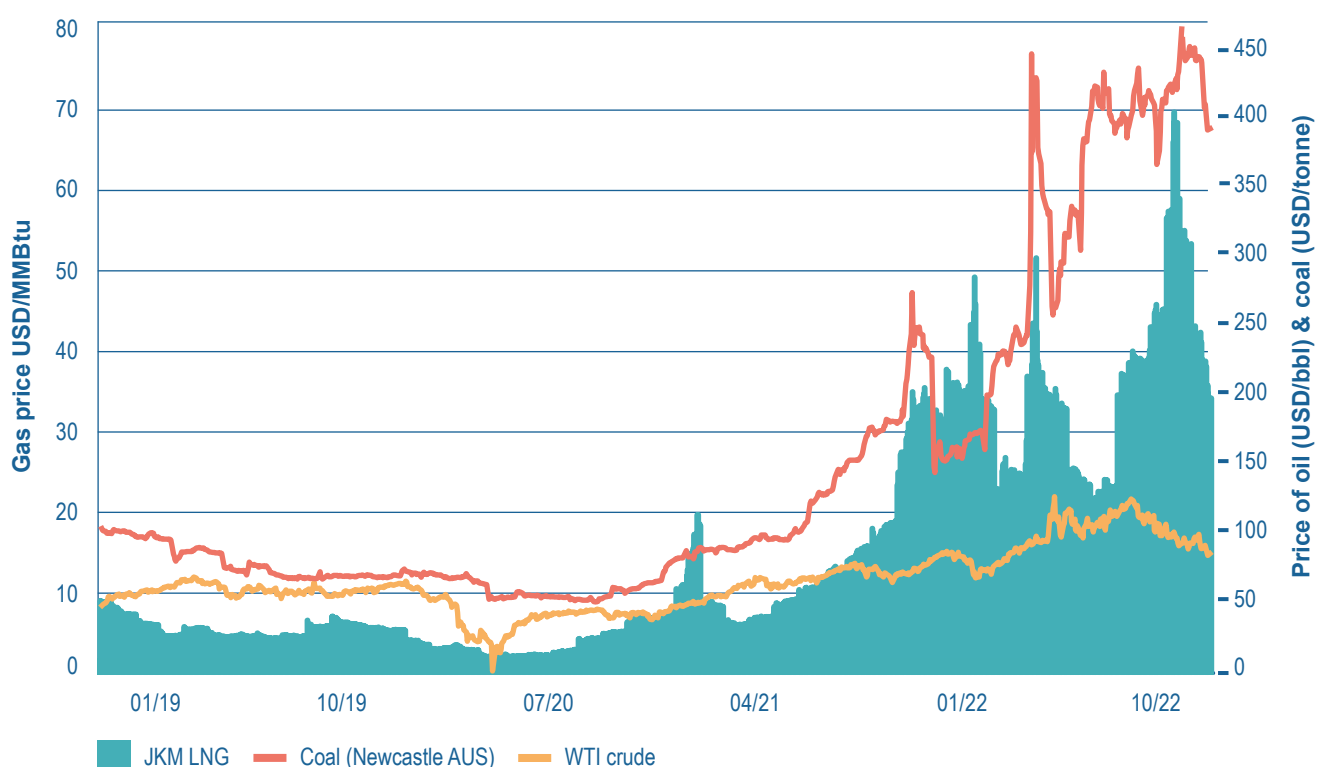
plies to Europe deeper than it already had in 2021, creating a shortage of critical supply for winter heating that could last until 2025 (Shiryaevskaya et al., 2022). Despite the reduced transport of piped gas to Europe, Russia's foreign revenue increased significantly in 2022 due to high energy prices and the redirection of exports elsewhere (although export volumes have decreased overall) (CREA, 2022a; Ustenko, 2022). While Europe remains the largest consumer of Russian fossils, large Asian economies such as China, South Korea, Japan, and India are absorbing increasingly more of the redirected fuels. Southeast Asian countries are not typically dependent on fossil fuels from Russia, although Viet Nam, Indonesia, Thailand and the Philippines together have purchased almost USD 10bn worth of coal, USD 52bn worth of oil, and 27bn worth of natural gas from Russia since February 2022 (CREA, 2022b).

Virtually all countries, regardless of whether they purchase discounted Russian energy or expensive fuels on international markets, are

Figure 2

Futures prices of fossil fuel reference benchmarks in Asia for 2019-2022

Source: Produced by authors based on data from Investing (2022)



heavily exposed to an energy oligopoly controlling prices and supply. The global oil and gas industry made over USD 100bn in combined profits in the first quarter of 2022 and public exploration and production companies have been forecasted to amass more than USD 830bn in profits over the year (a 70% increase from 2021) (Parry et al., 2021; Carlington, 2022; Cavcic, 2022; UN, 2022a). Even as high prices eventually pushed down demand (and thus lowered prices) in Q3 2022, OPEC+ decided to cut oil production again by 2 million barrels per day (bpd) to push prices back up (Ziady, 2022). Despite some international efforts to alleviate the supply crunch throughout the crisis (e.g., joint announcements from China, India, Japan, Korea, United Kingdom, United States to release strategic petroleum reserves in November 2021), most countries remain price-takers in volatile oil markets susceptible to geopolitical shocks, which has resulted in domestic economic and energy instability.

The prices for non-energy commodities have surged, coupled with soaring energy prices, and are expected to rise by 20% on average in 2022 and remain elevated until at least 2024 (World Bank, 2022a). The largest impacts concern Russian and Ukrainian exports including wheat and grain, fertilisers, and metals. Although neither country is a primary trading or investment partner with Southeast Asian countries, the affected goods impact the entire global commodity space through their input into other supply chain processes. For example, food and energy comprise almost half of the consumer-price-index baskets for goods and services in Viet Nam, Thailand, and the Philippines (Pitakdumrongkit, 2022). Southeast Asia experienced rising prices in commodities and energy just as their economies began recovering from the COVID-19 pandemic, which had already caused sizable regressions in output growth, labour, and alleviation of poverty (ADB, 2022b).

At the same time, global inflation is forecast to rise to 8.8% in 2022, six percentage points higher than the average rate from 2010-2019 (IMF, 2022b). Geopolitical developments, such as China's zero-COVID-19 lockdown in supply chain hubs and the depreciation of Asian currencies

against the US dollar from monetary tightening in the US, have exacerbated energy and non-energy price hikes through the increased supply chain and borrowing costs. Southeast Asia's delayed pandemic recovery and associated delay in demand means the region is expected to experience lower than average inflation rates in 2022 (4.7%) compared to average rates for advanced economies, including the G7 and Europe (7.2%) (IMF, 2022b). Different energy trade patterns, in which Russia has a much lesser role, have also avoided worse inflationary impacts, such as witnessed in the EU.

However, the impacts of the crisis across the region are heterogenous; **the energy crisis has disproportionately affected low-income economies given their greater constraints on fiscal space and reduced ability to absorb exogenous shocks.** Economic growth in developing Asian countries is expected to decline as a whole, while Viet Nam, Indonesia, Philippines, and Thailand are expected to experience larger economic growth in 2022 compared to 2021 due to steady manufacturing sectors and a rebounding tourism sector (ADB, 2022a; Srinivasan, 2022).

Developed economies also have the structural capacity to better adapt to the crisis' shift in international cooperation on energy, trade, and technology and typically receive a lion's share in foreign direct investment (FDI) flows. While global FDI inflows in 2021 rebounded above pre-pandemic levels, with Asia receiving a record high USD 618bn, 79% was directed to just five countries (China, Hong Kong, Singapore, India, UAE) (UN, 2022b). FDI inflows to Indonesia, Viet Nam, Thailand, and the Philippines either decreased or remained level compared to 2019, with the bulk going towards bullish manufacturing and industry subsectors.

Redefining energy security without fossil fuel dependence

The exposed system vulnerabilities stemmed largely from a global over-reliance on a fossil fuel supply chain disrupted by geopolitical events, which has necessitated a new energy security paradigm. Skyrocketing fuel prices have underlined the urgency to reduce dependencies on fossil fuels, questioned the viability of gas as a transition fuel in the region, and demanded a greater focus on cheap, domestically available, and renewable resources.

Yet, there is a clear trend that governments worldwide have rushed towards new fossil fuel infrastructure, contracts, exploration, and storage amidst short-term supply concerns (Figure 1):

- Europe (e.g., Germany, France, UK, Italy) has continued to be the largest single importer of Russian fuels while simultaneously establishing new gas supply channels from emergent suppliers (e.g., Norway, Algeria, US) and adding new gas capacity (over what is needed to replace Russian imports) (Aitken et al., 2022; CREA, 2022b; Shiryayevskaya et al., 2022)
- Africa has been ramping up gas production and export capacity (e.g., Senegal, Egypt, Nigeria) and recently accelerated work on the 30bn m3/year Trans-Saharan gas pipeline to Europe (Algeria, Nigeria, Niger) (Climate Action Tracker, 2022b; IntelliNews, 2022)
- The US has scaled up oil and gas exploration while Canada boosted its oil and gas exports by 300,000 bpd (Al Jazeera, 2022a; Phillips, 2022)
- In Asia, China and India have been expanding coal production and imports while continuing to purchase Russian fossils, and Korea and Japan have been turning towards liquefied natural gas (LNG) and reviving nuclear (Bloomberg News, 2022; Tan, 2022)

Many governments have also responded by scaling up renewable and low-carbon energy alternatives—although this has been mainly concentrated in wealthier economies (a small portion of the growth in clean energy investments globally since 2020 has occurred in developing economies)—but few have focused on implementing sector cross-cutting (e.g., Denmark’s green tax reform, USA’s Inflation Reduction Act) and energy-demand reduction measures that would build energy independence in the long-term (IEA, 2022h).

The priority to shift from fossil dependence towards renewable sources is particularly pertinent for Southeast Asia, where fossil fuels largely dominate the primary energy supply (Figure 3). While energy systems vary within the region, what they have in common are fast-growing economies with growing appetites for power—electricity demand in the region is set to triple by 2050 and be fuelled increasingly by rising fossil fuel imports (IEA, 2022f). Although the region is not directly reliant on Russian energy exports, most Association of Southeast Asian Nations (ASEAN) countries (except for Brunei, Malaysia, Indonesia and Myanmar) heavily depend on fossil imports and are at high risk of future energy shocks (Figure 4). Volatile LNG markets are eroding the economic case for natural gas as a long-term transition fuel in Southeast Asia, yet the region is slated to become a net importer of natural gas by as early as 2025 and production from its largest gas fields (notably in Malaysia, Thailand and the Philippines) have been steadily declining (IEA, 2022f; Reynolds, 2022b).

Domestic wind and solar remain in the early stages of growth in Southeast Asia, with existing renewable generation comprising largely of bioenergy and hydropower (except for Viet Nam, where solar and wind account for 26% of total installed capacity). Upstream fossil fuel investments outweigh clean energy investments in the region, despite clean investments growing in share since 2015 (IEA, 2022f). ASEAN member states have committed to sourcing 23% of their total primary

Figure 3

Primary energy supply mix in 2019 for ASEAN countries

Source: Produced by authors based on data from IEA (2022i)

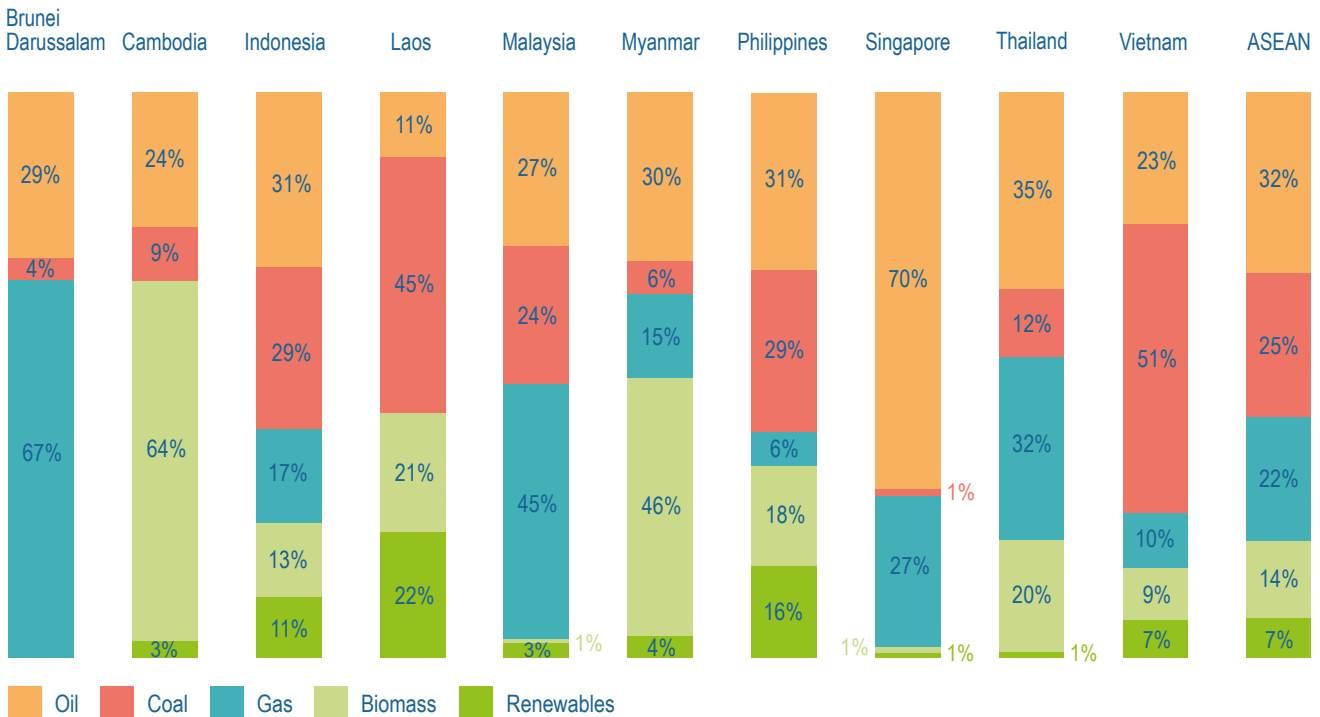


Figure 4

Fossil fuel dependency rate for each ASEAN member state in 2020

Source: Produced by authors based on ASEAN (2022)

Note: Dependency rate is net energy imports divided by gross available energy expressed as a percentage. A negative dependency rate indicates a net export of energy. Values exceeding 100% indicate an accumulation of stocks.



energy supply (TPES) from renewables by 2025 but are expected to miss the target by almost 6% without a significant increase in finance and deployment (ASEAN Centre for Energy, 2022). Even if the target is reached, much of the region's solar and wind resources would remain untapped, supply would be insufficient to displace fossil fuel dependence, and rapid energy demand growth will continue in the absence of energy-saving measures.

Shifting energy security paradigms is a key ingredient for transitioning out of the energy crisis with greater national resilience. The response strategy and energy decisions for countries such as Indonesia, Thailand, Viet Nam, and the Philippines, four of the five countries with the highest projected GHG emissions and energy demand in the region, have sizable implications for global efforts to reach the Paris Agreement's long-term temperature goals. In the following section, we explore the specific national circumstances of the ongoing energy crisis in these four countries, how the various governments have been addressing these challenges, and analyse the implications for the countries' long-term energy outlook.

③

Impacts, responses and implications for Indonesia, Philippines, Thailand, and Viet Nam



3.1 Philippines

The energy crisis in the Philippines disclosed some of the prevalent structural instabilities of the country's energy system while exposing citizens to the complex economic dynamics of fossil-fuel dependency in their everyday lives. The crisis further destabilized already fragile food, transport and power systems. While the government's immediate responses largely focused on mitigating price impacts to end-consumers, the crisis also helped catalyze policy rollouts supporting greater renewables deployment and market access. However, the government's long-term LNG strategy remains unchanged, and robust frameworks to address energy efficiency and conservation could be improved.

Impacts of the energy crisis

As the Philippines emerged from the worst of the pandemic in early 2022 and began its transition to a new administration in mid-2022, its economy was well-positioned to return quickly to its pre-pandemic economic trajectory. The economy grew by 5.6% in 2021, rebounding from a 9.6% drop in 2020 (Riñoza, 2022). The relaxing of COVID-19 measures in late 2021 further helped the country's economy recover quicker than expected, with real GDP growth rate accelerating to 8.3% in the first quarter of 2022 (Economist Intelligence Unit, 2022). By July 2022 unemployment improved to 5.2% having peaked in 2020 at 17.6% while remittances from Filipinos working abroad, an important stabiliser for the economy, grew steadily as key international markets such as the US, UAE and Japan rebounded from the pandemic (Philippine Statistics Authority, 2022b, 2022a).

The Russian invasion in February 2022, however, disrupted the rosy economic growth outlook. Despite its limited direct exposure to Russia and Ukraine, **the Philippines remains the most dependent**

country amongst ASEAN nations on fossil fuel and food imports (Nguyen, 2022). As such, the invasion's impact on global food and energy prices has been sorely felt. Inflation climbed from 3% in January up to 6.4% in July, the highest rate since October 2018 when inflation averaged 6.9% (NEDA, 2022; Trading Economics, 2022a). Steeply rising food and transport costs, primarily due to increased fuel prices, are credited as the main drivers of inflation (Philippine Statistics Authority, 2022c; UN Philippines, 2022). In the first six months of 2022, average diesel prices doubled and even overtook gasoline prices in the country (Department of Energy Philippines, 2022d). Diesel is the dominant fuel for Philippine agriculture, manufacturing, and transportation sectors and supplies fuel for 95% of off-grid areas throughout the archipelago.

The impacts of the global energy crisis have been further compounded by several domestic issues, including the lasting impacts of the COVID-19 pandemic, and prevalent structural and regulatory issues related to power supply.

On the supply side, production from the Malampaya gas field, the country's sole source of natural gas, has been rapidly depleting since 2020; production in 2021 was only half of that in 2020 and has continued to fall in 2022 (Velasco, 2022b). With no operational capacity for imports, power-plant off-takers for gas have been forced to reduce generation, which has corresponded to rising demand for coal and other alternative fuels. As a result, the share of imports of total primary energy rose to nearly 57% in early 2022, compared to 48% in 2020 (Department of Energy Philippines, 2020; Gomez, 2022). At the same time, many key coal-fired power plants have been offline for maintenance, having had to defer scheduled maintenance during the pandemic as they were unable to secure replacement parts due to restricted supply chains. This has culminated in severely constrained power systems, with both the Luzon and Mindanao grid operators issuing multiple

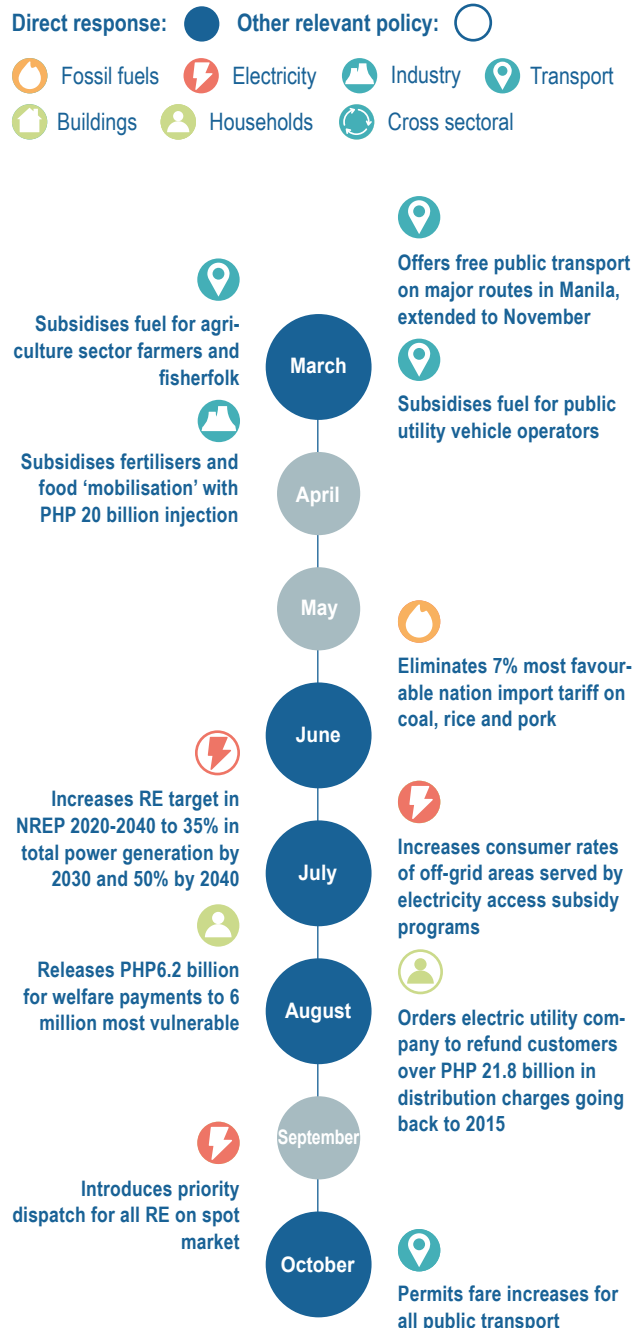
red alerts throughout the summer warning of rolling black- and brown-outs (Riñoza and Elemia, 2022). Almost half of Luzon’s power is supplied from coal power plants and the site is also home to all five of the nation’s gas-fired power plants.

The concurrence of rising fuel prices, low domestic gas production, and unavailable coal generators have caused consumer electricity prices to increase correspondingly. Sharply rising prices of coal, which account for more than 50% of the power generation mix, have led to some of the highest generation costs being passed on to consumers. Coal generation costs have surpassed 13 pesos/kWh (22 cents per kWh) for some distribution utilities, more than doubling in less than a year (Meralco, 2022). The depreciation of the Philippine peso against the US dollar also contributed to price increases, as 98% of long-term bilateral agreements with Independent Power Producers (IPP) and 36% of Power Service Agreements with generation companies are dollar-denominated (CNN Philippines, 2022).

Key policy responses

Short-term policy responses to the energy crisis have largely focused on mitigating price impacts on key sectors of the economy and protecting the most vulnerable citizens and jobs, with many of the policies building on policy packages issued during the pandemic (Figure 5). Citing inflationary pressures due to the Russian invasion, then President Duterte issued an executive order in June 2022 that modified tariff rates for four key import commodities: rice, pork, corn and coal. The new order represented an extension of measures enacted one year previously for rice and pork, and removed the 7% import tariff rate on coal until December 2022 (Official Gazette of the Republic of the Philippines, 2021a, 2021b, 2022). To help cushion the immediate impact of higher fuel, the government released PHP 6.2bn (USD ~ 100m) to 6 million of the most vulnerable Filipinos, in the form of PHP 500 (USD ~ 8.50) cash subsidies per month (Mercado, 2022). To improve transport costs, the government ordered many public transport routes to be free of charge across the country, whilst simul-

Figure 5
Policy timeline of Philippine’s energy crisis



taneously providing PHP 7 billion (USD ~ 120m) (Tupas, 2022) in financial support to transport service providers and workers, building on similar support supplied during COVID-19 (Department of Transportation Philippines, 2022). Fuel subsidies were also extended to support 150,000 farmers and fisherfolk (DA-AFID, 2022).

Reducing the country's reliance on imported fuels, developing domestic energy resources, and delivering affordable energy services have long been political priorities for successive administrations. Considering the existing freeze on new coal-fired power plants, the current administration under Ferdinand Marcos Jr. used rising energy prices to highlight his government's plans to pursue a mix of traditional and renewable technologies to meet future demand.

In his first state of the nation address in July 2022, Marcos Jr. highlighted the priority to secure natural gas supply. In September 2022, he issued a policy directive for all petroleum companies active in the Philippines to re-submit service contracts to the office of the President (Velasco, 2022a). He also expressed interest to reopen negotiations with China on joint exploration of oil and gas resources in the West Philippine Sea (Sayson et al., 2022). Yet, the country's primary strategy to compensate for declining production from the Malampaya gas field has been to develop LNG import capacity. The country has an estimated 36.5 million tonnes of import capacity in the pipeline, along with 29.9 GW of planned gas-fired power plants (Reynolds, 2022a). LNG import capacities have experienced consistent obstacles and delays, although two import terminals are expected to become operational in early 2023 (Evans, 2022a). A landmark decision in October 2022 by the Energy Regulatory Commission (ERC) represents perhaps the first signs of change. The ERC denied the holders of the country's largest power supply agreement a fixed-price increase to consumer bills to compensate for rising fuel costs, citing that depleting reserves had been public knowledge and that utilities should have factored

in potential price hikes before signing the power supply agreement (Rivas, 2022).

During his political campaign, Marcos Jr. voiced his support for his predecessor's executive order to **restart the country's Nuclear Energy Program and to include the technology in its long-term energy plans.** Discussions have focused mainly on reviving the 620 MW Bataan Nuclear Power Plant, which was completed but never fuelled, having been mothballed in 1986 (Power Philippines, 2022b, 2022a). A pervasive lack of confidence in the ability of renewables to provide reliable and affordable energy, and the prospect of serving off-grid areas have also put the prospect of small-modular reactors in the limelight (Department of Energy Philippines, 2022a).

On the demand side, energy efficiency and conservation continued to be aggressively promoted through public awareness campaigns that had begun during the Duterte administration. Campaigns targeting households, private companies, and public sector entities focused on issuing tips for electrical appliances and fixtures, mainly air conditioners, refrigerators, fans, lighting, and computers. Government offices underwent spot-check energy audits starting in April 2022 (Cabardo, 2022) as part of a drive to reduce power and fuel consumption by 10%, while companies were encouraged to submit annual use reports (Agustin, 2022). In August, the government proposed expanding its Energy Labelling Program to include a variety of other typical household appliances (Noa, 2022).

Implications for the long-term energy transition

Over the past five years, many acute impacts, such as rising inflation, high energy prices, or threats of power system blackouts, have been present in some form. These factors have shaped the main energy policy pillars of the Philippine government: energy security, resiliency, access, and affordability.

Although the global energy crisis has not necessarily created waves in terms of long-term energy policies, it has called into question the traditional views of fossil-based energy security and resiliency.

Like many other developing countries in Southeast Asia, the Philippines has looked to the success of coal-to-gas switching in the US and Europe as an archetype for reducing carbon intensities while maintaining economic growth.

The Philippine Energy Plan (2022-2040) puts forth a pathway to increase natural gas power generation from 20 TWh today to more than 140 TWh in 2040, an average annual growth rate of over 10%. With the Malampaya gas field expected to be depleted within the next five years, existing gas-fired power plants are in dire need of an alternative source of fuel, not to mention the gas power plants under construction (Yang, 2021). However, nearly all LNG infrastructure projects are delayed in part due to regulatory and administrative barriers while the Philippines' deregulated power market structure, which prohibits government interventions in power plant contracting, leaves LNG investors additionally exposed to market risks from a dynamic commercial and regulatory landscape (Reynolds, 2021). Gas infrastructure becomes an even less attractive prospect when accounting for soaring prices and more focused competition for LNG resources that are expected to last at least until 2026. This short-term uncertainty puts longer-term gas ambitions in question. Even if or when import infrastructure is built, the country will remain exposed to both the inherent climate and economic risks associated with the fuel. Risk perceptions will remain high, and without policies to alleviate gas demand pressures and a lack of government subsidies, future gas price shocks will simply be passed onto consumers, which is already a contentious issue.

Alternatively, **renewables development in the Philippines has gained encouraging momentum.** In July 2022, the Department of Energy (DOE) published its updated national renewable energy programme (NREP) for the period 2020 to 2040, setting targets of 35% renewable power generation by 2030 and 50% by 2040, corresponding to an addition of 102 GW electricity capacity by 2040 including 27 GW solar, 17 GW wind, 6 GW hydro, 2.5 GW geothermal and 364 MW biomass (Department of Energy Philippines, 2022c). Although not an immediate response to the energy crisis, the current situation provided motivation to accelerate the implementation of certain policies incentivizing renewables. In October 2022, the DOE announced an increase in the increment of renewable energy installations under the Renewable Portfolio Standards (RPS) from 1% to 2.52% in 2023 (Alcoseba Fernandez, 2022). The department also extended the preferential priority dispatch for renewables on the spot market to include biomass, geothermal and storage hydropower projects as a tool to reduce spot market power prices and to encourage new investments into renewables capacity development (Department of Energy Philippines, 2022b; Lagare, 2022). Wind, solar and run-of-river hydropower already received must dispatch status in the spot market, while biomass projects under the feed-in-tariff (FIT) scheme received priority dispatch.

This year also saw the inaugural round of the government's Green Energy Auction Program, where almost 2 GW of renewables were committed to being delivered between 2023 to 2025 at a price lower than or equal to prices set by the ERC. The auction program, expected to be held annually, is designed to assist those institutions mandated by the RPS in procuring renewable power through a competitive process while also setting a benchmark price for renewables (Lectura, 2022).

3.2 Thailand

Thailand is the second largest economy in Southeast Asia and has avoided the most severe consequences of the energy crisis, but energy security concerns are mounting. Thailand is greatly dependent on fossil imports, particularly on oil and natural gas, which together account for the majority of its primary energy supply; prices for both fuels have soared since the onset of the crisis as trade tightened and called into question the country's intention to use gas as a long-term transition fuel. The country has turned to an array of short-term measures to secure new fossil supply (even turning back to coal sources previously marked for phaseout), boost renewables, and alleviate price shocks for citizens.

Impacts of the energy crisis

Thailand is still in the process of recovering from a protracted COVID-19 pandemic, with a 2022 upturn in domestic demand and tourism softening economic disruption. As of August 2022, ongoing energy crisis pressures and Russia's invasion of Ukraine led the Bank of Thailand to revise the GDP outlook downwards from an initial 3.4% to 2.7-3.2%, mainly due to the impact from higher energy and commodity prices, a slowdown in the growth of Thailand's trading partners, decreased influx of foreign tourists (Bank of Thailand, 2022; Vananupong, 2022).

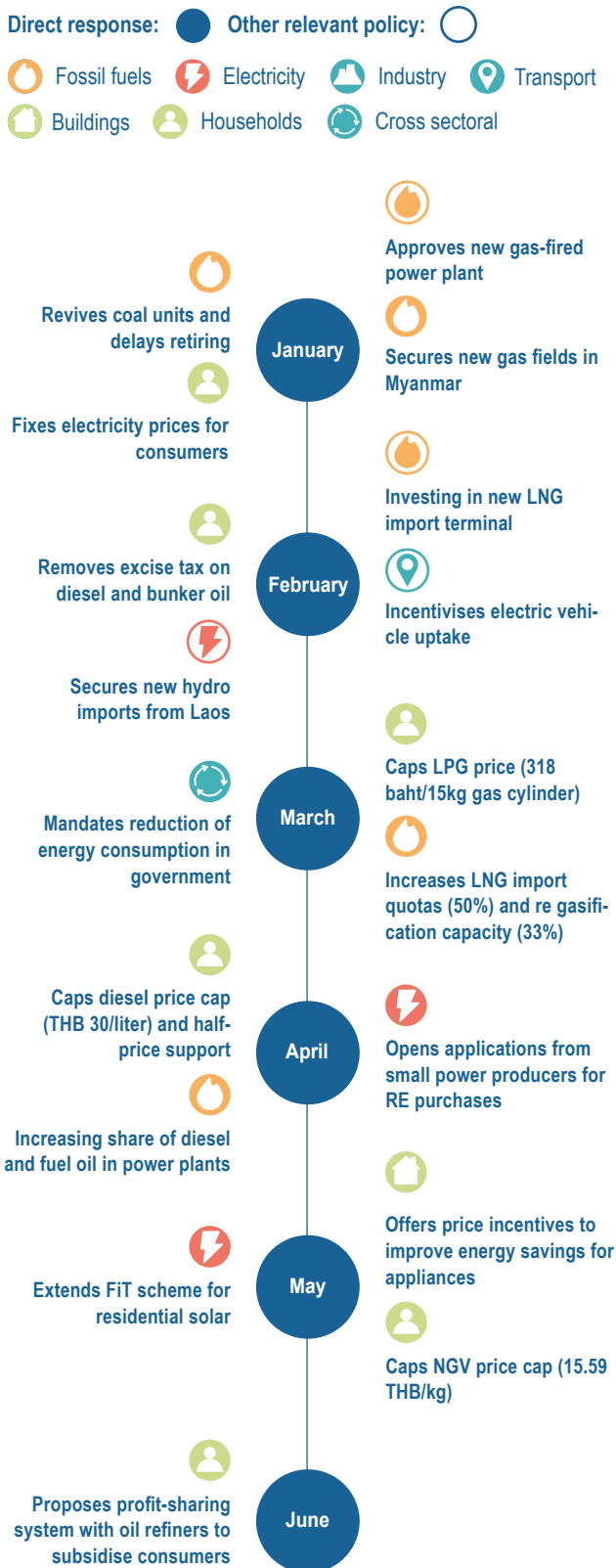
Rising energy and commodity costs have hit Thailand sharply; the Consumer Price Index in 2022 on average has increased by 6.14% across all commodities compared to 2021, driven by price increases for oil, electricity, and food products (TPSO, 2022). Protraction of the Russian invasion and the diminishing capacity of Thai businesses to absorb higher costs (on behalf of consumers) risks another surge in inflation expectations.

Thailand's continued fuel import dependencies on oil and gas shine a spotlight on stark energy security issues in a time of soaring fossil energy prices. In 2021, Thailand relied on imports for almost 75% of its fossil fuel and electricity needs while fossil fuels represented almost 80% share of the total primary energy supply in 2019 (pre-COVID) (Setboonsarng, 2022) (Figure 3). Excluding biomass and biogas (mainly fuelling the industry and buildings sectors), only 1% of Thailand's primary energy supply is from renewable sources; **the transition to renewables has been slow in pre-COVID years and stagnant since 2020, forcing the country to continue relying on overseas imports in the ongoing crisis.**

Although the country only imports 3% of its crude oil from Russia, 55% of it is imported from the Middle East (Sondi, 2022). Thailand is dependent on natural gas for over 50% of its electricity generation but Thailand's domestic gas field production has been on the decline, meaning the country needs to import approximately a third of its gas from Myanmar and overseas LNG producers (Asia Natural Gas & Energy Association, 2021; Evans, 2022b; Ministry of Energy Thailand, 2022b). However, Thailand faces steep competition for LNG shipments (e.g., with Europe) and potential sanctions on Myanmar's gas exports after a military coup.

Thailand faces decreasing domestic production, uncertain regional trade, and tightening global supply at the same time (Setboonsarng, 2022). To compound energy supply issues, energy prices have been increasing drastically, with gasoline and diesel prices reaching their highest levels in 14 years (Ministry of Energy Thailand, 2022a). At gasoline's peak price in August 2022, costs per litre in Thailand had increased by 96% compared to January 2021, while North Asian LNG prices in June 2022 tripled compared to a year earlier (Bangchak

Figure 6
Policy timeline of Thailand's energy crisis



Corporation, 2022; Stapczynski and Koh, 2022). As long as Thailand is highly dependent on fossil fuels, it will continue to experience price volatility in energy markets.

Key policy responses

In response to the crisis, Thailand has been planning and implementing a series of response measures with differing implications for energy transition and future resilience (Figure 6). Due to the uncertainty surrounding the developments of the crisis, the government initially prioritized short-term solutions to stabilize energy prices, including securing new fossil fuel resources upstream and domestic renewable electricity generation, while also issuing policy packages to ease energy price pressures on consumers.

Thailand has moved fast to secure new upstream fossil fuel resources as the global energy crisis deepened. At the end of 2021, the Electricity Generating Authority of Thailand (EGAT) delayed the decommissioning of 1.1 GW of old units, despite long-standing plans to retire the Mae Moh lignite coal mine and decrease lignite power generation (EGAT, 2022b; Praiwan, 2022a). At the same time, the state-owned oil and gas giant PTT Exploration and Production opportunistically engaged in a takeover of Myanmar's largest gas field as major oil and gas companies moved out due to increased sanctions against the military coup (Setboonsarng and Petty, 2022). As Thailand's energy security outlook worsened in Q1 2022, the Energy Regulatory Commission (ERC) increased LNG import quotas by 50% and correspondingly commenced adding re-gasification capacity by 33% to PTT's Nong Fab plant, which is due to start operations before 2023 (Setboonsarng, 2022). However, Thailand was already renegeing on its LNG import strategy by April due to surging prices, instead replacing LNG with cheaper and more polluting diesel and fuel oil in power plants (Stapczynski and Koh, 2022).

Energy regulators in Thailand are purchasing additional renewable energy to reduce dependency on gas imports and reduce cost burdens on consumers. Thailand has accumulated a sur-

plus in electricity generating capacity, with power production exceeding 50% of peak power consumption in 2022 (Thai PBS World, 2022). With most of Thailand's electricity produced from natural gas, the country has turned to alternative options to keep prices low for consumers and encourage renewable generation. In April and May, the Thai ERC initiated two response measures to invite applications for short-term power purchases from small power producers without power purchase agreements, and also extend a scheme to purchase surplus electricity at higher tariff rates from residential rooftop solar PV units (ENC, 2022; Praiwan, 2022b).

Thailand has taken a hybrid approach to regulating national energy demand by simultaneously issuing subsidies to smooth public energy consumption and policies to reduce demand. The country has issued a series of price-supporting measures by fixing electricity prices, removing excise taxes on diesel and bunker oil, and capping prices of LPG, diesel, and NGV in the first half of 2022 (Arunmas, 2022; Ministry of Energy Thailand, 2022a). The PTT (state-owned oil and gas company) also approved to grant THB 3bn (USD ~ 80m) of relief contribution to the national Oil Fuel Fund used to alleviate energy prices for consumers (Praiwan, 2022c). These measures are important to reduce the cost of living in the short term but lack the substance to induce long-term transformational change and reduce fossil dependencies. More positively, Thailand this year approved financial incentives to consumers to upgrade residential cooling appliances and a package of cuts and subsidies to promote a shift to electric vehicles (EGAT, 2022a; Reuters, 2022a). The Ministry of Energy has also approved a series of measures to reduce energy consumption in government agencies by 20% over the year, such as the mandated purchasing of energy efficient appliances, implementation of energy-saving practices, and limiting business travel in lieu of digital working (Rohit, 2022).

Implications for long-term energy transition

The Thai government's immediate responses have been driven by rising energy and commodity costs for its population and a destabilized energy portfolio of imported energy sources, but its decisions have lasting implications for its national energy and climate plans.

Thailand's most recent power planning strategies turned to natural gas, which has been the dominant source for power generation for decades, as a transition fuel at the expense of coal (Ministry of Energy Thailand, 2018b, 2018a). However, Thailand has temporarily reneged on this strategy by extending the lifetime of coal while still doubling down on gas: the National Energy Board approved the replacement of two units of the Mae Moh coal-fired power plant (600 MW starting operation in 2026) in 2022, while EGAT started construction of a new 1,400 MW gas-fired power plant at Surat Thani (starting to produce electricity by 2027-2029) and an LNG import terminal in Nong Fab sub-district in efforts to become a regional LNG hub for long-term energy security (EGAT, 2022c, 2022d).

Ironically, however, Southeast Asia's exposure to high gas prices is expected to continue increasing in the next years with expanding demand (IEA, 2022d). Despite Thailand being relatively insulated from LNG price increases given its high reliance on long-term contracts, prices are still indexed to trading hubs in some cases and subject to market swings; the country has already shown in 2022 that exorbitant LNG prices made dependence on gas untenable (PTT, 2021; Praiwan, 2022d; Stapczynski and Koh, 2022). While fossil fuels are expected to play a large role in Thailand in the considerable future, **this fossil fuel reliance locks in vulnerability—such as the volatile prices, geopolitical pressures, and supply chain disruptions experienced in the current crunch—in the system.**

As electricity demand in commercial, industry and residential sectors grow, **Thailand would benefit from a transition from a predominantly gas-fired power sector towards a more diversified energy portfolio inclusive of a modernized and flexible renewables-based system.** During the height of the energy crisis in Q2 2022, Thailand signed an agreement with Laos to increase electricity imports from an additional 1,500 MW of hydropower (up from 9,000 MW previously) and implemented policies to increase renewable purchases from small power producers and extend a FiT scheme for residential solar, but hydro imports come with their climate and geopolitical energy security risks and its renewable energy measures are only temporary (RFA's Lao Service et al., 2022; Thanabouasy, 2022; Whong and Avary, 2022). The government's response to clean energy would need to be scaled up to future-proof the country's energy security and reduce the need for fossil imports.

Investments into long-term strategies aiming to reduce energy demand, such as those in end-use sectors (e.g., public transport) and novel technologies (e.g., green hydrogen), are also missing in the country. Domestic funds, buffered

with the proposed taxes on windfall profits from oil and gas companies as the government proposed, for example, could mobilise a share towards long-term measures in energy efficiency and energy reduction as well as greater public awareness on the solutions to combat volatile energy and electricity prices.

Thailand's initial strategy in the global crisis concerned much-needed immediate relief to consumers but does not consist of the transformational change needed to secure long-term resilience. It is evident now that the impacts of the energy crisis are due to be prolonged into the medium term and thus the government's policy responses should also be. As Thailand's energy security vulnerabilities and exposure to price shocks are the results of insufficient renewable deployment and a slow-moving energy transition, a continued response of shoring up long-term fossil fuel supply rather than implementing clean energy and demand-side measures would keep compromising Thailand's long-term goals for energy security and independence.

3.3 Viet Nam

The energy crisis has presented Viet Nam with real security of supply risks and resulted in energy price inflation in 2022. These mostly impacted the electricity and transport sectors, which rely greatly on imports of coal and oil. The government's immediate response, including a freeze on electricity tariffs and tax cuts, shielded consumers from price increases to some extent. Recent successes in bringing new renewable energy capacity online have helped prevent greater supply and price impacts from fossil fuels, yet the growth in renewables is expected to slow until well beyond 2030. The impact of the energy crisis has so far

not encouraged the government to deviate from its LNG strategy, raising questions about the resilience of the energy sector over the mid-term.

Impacts of the energy crisis

Viet Nam is on a firm trajectory of recovery owing to a robust economic outlook before the pandemic and a successful COVID-19 containment strategy, including a rapid vaccination rollout and supportive policies for businesses and consumers. Strong fundamentals and fiscal and financial stability have contributed to Viet Nam's economic rebound. GDP

growth dropped below 3% in 2020-2021 but is projected to recover to pre-COVID levels of 7.2% by 2023—among the highest in the region (IMF, 2022a; OECD, 2022). Consumer price inflation has remained below the State Bank of Viet Nam's target of 4%, averaging between 2-3 percentage points through 2022 (Trading Economics, 2022b). Beyond the energy sector, where costs have increased dramatically, the largest price increases over the first half of 2022 were recorded in imported fertilizers (+44%), imported wheat (+29%), and animal feedstock (+9%) (General Statistics Office of Vietnam, 2022). Like most ASEAN countries, food prices and shipping costs have increased less sharply than in other regions. Price protection, limiting cost pass-through from upstream inputs, has also helped stem inflationary pressure on consumer prices (IMF, 2022a).

Despite Viet Nam's overall stable growth outlook, the global energy crisis has exposed the vulnerability of its energy sector to exogenous shocks and supply-side risks. Fossil fuels comprised 84% of Viet Nam's primary energy supply in 2019: the largest share is coal (51%), followed by oil (24%) and natural gas (9%) (Figure 3). Viet Nam is self-sufficient in natural gas, to some extent insulating it from the sharp price increases in global LNG markets. However, it became a net energy importer in 2015 and relies on imported coal and oil for more than half of domestic demand, a dependency which has grown over the years (ASEAN Centre for Energy, 2022).

Viet Nam's increasing reliance on imported coal affected electricity security as supply disruptions confronted the sector. Domestic coal consumption for power generation rose to 59 million tonnes in 2021, a near doubling compared to 2011, and was largely met through imports; Viet Nam imported 36.4 million tonnes of coal in 2021, an annual volume that is expected to double in the coming years as domestic production has stagnated (Raj and Ajmera, 2022; VietnamPlus, 2022b). Demand for coal has soared along with the construction of new coal-fired power plants

over the past decade which have since become the dominant technology source in the electricity sector. The majority of Viet Nam's overseas coal comes from Australia, followed by Indonesia, South Africa, Russia, and North America. As a result of Russia's invasion, the average price of imported coal in the first five months of 2022 hiked to USD 258 per tonne, a near triple increase compared to the year before and rising further thereafter. The price of domestic coal was 63% higher by July as input costs had risen (Vu, 2022). Supply disruptions, alongside elevated prices, decreased coal imports by 27% over January-May 2022 compared to the year before while the import bill more than doubled (Ministry of Industry and Trade Vietnam, 2022a). The ensuing shortage in coal supplies affected power generation over March-April forcing Viet Nam Electricity (EVN) to curtail operations of its coal fleet. It cut back the running hours of coal units to 60-70% of capacity while suspending production in others, resulting in 3,000 MW of idled capacity (Nath et al., 2022; Reuters, 2022b).

Meanwhile, global oil market developments and disruptions to a domestic refinery plant applied pressure on the prices of crude oil and refined petroleum, directly impacting end-use prices. The price effects were strong in the transport sector where service costs increased considerably as a result; during the first half of 2022, the government had to continually adjust petroleum prices (16 times) to account for ever-rising fuel costs, increasing retail price of petroleum by 52% on average compared to the year before (General Statistics Office of Vietnam, 2022). The ministry of industry and trade (MOIT) has been considering auctioning up to 100 million litres of gasoline (RON92) from its reserves at reduced prices but as of October 2022 has not exercised this recourse yet. Viet Nam became a net importer of crude oil in 2018, whilst in prior years it was a significant source of export revenue. With limited domestic refinery capacity, Viet Nam has relied on international markets for a considerable share of its supply of oil products.

While Viet Nam does not yet import natural gas, a great part of the gas produced domestically is indexed to prices of marine fuel oil and therefore susceptible to international market volatility.

This led prices to rise by 44% in the first half of 2022 (General Statistics Office of Vietnam, 2022). Production costs also increased because of higher fuel costs alongside increased transportation tariffs. PetroViet Nam Gas has invested in two LNG import terminals that are slated to start operating in Q4 2022 and 2023. Viet Nam projects gas imports to grow considerably over the coming decade. However, the current market environment has rendered that strategy uncertain to succeed as planned.

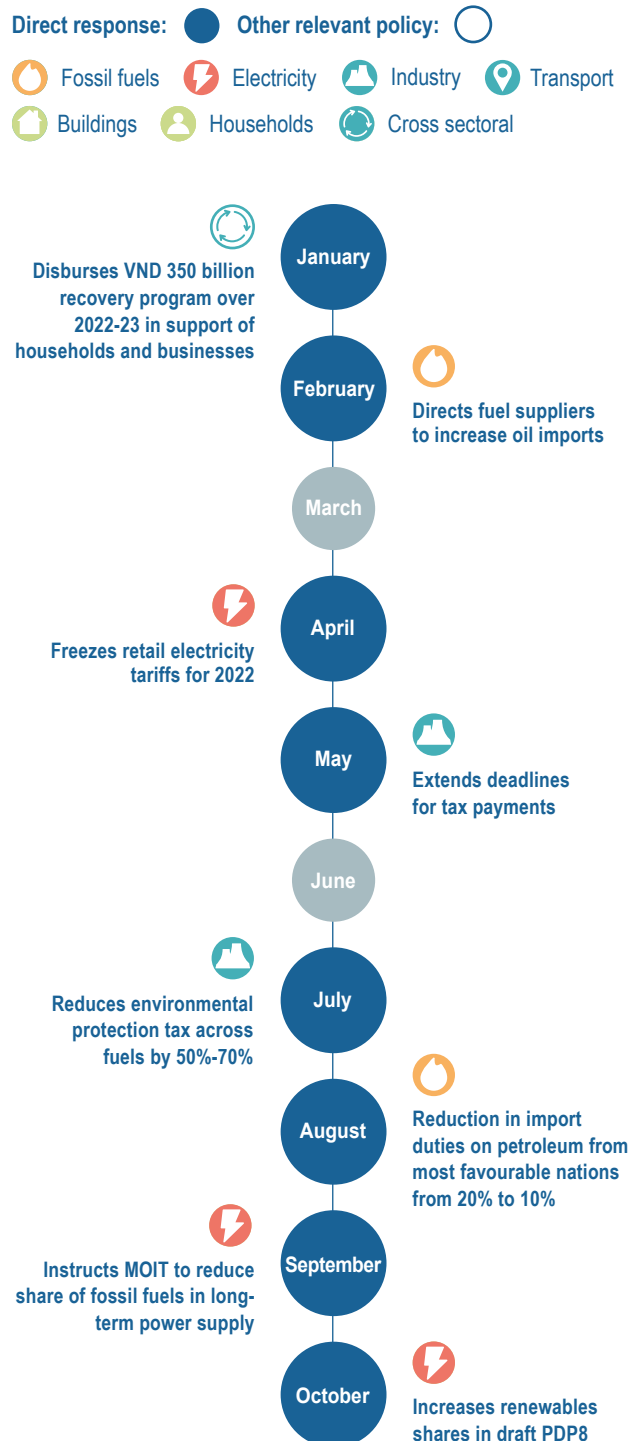
Recent successes in bringing new renewable energy capacity online have helped prevent greater supply and price impacts from fossil fuels. Viet Nam has witnessed a rapid build-out of wind and solar power in recent years thanks to a favourable investment framework that included generous feed-in-tariffs and tax exemptions (income and land lease) (Do et al., 2021). In 2021, installed wind power mounted up to 4.1 GW and solar power to 16.6 GW, with a combined capacity equal in size to Viet Nam’s hydropower fleet. The growth in wind and solar pushed total RE capacity to 42.7 GW, a 128% increase compared to 2018. As a result, renewables reached a 56% share in installed capacity in 2021, generating more than 40% of electricity (IRENA, 2022). Generation output from wind and solar combined surpassed 12% that year freeing up a share of the load otherwise supplied by costly fossil fuels (Thai Son, 2022).

Key policy responses

Viet Nam’s immediate response to the energy crisis has centred on addressing supply shortages while minimizing impacts to industry and consumers. The government has enacted a range of measures that include import diversification for coal, oil, and refined petroleum, price regulation, and fiscal and monetary support (Figure 7).

Faced with acute shortages, the government has sought to secure new supplies of coal and

Figure 7
Policy timeline of Viet Nam’s energy crisis



oil by building on existing trade relations and encouraging the establishment of new ones.

It turned to Australia and South Africa to make up for the shortfall in coal in early 2022 (Thuy, 2022; VietnamPlus, 2022a). These countries have been Viet Nam's second and third largest suppliers and together provide about half of Viet Nam's imported coal, a share that may now increase (Chaturvedi, 2021). In the oil sector, the government mandated key suppliers to increase imports of both crudes and oil products (Ministry of Industry and Trade Vietnam, 2022b). In a bid to encourage import diversification, it approved in August 2022 to halve import duties—from 20% to 10%—on petrol from most favoured nations, which include major suppliers like the US and those from the Middle East (Government of Vietnam, 2022). Viet Nam has so far traded refined petroleum mostly with Asian countries it has signed free trade agreements with. Import duties on oil products from those countries are at 8% (Vahn et al., 2022).

Viet Nam has utilized multiple instruments at its disposal to alleviate negative impacts on key demand sectors including through fiscal support, public investment, and regulatory measures.

In January 2022, in the wake of eased COVID-19 restrictions, the government announced a VND 350,000bn (USD 15.4bn) socio-economic recovery and development programme, the largest economic support package in the country's history, with the aim to achieve 7% annual GDP growth by 2025 (Ministry of Industry and Trade Vietnam, 2022c). The package covers funding for healthcare, transport infrastructure and climate adaptation (amongst others) and will also reduce VAT by 2% and secure concessional loans at a 2% interest rate for businesses and households to support for low-income earners. The programme is set to support demand and investment as both (energy) cost inflation and an increased risk of recession in major economic blocs may yet hamper the country's economic recovery.

Measures implemented to stabilize energy prices have provided relief to consumers but

may come at increasing costs to the public budget.

Despite higher fuel costs for electricity generation, the government vowed to keep electricity rates unchanged over 2022 (Minh, 2022; Vu, 2022). EVN, Viet Nam's state-owned utility and sole offtaker of electricity, bears the costs of the implicit subsidy and will see its margins decline as a result. Coal units have accounted for roughly half of the total electricity generation, the cost of which may continue to increase as imports are set to grow further and prices are likely to remain high. This will put increasing pressure on EVN to increase its tariffs or on the government to subsidise fuel costs, were it to decide to prolong the measure into 2023-24. In parallel, Viet Nam's National Assembly approved two consecutive tax cuts on transport fuels in April and July. The measure reduces the environmental protection tax (ETP) by 50-70%, depending on the fuel type, during 2022. The tax reduction, while effective in the short-term, shifts the financial burden of price stabilization to the government; The Ministry of Finance estimates the measure to cost VND 25.5tn (USD ~1bn) in foregone tax receipts for the year 2022 (An, 2022). The oil price shock has renewed discussions about the effectiveness of Viet Nam's petroleum price stabilization fund set up in 2009 (Thuy Van, 2013; Mai and Ngoc, 2022). The fund is financed through contributions from petroleum suppliers (based on the quantity of fuel sold) who pass that cost on to consumers. However, it remained in deficit as the energy crisis hit Viet Nam and did not prevent prices from increasing.

Implications for long-term energy transition

Beyond the introduction of short-term relief measures, the energy crisis has had an impact on Viet Nam's long-term energy strategy. The release of the Eighth Power Development Plan (PDP8), the central planning document for Viet Nam's electricity sector towards 2030 and with a vision to 2045, has been dormant since early 2021. Instead, MOIT has circulated multiple revised draft versions

in a consultative process aimed at ensuring the long-term energy outlook is compatible with the government's net-zero emissions target for 2050 and captures the rapidly evolving geopolitical and energy landscape. The consecutive draft versions of PDP8 have brought forth differing projections for Viet Nam's future electricity demand and capacity additions. What they all underscore is a power system built on LNG-fired power and renewables, with coal still growing in capacity towards 2030 but levelling off thereafter—translating into a declining overall share given surging demand. All draft PDP8s have been significantly more ambitious than the coal-centred revised PDP7, signalling increased momentum for the low-carbon energy transition (Zheng, 2021; Tachev, 2022). The energy crisis appears to have reinforced it further by exposing the risks of an energy future heavily reliant on fossil fuels; Tthe government issued an update in September 2022 (Notice 277/TB-VPCP) instructing MOIT to cut back on capacity additions of conventional thermal power in favour of solar and wind power in the PDP8. The revised draft PDP8 released in October 2022 markedly increased ambition, yet challenges remain.

Viet Nam is about to introduce an ambitious long-term renewable energy growth strategy but would rely largely on additional fossil thermal power up to 2030. According to the October draft, coal power is to peak in 2025 (at 30 GW and decrease after 2030), with 5 GW being under construction and no additional capacity to be added, contrary to prior projections. On the other hand, more LNG-fired power is to come online sooner: approximately 25 GW of additional capacity by 2030. This compares to an 11 GW net-capacity increase in renewables over the same period, driven by wind and hydropower in that order, while utility solar PV growth would stall until beyond 2030. In the long-term, wind and solar power are projected to far outstrip any other technology, increasing more than tenfold to 224 GW combined. The projections are putting Viet Nam on a firm trajectory to fully decarbonize its power sector by mid-century. Yet, the increased reliance on LNG

and coal in the short- to mid-term is likely to present it with an economic risk well before.

Viet Nam's mid-term gas strategy risks jeopardizing energy security and increasing the costs of the energy transition. The country's depleting gas reserves mean that most of its projected increases in gas-fired power will be fuelled by imports, as has already been the case for coal power. This is likely to translate into higher energy import bills and with it a heightened risk of import inflation, increasing the need for tariff increases, or if deemed unfeasible, fuel cost subsidies. With JKM LNG traded in the range of USD 35-55 per MMBtu for Q4 2022, prices would need to drop by 300% to 450% for a gas plant to recoup its costs (CME Group, 2020; Ha-duong, 2022). The economics of LNG for power presents the government with a dilemma: facing the risk of project cancellations and delays or filling the cost gap through tariff revisions or producer subsidies. The tradeoff is thus one between the endangered security of supply, political backlash, and government debt.

The government's gas strategy will further necessitate the construction of new LNG import facilities at significant investment cost, the introduction of technical standards to operate them, and an improved monitoring system to identify and avoid methane leakage. The economic justification for new fossil fuel infrastructure partly rests on the government's assumption to repurpose power plants for the use of clean fuels, like ammonia and hydrogen, from 2035 onward. Such resources are going to be important for integrating greater shares of variable renewable energy (VRE) during the later stages of the transition—in the form of storage and backup supply. However, using them for baseload power (as the government envisages), is unlikely to be economically viable (Agora Energiewende and Guidehouse, 2021; BloombergNEF, 2022). Vietnam's transition strategy towards greater use of natural gas thereby entails a double risk: that of prolonged fossil-based electricity generation in the absence of a viable off-ramp route, or a build-up of stranded assets, raising the cost of the transition.

Viet Nam's recent successes in adding wind and solar power to the system, amounting to ~12% of electricity production in 2021, demonstrate the potential to leapfrog another fossil fuel transition phase. The conservative mid-term outlook for renewables reflects emergent bottlenecks Viet Nam has been having to address in the wake of its wind and solar sprint. FiTs for solar expired at the end of 2020 and those for wind power one year later. Since then, the growth in VRE has stagnated. MOIT introduced a transition mechanism in October 2022 for projects that had missed the FiT deadline and faced delays because of it (Watson Farely & Williams, 2022). The surge in wind and solar power has exposed the physical constraints of the transmission and distribution grid. Network capacity has become the major barrier in bringing new capacity online quickly (EREA & DEA, 2019; Paudel, 2022). However, with elec-

tricity demand having increased by roughly 10% per year and forecast to continue to grow at that pace, moving ahead at speed is critical for Viet Nam (China Research & Intelligence, 2022; IEA, 2022b). Instead of relying on costly fossil fuels, the government could accelerate its renewables-based transition by establishing uninterrupted long-term investment certainty for renewables, raising grid investment and planning to a strategic national priority, and prioritising the optimization of the country's power system (forecasting, balancing, flexibility provisions). Prioritizing those over additional conventional power in this decade would help improve Viet Nam's energy system resilience in the short-term, allow it to reach its decarbonization goals sooner, and enable it to evolve into the regional renewable energy hub it aspires to become.

3.4 Indonesia

The global energy crisis has had mild impacts on the Indonesian economy but concerns for continuous food, gasoline, and energy affordability grow amidst steadily rising levels of inflation. Most of the energy consumed in Indonesia stems from domestic production, thus, energy security and availability have not been a major concern for the Government of Indonesia (GOI). The government's response to the energy crisis has, hence, focused on providing short-term financial relief to lower-income groups combating rising gasoline and food prices through one-off payments and fuel subsidy expansions. While the impacts of the energy crisis did not trigger a fundamental deviation from Indonesia's long-term energy strategy, Indonesia issued its highly anticipated tariff design to support renewable energy investment in 2022.

Impacts of the energy crisis

Indonesia is the largest economy in Southeast Asia, having recorded GDP growth of over 600% since the 2000s, and is projected to become the fourth largest economy globally by 2050 (IEA, 2022c). The sudden economic shutdown due to the COVID-19 pandemic pushed Indonesia into its first recession in over two decades (OECD, 2021). After the gradual reopening of the global economy in Q2 2022, Indonesia's real GDP growth returned to pre-pandemic levels to 5.5% (Sihombing and Jioa, 2022b). Indonesia's domestic price controls, significant reserves of fossil fuels and well-established export position allowed the government to raise export revenues while being less exposed to imported inflation from primary energy trade; this put Indonesia in a comfortable position compared to its neighbouring countries such as Thailand and the Philippines. However, lasting tensions

in global commodity markets eventually caught up to the economy, with rising food prices driving inflationary pressures and pushing up costs for households (Malik, 2022; Sihombing and Jioa, 2022a). In Q4, core inflation hit a seven-year high at just below 6%, overshooting the Bank of Indonesia's target range of 2-4%, causing the bank to hike interest rates larger than expected (Sihombing and Jioa, 2022c).

Indonesia has benefited from soaring global commodity prices to the point where export controls were introduced to maintain domestic supply. Indonesia's trade surplus in the second quarter of 2022 increased to USD 24.89bn, the highest ever recorded, as average global market prices for thermal coal skyrocketed, surpassing USD 400 per tonne (IEA, 2022b; Suroyo and Christina, 2022; Tampubolon et al., 2022) (Figure 2). The substantial price difference between regulated domestic prices for coal (capped at USD 70 per tonne for electricity generation and USD 90 per tonne for industrial use) and international coal prices incentivised producers to increase their coal exports and threaten domestic supply. Even though there is a domestic market obligation (DMO) to sell at least 25% of the produced coal on the domestic market, it has been reported that producers bypass the DMO at the risk of paying a fine (Pande et al., 2022). The GOI subsequently imposed a month-long coal export ban in January 2022 amidst critically low domestic stocks (Guild, 2022).

Despite the increased export earnings from coal, Indonesia has been exposed to the volatility of oil markets on which it has increasingly come to rely to meet rising domestic demand. While Indonesia's direct trade relations with Russia and Ukraine are limited, global tension in the energy markets affected Indonesia's domestic energy and commodity supply (WITS, 2022). Over the past decade, Indonesia's domestic coal and gas production grew in line with demand whereas domestic oil production dropped, leading Indonesia to become a net crude oil importer; in 2021, Indonesia imported about half of its

petroleum products due to a lack of domestic supply of crude oil (EIA, 2021). Oil accounted for 31% of the total primary energy consumed in Indonesia in 2019, the largest share in the energy mix, mainly driven by a rapidly expanding transport sector (Ministry of Energy and Mineral Resources Indonesia, 2021) (Figure 3). With crude oil prices rising above USD 100 per barrel in 2022, Indonesia's economy has felt the impacts of the global energy crisis through energy prices despite significant domestic reserves (Figure 2).

Key policy responses

The primary focus of the GOI's response to the global energy crisis has been the provision of short-term financial relief to low-income households. As part of that strategy, the government reversed its policy banning the sale of emissions-intensive but cheaper gasoline products (IEA, 2022f). Similarly, it announced a new social aid package of IDR 24.17tn (USD 1.5bn) in April 2022, offering monthly cash payments to more than 20 million low-income households (Widiyanto and Suroyo, 2022). While the direct impacts of the global energy crisis have been limited in Indonesia, the global market tensions have raised pressure on the Indonesian economy. Concerns about the secure supply of crude oil have become more prominent leading the GOI to consider purchasing discounted Russian oil (Safitri, 2022).

In April 2022, amidst the price spike in global crude oil prices, the GOI increased the prices for high-quality fuels by 38%, which are typically consumed by higher-income groups (Karyza, 2022b). The socially progressive measure freed up the GOI's subsidy budget, providing fiscal space to raise subsidies in support of low-income households affected by rising energy prices. In May 2022, the government announced a subsidy budget extension of almost IDR 74.9tn (USD 4.9bn) for electricity, LPG, and fuel oils, intending to ensure the continued affordability of electricity and gasoline for low-income households (Sembiring, 2022).

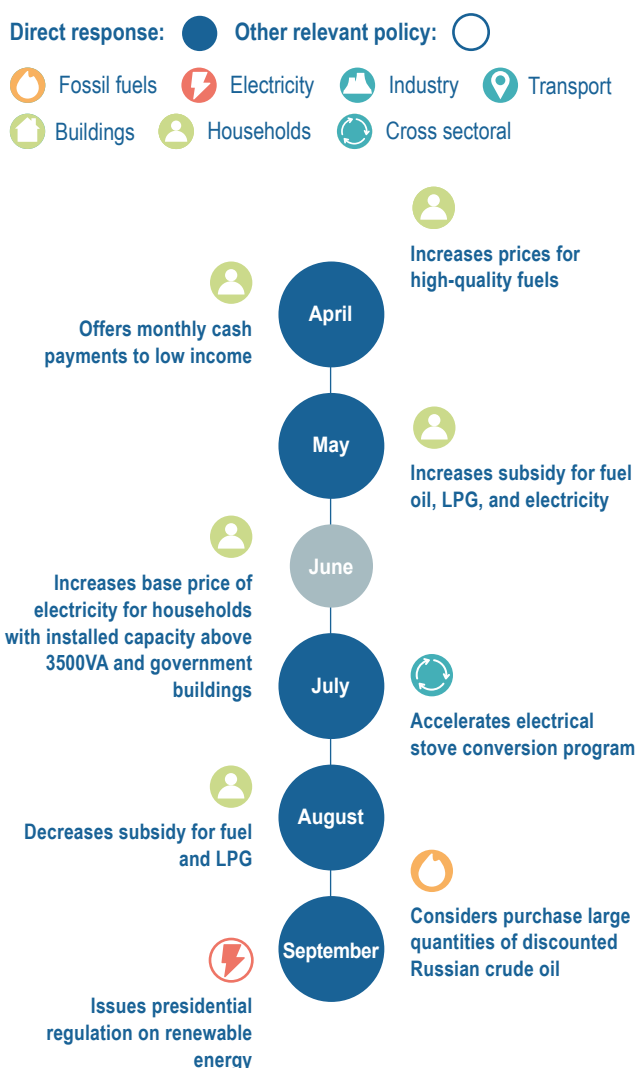
While the prices for high-quality fuels were increasing, prices for low-quality fuels remained constant as the government covered the increased costs of imported fuels through a subsidy increase. Growing price disparity between the fuels had incentivised households to switch to subsidised gasoline, leading to an overall demand increase of 30% (Margenta and Yusgiantoro, 2022). President Widodo reported that about 70% of the total subsidy budget expansion was absorbed by households that consumed high-quality unsubsidised

gasoline before the price spikes and had now shifted their demand to subsidised gasoline (Mokhtar, 2022). The sudden demand hike for subsidised fuel tripled the state's gasoline subsidy expenses to IDR 502tn (USD 33.8bn) (Margenta and Yusgiantoro, 2022). Since then, the GOI has launched a program trying to deliver the subsidy with more accuracy to those eligible, with limited success thus far (Pratama, 2022).

The increase in fuel subsidies led to a substantial increase in the state's deficit spending forcing the GOI to reduce its subsidies. The World Bank (2022b) projects a continuous increase in fuel prices throughout 2022 and 2023. To prevent further demand shifting from unsubsidised to subsidised fuels, the GOI lowered the subsidy for gasoline and effectively increased the prices at the pump by 30% at the beginning of September (Widianto and Suroyo, 2022). These soaring gasoline prices led to multiple protests across the country (Al Jazeera, 2022b). Fuel price increases are particularly sensitive in Indonesia as low-income households and small businesses are heavily dependent on subsidised gasoline. These two groups make up over 80% of Pertamina's, Indonesia's state-owned oil company, revenue through their purchases of subsidised fuels (Widianto and Suroyo, 2022). To further reduce the state deficit spending, the GOI announced an increase in electricity base prices for households with an installed capacity over 3500 VA and for government buildings with an installed capacity above 6600 VA, as of July. However, this tariff adjustment only applied to about 3% of the Indonesian population (Dewi, 2022).

Figure 8

Policy timeline of Indonesia's energy crisis



Implications for the long-term energy transition

In the wake of Indonesia's announcement in late-2021 of its objective to reach net-zero emissions by 2060, **the global energy crisis helped place the country's energy policies under increased scrutiny, while also presenting an implementation speedbump** as government ministries focused efforts on protecting vulnerable citizens from sharp

price increases. A majority of GOI's responses have involved providing welfare measures for energy and living costs while attempting to alleviate pressures for low-income households. The strategy has continued from a long-standing support of fossil fuel subsidies but has raised a dilemma for the government: it passed a budget extension in April 2022 to increase fuel subsidies and foster business-as-usual energy consumption but rolled back subsidies in August due to rising fiscal concerns. These developments could reflect an adjustment in the country's approach to discounting fossil fuel consumption, which has undermined efforts to achieve Indonesia's clean energy targets since 2016 (Suharsono et al., 2022). The GOI's priorities have insofar been focused on short-term welfare measures. Addressing existing fossil dependency risks has not featured as prominently in the government's crisis response strategy.

Indonesia's energy transition is facing a watershed moment, with high-level political commitments predating the crisis taking shape through new milestone policy announcements on coal. The government is becoming increasingly visible in its commitment to accelerate the phase-down of coal-fired power plants. In November 2021, the Ministry of Finance stated the country could retire coal-fired power generation by 2040 conditional on sufficient international support. Indonesia also signed the Global Coal to Clean Power Transition Statement at COP26 (although did not go far enough to commit to restricting the issuance of new coal permits or building of new infrastructure). Indonesia's coal sector was in the international spotlight in 2022 due to ongoing negotiations on the Energy Transition Mechanism and Just Energy Transition Partnership, two initiatives to deliver international finance to the country for the accelerated phaseout of coal and the build-out of renewables. In September 2022, President Widodo enacted a landmark regulation on the "Acceleration of Renewable Energy Development for Power Supply" (PR112), which lays the foundations for a roadmap to phase-out coal use by 2050 and provided signposts for where international finance could help support this transition. Already in October,

state utility PLN introduced possible mechanisms to retire coal power plants early and focused on blended finance schemes to reduce power plant lifetimes (Karyza, 2022a).

The renewed commitment towards a clean energy transition has been strong at the political level, and **new policy signals issued recently is expected to boost renewables investment and deployment** in the coming years. The long-awaited regulatory framework accompanying the PR112 supports renewables development by establishing a beneficial tendering and tariff regimes for renewable energy projects and includes supportive policies such as prioritising power purchases from renewables and including a must-run provision based on technology characteristics similar to priority dispatch rules in a spot market. The regulation also outlines certain forms of government support applicable to renewable energy projects, including fiscal and non-fiscal incentives. As part of its long-term targets, Indonesia has an interim target to increase the share of renewables in the power mix to 23% by 2025 and 31% in 2050. However, renewables accounted for only 13.5% of total power generation in 2021, and renewable capacity additions made up approximately 10% of added installed capacities in 2019 and 2020 (Ministry of Energy and Minerals of the Republic of Indonesia, 2021).

The momentum to shift the deep reliance on fossil fuels in Indonesia's energy sector has been building for several years. There is no clear indication that the global energy crisis has accelerated the implementation of Indonesia's long-term energy objectives. While less strongly affected than import reliant neighbours, the Indonesian government faces mounting incentives to do so. Due to a record surge in fossil fuel prices over 2022, the GOI has experienced economic setbacks in both loss of export revenue and rising subsidy bills due to its fossil dependency. Indonesia would benefit from a more rapid scale-up of renewable deployment, which would enable cheaper electricity generation and reduce fiscal pressure. An IESR study suggests that the technical potential

for solar power in Indonesia remains many times greater than both the latest capacity statistics and official government estimations (Tampubolon et al., 2021; IRENA, 2022a). The country's import dependency on oil, the only fossil fuel it is not able to meet with domestic production, also remains an issue for long-term energy security considering the growing demand from the transport sector. To supplement Indonesia's initiatives to reduce dependency on coal, an expansion of the GOI's policy response toolbox to prioritize near-term renewable deployment along with fuel-switching measures and a greater focus on energy efficiency improvements would help reduce its fossil dependency sooner.

4

Moving from crisis to transition



The energy crisis has subjected challenges of varying extremes in Viet Nam, Thailand, the Philippines and Indonesia given their variations in the energy mixes, domestic energy resources, market exposure and national circumstances, and thus has elicited differentiated responses from governments. Patterns of similarities and differences have surfaced with the ongoing disruption, but lessons and insights converge when looking to the future to build more resilient and secure energy systems.

Energy security risks are growing for all four fossil-reliant countries amidst increasing concerns on global supply, price volatility, and struggling domestic production. Thailand, Viet Nam and Indonesia all depend on fossil fuels for over 75% of their primary energy supply, with the Philippines reliant on the fuels for 66% (Figure 3). While all four countries are dependent on fossil fuels, they fared differently during the ongoing energy supply crunch. Indonesia's endowment with coal and natural gas has continued to uphold national production through the crisis and is the only country of the four expected to meet the demand for those fuels domestically in upcoming years. The other countries have increasingly come to rely on energy imports to meet fast-growing energy needs, notably in the power sector where coal and natural gas dominate supply. All four countries heavily rely on oil in the transport sectors, but none are self-sufficient in the fuel. With large and growing dependencies on imported fuels, these countries have been price-takers in the current crisis and are subject to the volatility of global energy markets and the increased politicization of energy oligopolies.

Slow progress in domestic clean energy deployment and finance in recent years has led to greater energy dependencies and exposure to exogenous events. Since the COVID-19 pandemic, renewable energy capacity and shares in the primary energy supply have stagnated, aside from Viet Nam, and have been unable to offset rising fossil fuel consumption and energy demand (Panos et al., 2020). The window of opportunity provided by the pandemic to deploy clean energy

would have been beneficial for further alleviating current energy concerns, although none of the countries had dedicated recovery spending towards clean energy measures and per-capita clean energy investment has also remained flat (O'Callaghan et al., 2021; IEA, 2022h).

Countries' have insofar addressed the crisis reactively in the short-term, focusing on alleviating social welfare impacts and a mix of dirty and clean energy solutions. The immediate priority in the four countries has focused on near-term policies to relieve pressure on citizen welfare as well as the overall energy system and state budget, but the balance between the objectives remains a challenge. Thailand and Viet Nam have mainly implemented a slew of measures aimed at reducing energy prices for consumers to smooth consumption in place of incentivizing energy demand reduction, which supports welfare objectives but adds pressure on the economy and energy system in the future. Indonesia has already internalized this issue by (recently) opting to reign in fuel subsidies and place higher prices on wealthier consumers, citing fiscal concerns. The Philippines and Thailand are exploring alternative approaches by targeting windfall profits from utilities and refiners to share the burden of consumers, a common practice among many European economies.

To secure energy supply, Indonesia, Viet Nam, and Thailand have all upped import quotas for fossil fuels, with the latter also securing new gas reserves and hydro imports from neighbouring countries. Thailand, Indonesia, and the Philippines have also actively pursued renewables as part of the short-term solution by expanding renewable purchases from small power producers, revising the design of feed-in-tariffs, and extending priority dispatch for renewables on the spot market.

Yet, governments' short-term actions have not sought to correct pre-existing vulnerabilities and encourage structural changes in energy and end-use sectors. Most of the response measures target solutions to alleviate the crisis in the short-term but would have no, or even det-

perimental, effects in a future energy supply shock. Implemented policy measures incentivizing greater renewables contain an expiry date, with only Indonesia implementing a policy that could accelerate deployment in the short term. Positively, the Philippines and Viet Nam issued revised long-term energy plans with increased renewable targets during the crisis. Although these targets are likely to reflect the additional urgency from recent global developments, the measures backing up the targets are still unclear.

Energy efficiencies and fuel-switching measures in end-use sectors have not yet materialized in the government responses, aside from temporary incentives for behavioural changes in the Philippines and Thailand which encourage a modal shift to public transport and one-time improvements in building appliance upgrades. Viet Nam and Thailand both seek to build regional hubs for the electric vehicle transition, but these are long term strategic plans and not a response to the crisis. Industry subsectors in the countries and agriculture

in the Philippines have only received incentives to encourage the smoothing of energy consumption, rather than for long-term efficiency gains or fuel switching. Without more ambitious policies to implement long-term energy and climate objectives, demand for fossil fuels towards 2050 may increase by as much as 50% in Thailand, 80% in Indonesia and the Philippines, and almost 130% in Viet Nam (APEREC, 2022). To hedge against future energy crises, short- to medium-term actions are critical to accelerate the energy transition and avoid the consequences of a business-as-usual approach.

Rethinking energy security — policy implications

Coal has become a liability to energy security, more for countries relying on imports. The price of Newcastle Coal, typically traded in the range of USD 50-100 per tonne, reached a record high of

Box 1

Policy implications for coal

- The heightened market risk for coal procurement will require governments in the region to reevaluate the exit pathways currently planned, many of which project a continued reliance on the fuel for power well beyond 2040.
- The increased cost of energy generation using coal must be weighed against the cost savings of using domestically available renewables and the costs of amortizing coal-fired power plants sooner.
- A swathe of policy instruments is available to support decision-making, including refinancing schemes through securitization, carbon pricing, and exit auctions to gauge the cost of early retirement.

USD 458 per tonne in September 2022. The dramatically increased prices present Southeast Asian jurisdictions with inflated import bills that may yet undercut macroeconomic stability and have pressured governments to offset the impact on electricity prices, putting a strain on the public budget. The knock-on effects of high fuel costs, supply chain risks, and acute shortages have undercut the role of

coal as an anchor of energy security. Previously, low fuel costs (often ensured through a mix of implicit and explicit subsidies) had underpinned the growth of coal-fired power in Southeast Asia; in all countries but Thailand, coal has fuelled over half of the national electricity in recent years (IEA, 2022f). The price environment of 2021-2022 no longer guarantees the use of coal, even without correcting for

externalities. Were prices to drop beyond 2025, the temporary relief would still leave coal-reliant countries vulnerable to future price shocks and supply risks.

The energy crisis has overturned the assumptions for natural gas as a transition fuel. Natural gas has been essential to Indonesia's and Thailand's energy supply and is set to remain so going forward. Meanwhile, Viet Nam and the Philippines,

where natural gas has so far played a smaller role, are looking to heavily invest in gas infrastructure and generation capacity to reduce their carbon intensities. A switch to natural gas can smooth the transition away from coal and has successfully driven emissions cuts in the U.S. and Europe. In Southeast Asia, it implies lower emissions growth as natural gas would mostly serve additional energy demand. However, the energy crisis is

Box 2

Policy implications for natural gas

- Presented with heightened market risk, governments must reconsider the strategic value and economic justification of a continued or increasing reliance on natural gas over the mid-term.
- Governments should consider redirecting projected investments in gas infrastructure towards clean and low-risk alternatives (wind power, solar power, and grid upgrades) to buttress energy security and meet long-term energy policy objectives.

sending a fresh signal that coal-to-gas switching may no longer be a feasible mid-term strategy for a region relying on imported LNG.

The escalating prices of LNG from 2021 onward have presented Thailand with a liability, and Viet Nam and the Philippines with a strategic risk. In Thailand, the increased price of natural gas has encouraged a switch to more polluting diesel and fuel oil. In Viet Nam and the Philippines, ongoing gas projects now risk being cancelled while future ones are no longer certain to deliver energy reliably and at an affordable cost—if they are to come to fruition. With domestic fields nearing depletion and the share of imported LNG expected to rise, their energy systems will continue to be exposed to supply-side risks if the current policy is implemented. A shift in market dynamics over the coming years may yet turn the tide. However, the outlook for natural gas is subject to high uncertainty that further affects the returns on planned investments and the long-term security of supply.

Prioritizing a rapid shift to domestic renewable energy sources will better shield countries against supply-side risks and prevent the need for costly fossil fuel infrastructure. The energy crisis has unsealed the commodity risks associated with energy strategies based on fossil fuels. In doing so, it has raised the urgency of increasing renewable energy production sooner and at a greater scale. Viet Nam, Indonesia, Thailand and the Philippines all plan for significant increases in renewables over the long-term but their mid-term ambitions towards 2030 are insufficient to satisfy growing energy demand and mitigate the need for more fossil fuels. This will leave their economies exposed to the risks the current crisis has engendered. Southeast Asia has benefitted from favourable geothermal and hydropower conditions. The growth in output of those technologies should accelerate alongside a massive deployment of wind and solar energy to meet growing demand, and over time, replace production using fossil fuels (IEA, 2022f; Mordor Intelligence, 2022).

Box 3

Policy implications for renewable energy

- Front-loading investment into renewable technologies will require governments to prioritize establishing a conducive investment environment alongside introducing measures that equip their power systems for a new technology mix.
- This means implementing continuous, predictable support mechanisms tied to long-term targets, reducing red tape and permit restrictions, and facilitating access to low-cost finance.
- It also means addressing physical system constraints early on by allocating more resources to grid planning and elevating network investment to a national strategic priority.
- In parallel, regulators should start reforming operational practices today to improve forecasting and set the right incentives for flexibility and balancing services needed to integrate growing shares of variable supply.

Energy efficiency, essential to improve energy system resilience and temper demand growth, is receiving greater attention but should be backed by more ambitious structural policies in all four countries.

Both Thailand and the Philippines introduced measures in 2022 to encourage energy savings in end-use appliances and to cut energy consumption in public buildings. Viet Nam and Indonesia did not include energy efficiency measures in their response to the energy crisis. Yet, all four countries have progressed on this front in recent years, be it by setting binding energy intensity targets, introducing energy labels or incentive

programmes pushing for efficiency improvements in industry sectors and end-use appliances (Ministry of Energy Thailand, 2011; Official Gazette of the Republic of the Philippines, 2018; IEA, 2021a; Pham, 2022; TÜV Rheinland, 2022). Despite such efforts, vast potential remains untapped in all four jurisdictions. Southeast Asia's hefty energy demand growth, in the range of 4.5-10% for the countries of focus, testifies to the importance of greater improvements in energy efficiency as a least-cost method to help meet energy needs. The energy crisis has raised the stakes further by imposing inflated costs on energy consumption.

Box 4

Policy implications for energy efficiency

- The price support policies governments have introduced may block the signal for demand reduction insofar as they directly target end-use prices. Where fossil fuel subsidies are deemed indispensable in the short-term, they should be allocated through separate mechanisms.
- Ideally, governments extend price support to encourage energy efficiency measures, using the crisis to drive structural improvements in energy consumption.
- Energy standards and building codes must feature more prominently in the policy mix. Both their target level and enforcement currently pose barriers to better energy performance in the end-use sectors across the region.
- A greater focus on energy efficiency must be backed by commensurate financing opportunities. Traditional financing has fallen short. A range of tested and proven specialized finance instruments—including utility financing, special purpose funds, performance contracting, and credit guarantees—should be used in addition in order to invest now and save tomorrow.

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