

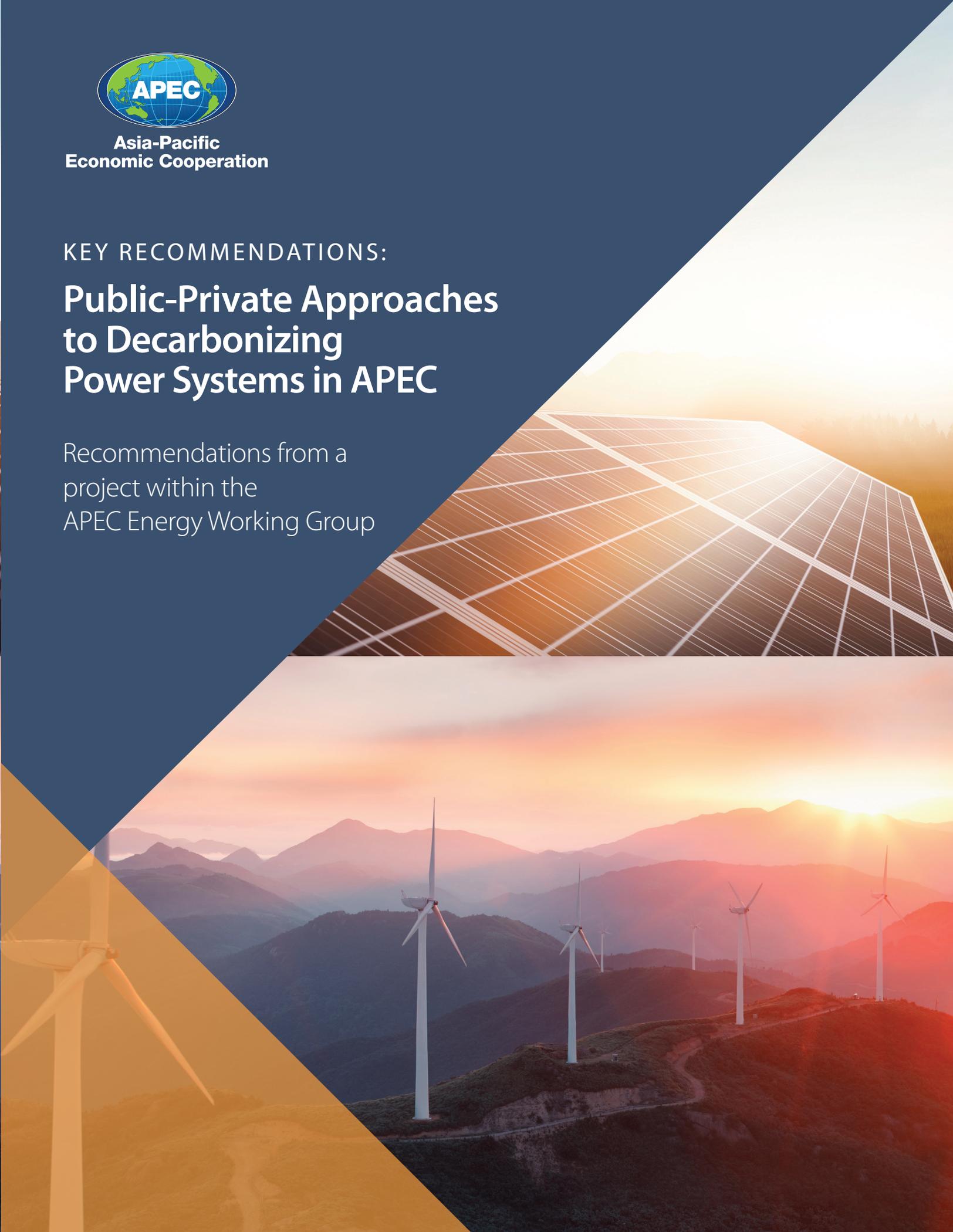


Asia-Pacific
Economic Cooperation

KEY RECOMMENDATIONS:

Public-Private Approaches to Decarbonizing Power Systems in APEC

Recommendations from a
project within the
APEC Energy Working Group



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Introduction: The Case for Action

As the Sixth Assessment Report by the UN Intergovernmental Panel on Climate Change (IPCC) makes clear, we as a society must do much more to rapidly decarbonize our energy systems. Electricity lies at the heart of this challenge. It is both a large source of global carbon emissions today and is also key to decarbonizing other sectors of the economy, including buildings, transport, and industry. To achieve net-zero emissions/carbon neutrality electricity must decarbonize even faster, while becoming the core of the energy system.

While electricity systems decarbonize, they must simultaneously expand to meet the increasing energy demands of the hundreds of millions of people around the world who lack adequate access to electricity today. The U.S. Energy Information Administration (EIA) projects global energy consumption to increase by more than 50 percent by 2050, with Asian economies accounting for 44 percent of that increased demand.¹ Governments and stakeholders cannot be forced to choose between energy access and decarbonization — they must promote policies and technologies that enable both. According to the Asian Development Bank, meeting these twin challenges will require global public investment on the order of at least 1 percent of GDP per year for the next 20 to 30 years – with a similar contribution coming from the private sector.

APEC has long recognized the importance of addressing this challenge, and recently reaffirmed the centrality of this work via the Leaders'-level *Putrajaya Vision 2040*, which will drive APEC's agenda for the next two decades. The climate commitments in this document demonstrate that APEC Leaders recognize this as an urgent, priority issue.

It is against this backdrop that the **APEC Energy Working Group (EWG)** supported a project on APEC Clean Energy Purchasing and Decarbonization, which held two workshops in 2021 focused on power system decarbonization in APEC economies and the broader Asia-Pacific region. The workshops were sponsored by the U.S. Department of Energy and supported by Google. **The first workshop focused on the role that governmental action and policy must play to accelerate the creation of a decarbonized electricity sector, through interventions that drive clean energy deployment and make clean energy more affordable for everyone.** Experts discussed how policies such as tax incentives, low-cost financing mechanisms, and competitive auctions can help to reduce the cost of zero-carbon energy technologies. The panelists emphasized how liberalized, competitive electricity markets can help increase access to clean energy, and stressed the importance of grid investment and grid regionalization to integrate greater amounts of variable renewable energy. Finally, the session highlighted how advanced carbon-free energy technologies, such as low-carbon hydrogen or carbon capture and storage, can potentially play a role in decarbonizing energy systems.

The second workshop focused on how the private sector leadership is critical to supporting the deployment of new clean power technologies on electricity grids across the Asia-Pacific. Collaboration between private and public sectors is key, and panelists highlighted exemplary initiatives underway by corporates operating across Asia, with a goal towards decarbonization of corporate operations and supply chains. The workshop identified important policies that governments should consider to spur additional private investment in zero-carbon energy. Lastly, the session highlighted innovative collaborations among public, private, and non-governmental sectors to open up new opportunities for companies to purchase clean energy.



APEC and the Need for Regional Decarbonization

Environmental efforts, including decarbonization, are important to APEC's mission. In fact, APEC has already catalyzed significant energy and climate commitments by Leaders from its participating economies. A significant milestone was reached in the 2014 Beijing declaration of the Energy Ministerial Meeting, further recognized by APEC Leaders², in which APEC economies collectively pledged to double the share of renewable energy in the region by 2030, with a base year of 2010. And this pledge was predated by the 2011 Honolulu declaration, in which APEC Leaders set an aspirational goal to reduce APEC's aggregate energy intensity by 45 percent by 2035, compared to 2005 levels.

APEC has also reaffirmed the critical importance of supporting the clean energy transition to the forum's future work and aspirations. The *Putrajaya Vision 2040*, agreed upon by Leaders during Malaysia's 2020 host year and meant to guide APEC's work for the coming decades, firmly embraces this vision. Alongside pillars related to trade and investment, and innovation and digitalization, the *Putrajaya Vision* declares APEC's commitment to sustainable and inclusive growth, with the Leaders pledge that, "We will promote economic policies, cooperation and growth which support global efforts to comprehensively address all environmental challenges, including climate change, extreme weather and natural disasters, for a sustainable planet." The following year, New Zealand led the development of a detailed implementation plan – the *Aotearoa Plan of Action* – which outlined the individual and collective actions that APEC economies can take to meet this commitment.

In addition to accelerating efforts to meet the charge of the Beijing declaration, the *Aotearoa Plan of Action* committed APEC economies to cooperate on sustainable growth initiatives, such as through "promoting sustainable growth across sectors and the development of cost effective low and zero emissions technologies, sustainable finance and, if appropriate, carbon pricing mechanisms; and ensuring energy security, access, reliability and resilience through energy transition."

The mandate for this critical work within APEC, therefore, is clear. But a presentation during these workshops by the Asia Pacific Energy Research Center (APERC) illuminated just how urgent and necessary collective action will be to meet these challenges, and the role that power system decarbonization must play.

Drawing on research from the updated edition of the *APEC Energy Demand and Supply Outlook, 8th edition report*³, APERC presented two potential scenarios for the region's energy consumption. The first - a baseline, or "Reference" scenario – utilized data on expected economic and population growth across the region, alongside projections for the parallel increase in electricity consumption. Assuming current and planned energy policies, this scenario highlighted the need for action. By 2050, the increased demand for energy in the region is equivalent to adding more than the entire current demand levels for all of Southeast Asia and Oceania (at 2018 levels).⁴

In comparison, the second scenario – the "Carbon Neutrality scenario" – examined the hypothetical outcomes if APEC's 21 member economies implemented carbon neutral measures, aligned with the IPCC's framework to limit global warming to an increase of 1.5 degree Celsius by 2100. In both scenarios, fossil fuels remained the foundation for APEC energy systems, reflecting the economic realities of expected growth and demand in the region. But the commitments required to meet carbon neutrality in the region spurred substantial developments in projected energy use, and fundamental changes in how APEC economies met their energy needs.

In the Carbon Neutrality scenario, fossil fuel retirements accelerate and coal capacity is almost entirely eliminated, save for a few economies in Southeast Asia. Electrification across end-use sectors, particularly transport, contributes to lower energy demand and supports emissions reductions. Moreover, the Carbon Neutrality scenario showed an increase in generation driven by solar and wind power. Finally, the Carbon Neutrality results illustrate the potential for additional energy efficiency improvements, which lead to lower overall energy consumption in the region, when compared to the baseline scenario. None of this will be possible, however, without significant decarbonization efforts within APEC power systems.





MEETING THE CHALLENGE: PART ONE

> DRIVING CHANGE

Through Governmental Action and Public Policy Innovation

The future energy needs and challenges in the Asia-Pacific region – as well as the global community’s climate and decarbonization goals – cannot be met without leadership, political will, and effective policy interventions by APEC member economy governments. At a high level, this reality has been evidenced through the global commitments at the 26th Conference of Parties (“COP26”), a.k.a. the United Nations’ climate change conference, where over 130 heads of state and government made commitments to reduce global carbon emissions.

But translating these ambitious global pledges into tangible outcomes for individual economies and the APEC region requires effective public policy. The critical work, therefore, must be done by the ecosystem of stakeholders – public, private, and within civil society – within each domestic economy, supported by collective action among partners in regional forums, like APEC.

Governments have a critical role to play in creating an enabling regulatory environment that supports the deployment of clean energy solutions, promotes innovation and new technologies, and catalyzes investment into the market.

Given the rapid pace of innovation in the energy and power systems sector, policy and regulatory frameworks to incentivize decarbonization should strive to be “future proof.” This means adopting policy approaches that are adaptable, flexible, and transparent for all stakeholders. It also means incorporating the expertise of academia and the private sector, given their critical role in energy innovation. Such a collaborative approach recognizes the uncertainties of the future – both the challenges from future political and economic realities, as well as the promise of new technologies that will emerge – and allows maximal space for new and innovative approaches to promote a low-carbon future.

This section outlines key recommendations for APEC member economy governments to promote sustainable investment in low-carbon technologies, decarbonize power systems, and drive the clean energy transition in the Asia-Pacific.



1

RECOMMENDATION 1: Set ambitious, government-driven targets and energy portfolio mandates

Government policy on decarbonization must begin with a top-down, ambitious vision, and a clear articulation of energy policy, preferably through a whole-of-government commitment to help meet the economy's energy goals while advancing decarbonization. Such policies send a clear signal to consumers, industry, and investors about the direction of energy policies in APEC economies. Long-term targets not only give confidence to investors, providing a catalytic effect to needed energy investment, they may also help spur needed changes in how energy markets operate.

Singapore's Green Plan 2030 is an excellent example within the region of a clear, strategic roadmap toward progress. The Green Plan 2030 sets a target of 2 gigawatts (GW) of new solar generation by 2030 for the small island nation, while also aiming to convert 80 percent of existing building stock to utilize low carbon technologies in the same period. Importantly, the Green Plan includes a clear mandate for public-private collaboration to meet these goals, bringing together a range of stakeholders for concerted action.

In the United States, the Biden Administration has ambitiously pledged to reduce CO₂ emissions by 50-52 percent by 2030, compared to 2005 baseline levels. To meet this objective, the White House also set a goal for the American electricity sector to be 100 percent carbon-pollution free by 2035. State and local leadership has also proven important in the American energy transition, and is replicable in many APEC economies. California is a clear leader, with a state-wide mandate to reach 60 percent renewable energy generation for all utilities by 2030, and a 100 percent carbon-free electricity goal by 2045.

The Australian Government has implemented a Renewable Energy Target (RET) scheme to help incentivize investment into utility-scale generation – with annual targets of 33,000 gigawatt-hours (GWh) of additional renewable electricity – as well as small-scale systems, such as, rooftop solar panels, solar water heaters, and small wind or hydro systems. Under the scheme, large developers, households and small businesses can create either large-scale generation certifications (LGCs) or small-scale technology certificates (STCs) based on their renewable generation, which may be sold to liable entities, such as electricity retailers. The RET scheme has helped drive record levels of renewable energy investment and deployment in Australia, with total installed capacity reaching over 45 GW in 2021. In turn, this has facilitated Australia's energy transition from a coal-dominated energy system. Since 2012, over 20 percent of the coal power stations in the east coast market have been retired; by 2040, a further 63 percent of remaining coal power is scheduled to retire or reach the end of its technical life. Australia now projects that, by 2030, over 61 percent of its electricity mix will come from renewables.

At a regional level, APEC has already set such ambitions through the Beijing and Honolulu declarations, discussed above. To implement these regional aspirations, voluntary and engaged APEC economies are encouraged to develop their own individual action plans for decarbonization that are aligned with these goals, helping to drive needed decarbonization through collective action.

2

RECOMMENDATION 2: Promote robust, competitive energy markets with innovative energy procurement mechanisms

Across APEC member economies different energy market structures exist, displaying varying degrees of liberalization and competition. Generally speaking, market liberalization leads to an increase of market participants which may compete along the electricity supply chain: from generation, distribution, to retail. Wholesale markets enable competition and facilitate access

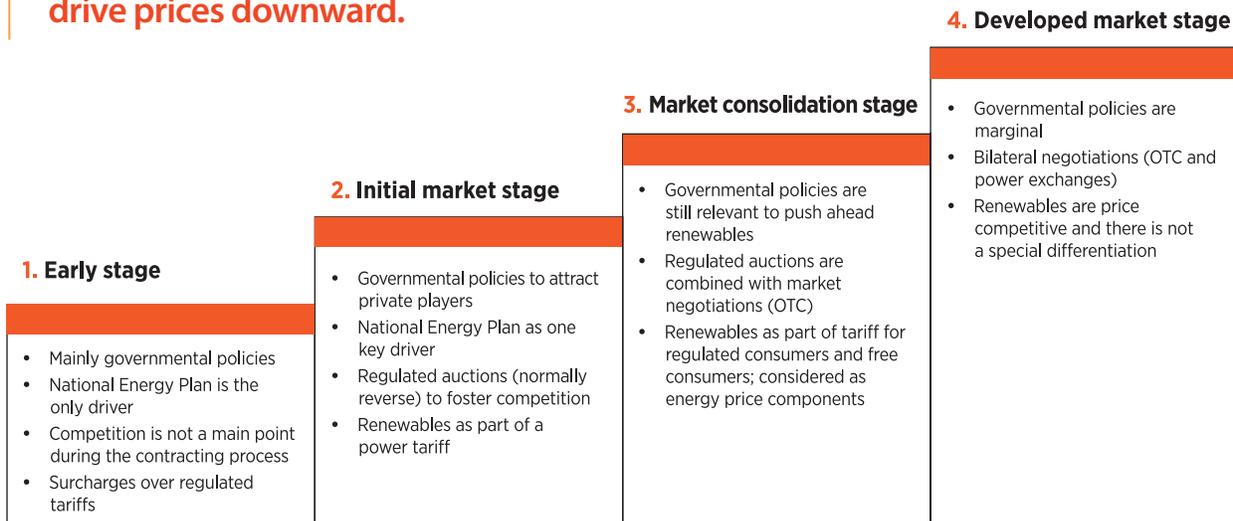


to low marginal cost clean generation, which in turn encourages more investments in carbon-free energy. Australia, Japan, and Singapore offer examples of liberalized, competitive markets in Asia-Pacific. Over the course of two decades, Singapore became Asia’s first liberalized electricity market, progressively moving from a vertically integrated monopoly model to a competitive generation, wholesale and retail market structure.

In short, competitive energy markets can incentivize investment and development of sustainable new power projects, increase access to energy in APEC economies, and ultimately drive down costs for consumers – all while advancing social-environmental goals. Regulators and policymakers should embrace liberalizing reforms that have proven successful in transitioning towards delivery of clean, affordable, and reliable power in other markets around the globe.

Although it is important to recognize that different paths may lead to the same end goal, a common trajectory might look similar to that outlined in the graph below, which describes four main stages in developing a market-based renewable energy power market, and the role of government at each stage of development. Despite variations from the pathway depicted below, many markets in the Asia-Pacific remain at an early stage when it comes to the overall development of their energy market.

Stages of a renewable-power market, a reliable transition to market mechanisms is recommended to generate competition and consequently drive prices downward.



Source: Alexandre Viana, Thypos Energia

The first stage begins with heavily government-driven, minimally competitive electricity markets. To the extent they are incorporated, renewables are paid for using surcharges or regulated feed-in-tariffs, which provide a fixed-price subsidy for renewable power. As the policy environment matures and an economy shifts to more market-based structures, the economies undertake greater efforts to attract private sector investment. At this stage, governments may begin to introduce auction mechanisms and new incentives under a domestic energy plan, which creates competition in electricity generation that can reduce costs. At this stage, however, a government entity often remains the single buyer of renewable energy. It is only at the third stage – “market consolidation” – where government policy gives way to more liberalized markets, with robust auctions and other direct procurement mechanisms. This stage sees many private actors executing large power purchase agreements directly from power generators, which is discussed further in the second half of this report. Private buyers can increase the deployment of cost-effective renewable energy, often without any government financial support required. Government policy, nevertheless, remains an integral driver to attract new clean energy investments in the market. Much of Latin America, Europe, and parts of the



United States currently sit at this level of maturity. The final stage, a truly “developed market,” is reached once clean energy is price competitive and government policies become residual, not primary, drivers for new investment in renewables. In the United States, many would consider Texas to have reached this stage, with California close behind – and more global jurisdictions will soon follow.

The evolutive nature of energy markets requires consideration of how policies can be made “future-ready.” In other words, it is important to develop frameworks that can balance short-term needs against longer term objectives effectively. For instance, non-market-based support mechanisms like subsidies or feed-in-tariffs which jump-start markets and provide critical early momentum, can also become limiting factors to clean energy deployment over time. As clean energy competitiveness improves, these administratively-determined tariffs may become misaligned with the market reality and keep prices unduly high, dampening private buyers’ energy demand and capping expansion based on government budgets. Ensuring policies evolve and include flexible design characteristics – such as, for example, degressive or shorter-term feed-in-tariffs – that progressively but surely tie back to the market, is important to cost-effectively scale clean energy.

As stated, competitive tendering of new generation (and transmission), can be a way to incorporate market forces and is a significant global trend in the development and procurement of cost-effective clean energy at scale. Across the globe, the rising use of energy auctions have increasingly been replacing fixed price support policies. In the energy context, auctions are competitive processes with transparent award rules, whereby energy project developers bid to supply energy through long-term contracts. When structured properly and with clear design and standards, these competitive tenders can be a powerful tool to attract investors for clean energy activities.⁵ They are also a recognized best practice for procuring least-cost energy.

Malaysia, for example, leveraged competitive auctions as part of its Large Scale Solar (LSS) program to drive the cost per kilowatt-hour (kWh) for solar energy below the cost for gas-fired power generation, as of late 2019. The Malaysian government has completed four rounds of the LSS program, which replaced the previous feed-in-tariff system and was introduced to help meet Malaysia’s goal of becoming the second-largest producer of solar photovoltaic (PV) power in the world.

In Australia, power market auctions have been driven at the state and territory level. For example, to meet its goal of carbon neutrality, the Australian Capital Territory (ACT) utilized reverse auctions from 2012-2020 to procure over 841 megawatts (MW) of large-scale wind and solar power. The auctions garnered international interest, delivered record low prices for renewable energy in Australia, and ultimately contracted sufficient renewable generation for ACT to meet its 100 percent renewable energy target.

More recent developments within Asia include the Philippines’ launch of a Green Energy Auction Program in February 2022 which targets 2 GW of renewable energy capacity, as well as Cambodia’s first solar auction which awarded 60 MW of solar capacity at a record low price in 2019, with the support of the Asian Development Bank acting as transaction advisor. Tenders are also increasingly driving offshore wind development across APEC, as seen in Japan and Chinese Taipei.

Finally, an important complementary instrument to the liberalization of energy markets and innovative procurement structures is energy attribute certificates (EACs). The instrument is used to track the production of electricity from renewable energy sources, and allows end users (be they vertically integrated utilities or corporate buyers) to demonstrate their consumption of electricity that is generated by renewable energy. One EAC is issued for each MWh of electricity produced by renewable energy sources, and represents ownership of the environmental attribute of that electricity. Several EAC systems exist globally, the most common being: Renewable Energy Certificates (RECs) in the United States and Canada, Guarantee of Origin (GO) in the European Union, Large-scale Generation Certificates (LGCs) in Australia, and International REC Standard (I-RECs) in other parts of the world. I-RECs, created by the International REC Standard Foundation, is a popular EAC to track and disclose renewable energy consumption in economies that do not have domestic energy certificate systems.



EACs are typically operated by non-profit actors, and are used to track production and consumption of clean electricity under in voluntary markets (whereby commercial entities choose to procure them) as well as under compliance markets, such as renewable portfolio obligations (RPOs) and renewable portfolio standards (RPS). As an example, the I-REC Standard Foundation is a non-profit entity that currently manages an EAC ecosystem across the APEC region and in more than 30 economies, worldwide. It provides free capacity building opportunities for government actors, and transfers market ownership functions and associated revenue generating to domestic entities upon request. Governments across APEC have begun adopting the I-REC instrument to support market transparency.

3

RECOMMENDATION 3: Remove regulatory hurdles and other “soft costs” that hinder the deployment of clean energy solutions

As is true for nearly every industry and industrial sector, energy investments will naturally flow to economies with strong rule of law, regulatory stability, and financial soundness. As it relates to the energy sector and investment in low-carbon solutions, good governance is particularly important. This includes not only transparent, accountable, and progressive policymaking initiatives, but also the clear attribution of roles and responsibilities across government bureaus and entities, as they relate to sustainable investment in clean energy.

Policymakers must think – and act – broadly to develop a holistic ecosystem that encourages energy innovation. Regulatory frameworks too often focus narrowly on renewable energy *generation*. As part of a holistic approach, governments – in partnership with corporates and other stakeholders – must develop comprehensive policies that cover all aspects of the energy ecosystem, including generation, production, transmission and distribution, end uses and users, as well as the promotion of next-generation, transformative technologies.

Targeted policies and regulations regarding right-of-way and land acquisition issues, for example, are critical not only for new energy installations but are also particularly important for power transmission and distribution. Clear and efficient permitting policies related to new installations of renewables are a critical factor to spur new investments and get projects online quicker. Ensuring private generators can access the electricity networks is another way to accelerate clean energy deployment, increase competition, and lower costs. Thailand’s Energy Regulatory Commission, for example, has launched a public hearing on draft Third Party Access Codes, which once enacted, would provide open access to the transmission and distribution systems.

Some APEC economies have developed the concept of “renewable energy zones,” a targeted approach between government and a diverse group of stakeholders to identify promising areas, and reduce corresponding regulatory barriers, to drive new installations and transmission of utility-scale renewable power. Numerous state governors and utilities in the western United States, for example, championed this approach in a landmark partnership with the U.S. Department of Energy and other federal regulators. This work helped enable collaborative buildout plans for transmission across the Western Interconnection, the electricity grid connecting over ten American states, several Canadian provinces, and parts of Mexico.⁶ In Australia, the Australian Energy Market Operator (AEMO) has also suggested the use of renewable energy zones as part of its Integrated System Plan, the economy-wide strategic roadmap for grid modernization. To help modernize one of the world’s longest interconnecting power systems, AEMO has identified these zones not only to help coordinate investment in generation, transmission, and storage, but also to identify needed market and regulatory reforms to promote further grid integration for renewables.



4

RECOMMENDATION 4: Enable direct access to clean energy

One of the most tangible and important policy drivers to advance decarbonization is the enablement of direct corporate procurement of clean energy from power project developers. Following global best practices, APEC economies should allow end power users to enter into power purchase agreements (PPAs) with developers.

Corporate PPAs are the legal agreements made directly between a power generator and a corporate or industrial offtaker for the purchase of energy. The utilization of such agreements can help ensure the security of demand and financial reliability of new generation projects, thus spurring investments. The use of corporate PPAs can also provide a predictable long-term revenue stream to power generators, thus alleviating the need for continued government subsidies. They are, therefore, a key instrument to accelerate bringing more clean energy online and can help advance more liquid, competitive wholesale energy markets. PPAs settle physical electricity using grid infrastructure, and where corporate offtakers are involved, transfer ownership of environmental attributes using EACs.

Despite the growing demand for carbon-free energy, however, several APEC markets still prohibit or limit companies from signing PPAs directly with power generators. In such economies, the sole offtaker for power projects is often a government entity. This can force corporates into complex and scale-limiting work-arounds, such as the use of ‘private wire’ or ‘behind-the-meter’ arrangements (e.g., where a smaller energy developer bypasses the distribution network entirely, to sell directly to a corporate offtaker that is generally adjacent to or co-located with the generation asset) to meet their demand for renewable energy.

Recent developments within APEC have been promising. Chinese Taipei has been a regional leader in liberalizing its energy regulations to allow for direct corporate procurement. As a result, Chinese Taipei witnessed not only the region’s first corporate PPA signed by Google in 2019, but also one of the world’s largest to-date, a deal by TSMC to purchase over 900 MW of energy from an offshore wind farm. And in 2021, the Korean National Assembly amended its Electric Utility Act to allow companies to enter into PPAs for the first time, for the direct purchase of renewable energy. The Act had previously banned power generators from selling directly to electricity consumers, and instead required the purchase to be contracted only with the domestic-owned Korea Electric Power Corporation (KEPCO).

An ongoing public-private partnership involving the government of Viet Nam, and supported by the U.S. Agency for International Development (USAID), also provides a potential model for other APEC economies seeking to liberalize their energy procurement regimes, and for regional capacity building. Working closely with Electricity Regulatory Authority of Viet Nam (ERAV), Electricity of Viet Nam (EVN), as well as private power producers, corporates and other stakeholders, USAID helped develop the Viet Nam Direct Power Purchase Agreement (DPPA) pilot scheme to enable clean power producers to directly sell power to private offtakers which is soon expected to be launched. Many global companies with operations in Viet Nam have noted the value of a DPPA framework to help them meet their clean energy demand, as well as their commitments under voluntary programs such as the RE100⁷ (discussed later in this report), the Science Based Targets initiative⁸, and others.



5 RECOMMENDATION 5: Enable low-cost financing and introduce incentives to spur clean energy investment

Governments also generally play the role of “first mover” in helping to bend the cost curve downward for sustainable energy investments in their economies. This can take many forms, including direct financing models or loan guarantees; technical assistance to “de-risk” new projects; currency risk hedging for international investors; multilateral programs and tools from international development banks; as well as tax credits; and other direct incentives for new power generation.

Once again, clear responsibilities and coordination within government is critical. A whole-of-government approach that convenes relevant ministries alongside regulators and other agencies with lending and financial capabilities is important; and private sector financial institutions should work hand-in-hand alongside their government counterparts in developing new financial mechanisms for the energy sector.

Australia’s multifaceted approach provides a well-functioning model of such a mechanism. There, the government has established two key funding entities to help develop low-carbon projects and technologies. The Australian Renewable Energy Agency, or ARENA, is primarily a grant funding organization, with a focus spanning the R&D cycle through to early deployment of renewable technologies. It has funded over 600 projects since it was created in 2012, helping advance innovation in the Australian energy sector and promote worthy projects that may not be commercially investable. The Clean Energy Finance Corporation (CEFC) is a government-funded green bank that invests in the clean energy sector with the mandate to produce commercial returns on the government’s investment. It has played a key role in providing over \$10 billion in direct financing for many renewable energy projects, utilizing debt and equity funding with a lifetime value exceeding AUD \$30 billion. Its mandate (similar to that of the U.S. Development Finance Corporation) is to catalyze and “crowd in” additional private sector capital toward qualifying clean energy activities.

In the United States, the Department of Energy (DOE) has programs that support private financing for innovative energy-related projects. The *Title XVII Innovative Energy Technology Loan Guarantee Program* authorized by the 2005 Energy Policy Act provides loans between several million to more than US \$1 billion for projects that “utilize a new or significantly improved technology” and “avoid, reduce or sequester” greenhouse gases.⁹ The program’s key role is to finance the initial deployment of new technology to bridge the gap before commercial lenders are confident enough to come on board. When the technology’s commercial viability is proven, the initial financing is wound down so the private market can take over. To-date, more than US \$25 billion in loans have been disbursed. This program supported the construction of the first utility-scale solar PV plants in the United States, and also provided support to Tesla to scale its electric vehicle manufacturing.

Other financing and investment tools, such as tax credits, rebates, and investment incentives, help mitigate risk and create an attractive environment for new clean energy deployment. Governments can also play a role in ensuring that legal contracting models and rules enable clean energy development and bolster investments. Where the use of standardized Power Purchase Agreement templates is mandatory, ensuring the PPA terms are bankable through adequate risk allocation and mitigation is one example of this.

Regional collaboration is another key resource. Multilateral development banks and official development assistance (ODA) agencies often provide capital to de-risk projects, or bolster the overall investment landscape within Asian economies. For instance, in India, the Asian Development Bank (ADB) has supported solar park development in Maharashtra, Rajasthan, and Gujarat, allowing local governments to leverage ADB funds to minimize early stage development risk and make less painful choices about funding priorities.¹⁰ In the energy development context, the ADB and other multilateral lenders can assist with structuring the loan and project documents, and provide a single-window approach to mobilize project debt, thereby mitigating



risks of delayed financial closure. They may also help with securing concessional project finance, which is often essential to meeting the sponsor's equity returns and the lender's debt serviceability requirements – thus helping assure the bank lender of the project's viability.

Finally, governments often play a key role in stimulating research and development of new clean energy technology solutions. Japan, for example, established a Green Innovation Fund which plans to allocate JPY 2 trillion (US \$18 billion) to decarbonization technologies like hydrogen, through the end of the decade. In Singapore, the Low-Carbon Energy Research Funding Initiative aims to accelerate the technical and economic viability of new low-carbon technologies such as hydrogen and carbon capture, utilization, and storage (CCUS) to support power and industry decarbonization. This multi-agency funding initiative provides support to early technologies through grants.

6

RECOMMENDATION 6: Promote regional energy cooperation

Regional integration and energy connectivity – and the enablement of multilateral power trade that comes with it – can unlock myriad benefits for participating economies. It can help meet APEC's climate and environmental goals, by enabling renewable energy integration and efficient resource optimization thanks to improved access to diverse energy sources, diversified weather patterns and increased balancing areas. But regional power supply chains can also promote job creation, drive down costs, and ensure energy access by connecting hard-to-reach and underserved areas.

Southeast Asia has proven to be an important testbed for such regional connectivity efforts. The Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP) aims to foster cross-border power trade from Laos to Singapore and may provide a pathway towards broader regional power system integration. The LTMS-PIP can leverage complementary resources and needs, and lead to a cleaner and more cost-effective power system for the benefit of consumers. Lao PDR, for example, has tremendous potential for hydroelectric power generation. The International Energy Agency (IEA) has therefore undertaken work to examine how Thailand can integrate a higher share of renewables and, specifically, hydro-generated power into its domestic grid. One element of this work, for example, illuminated the need for greater contractual flexibility among offtakers in Thailand.

As an APEC economy with a small amount of available land for power generation, regional integration is particularly important to Singapore. As part of its Green Plan 2030, the Energy Market Authority (EMA) is examining how to facilitate power imports, and recently announced plans to import up to 4GW of low-carbon electricity by 2035 through the issuance of two Requests for Proposals.

In its research and work on promoting regional energy connectivity in Asia, the IEA has noted three fundamental factors for establishing effective multilateral power trade: political will; technical capacity; and *institutional collaboration*. Cross-border trade of energy can understandably raise concerns about adverse events or circumstances within a trading partner's domestic market – thus, political will and leadership among the parties is a key requirement. Regional integration can, for example, increase competition among producers; but, strong political leadership can communicate the benefits of such competition among key actors in an energy ecosystem. Technical capacity building is important to ensure a consistent level of implementation among energy trading partners. Such efforts can include the recognition and use of harmonized technical standards, or utilization and training regarding the use of third-party access agreements. Finally, regional integration cannot be achieved without robust institutional collaboration, on issues such as payment and settlement mechanisms, reporting and accountability, and general information sharing among parties. Partners in regional trade must also ensure that they have complimentary and ambitious policies in place related to uptake of renewable energy – without such, the risk of increasing the utilization of thermal generation, such as by coal and gas, may be increased.



MEETING THE CHALLENGE – PART TWO

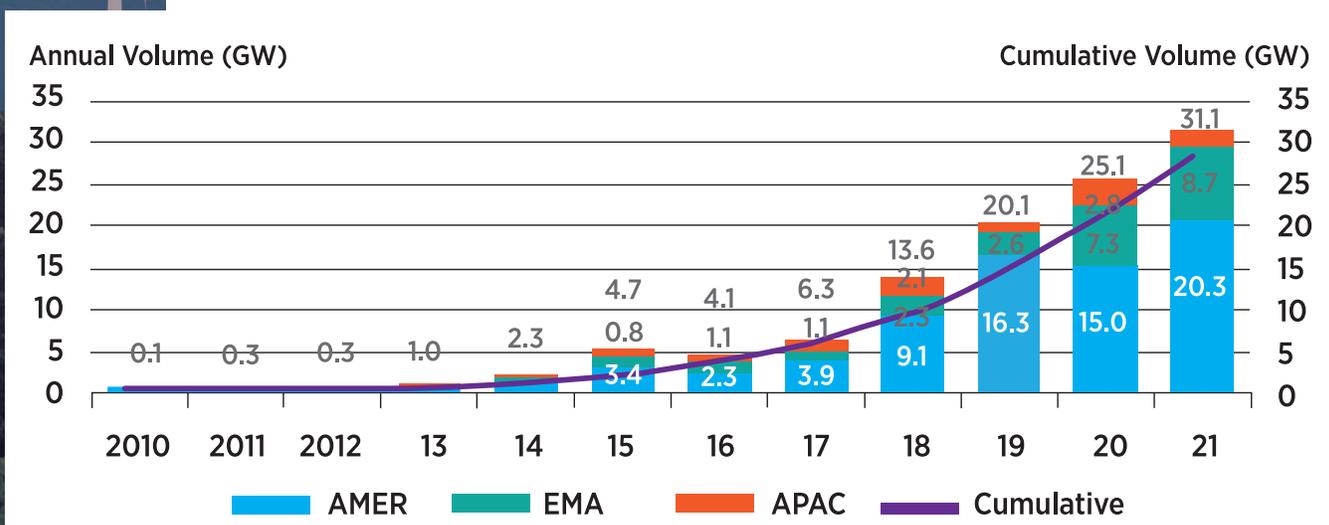
> THE ROLE of Corporates and Private Sector Leadership

The scale of energy transformation needed in the APEC region cannot be realized by government policy, alone. Private sector-led innovation will be absolutely critical in meeting the surging demand for low-carbon energy in Asia. And public-private collaboration can induce the economic and political incentives necessary for faster decarbonization, such as guaranteed cost recovery, accelerated returns, and tax reductions.

But to-date, corporate procurement of clean energy in Asia – while rising – has not yet met its potential, and significantly lags the levels that will be needed to meet APEC’s energy challenges.

BloombergNEF, which tracks corporate clean energy procurement, has noted that 2021 was a record year, with corporations – led by large technology companies – purchasing 31.1 GW of clean energy in global markets, an increase of almost 24 percent from the previous year’s record of 25.1 GW.¹¹ This increase, however, was predominantly led by the Americas and Europe, with purchasing in the Asia-Pacific significantly behind. Only 2.1 GW of renewable energy were purchased by the Asia-Pacific in 2021, and only slightly more than 11 percent volume-wise, since 2008.

Global Corporate PPA Volumes, 2010-2021



Source: BloombergNEF. Note: Onsite PPAs excluded. APAC volume is an estimate. Pre-reform PPAs in Mexico and sleeved PPAs in Australia are excluded. Capacity is in MW DC.



Despite policy roadblocks in certain markets, demand for renewable energy in the Asia-Pacific is rising rapidly, driven by corporate commitments. The RE100, a global initiative of companies committed to 100 percent renewable energy usage by 2050, has seen record growth of corporate signatories since 2019. Asia now makes up the second-largest region for RE100 commitments; approximately 42 percent of companies that joined from 2020-2021 are from the region.

The Asia-Pacific is expected to surpass Europe, currently the largest region, in terms of membership imminently. This demonstrates a significant demand for carbon-free electricity in the region, and presents a tremendous opportunity for corporates to drive deployment of new clean energy technology in APEC, and to contribute significantly to domestic energy and decarbonization objectives – if the public and private sectors can work together to unlock barriers and accelerate clean energy deployment.

This section outlines best practices and recommendations for corporate partners working in APEC economies.

1

RECOMMENDATION 1: Set ambitious corporate targets for clean energy procurement and utilization

Just as governments should be ambitious in their renewable energy targets, so too should responsible corporates. The level of ambition of corporates helps with determining potential for corporate sourcing to drive renewable energy deployment. Clean energy procurement and utilization targets are also important in projecting corporates' sustainability commitments towards domestic and global climate goals.

Corporates are taking action by joining collectives, like the RE100, EP100, and the Science Based Target initiative (SBTi), thereby publicly committing to fixed industry targets.¹² The RE100, as mentioned above, has seen record numbers of companies from the Asia-Pacific region join in recent years, particularly from Japan. BloombergNEF forecasts that members will have to purchase an additional 240 TWh of clean energy by 2030 to hit RE100 goals – a tall order that entails collaboration between public and the private sectors for success. EP100 aims to lower global energy demand and accelerate clean energy transition by having corporates pledge to improving energy productivity. It currently has close to 130 members committed to measuring and reporting energy efficiency improvements.

The SBTi membership comprises more than 2,600 companies that develop emissions reduction targets for greenhouse gas. Siemens, for instance, has committed to sustainability and renewable goals aligned with these initiatives. It aims to own/lease only buildings that have net-zero carbon emissions, source 100 percent renewable power, achieve a 20 percent reduction in supply chain emissions, and has committed to a science-based emissions reduction, setting a 1.5 degree Celsius target.

Some companies are moving beyond 100 percent annual renewable energy commitments and seeking to fully decarbonize their electricity consumption. Google, which has achieved 100 percent annual renewable energy matching since 2017, has set a goal to operate on 24/7 carbon-free energy everywhere it operates by the year 2030. This means matching hourly electricity consumption with carbon-free electricity produced on the same grid. Early research indicates this approach can support advanced clean energy technologies and have a transformative impact on grid decarbonization.¹³

At a global scale, however, a substantial implementation gap remains. A 2021 report noted that only 110 of the world's 2,000 largest companies meet the United Nations' "starting line" criteria to "pledge, plan, proceed, and publish," and only 25 percent of those that have made commitments to ESG goals are on track to reach Paris Agreement goals.¹⁴



Corporates should also set an example by examining the energy mix of their supply chains and lead the push for change with vendor companies. According to BloombergNEF, Apple's ten largest Asian suppliers consume 80.5 TW of annual electricity – 3,000 percent greater than Apple's energy consumption. In addition, 71 percent of Apple's carbon footprint stems from product manufacturing. This makes Apple's *Supplier Clean Energy Program*, launched in 2015, particularly important.¹⁵ Apple announced in 2020 that it would achieve carbon neutrality across its supply chain and in product lifecycle by 2030. It plans to reduce emissions by 75 percent by avoiding carbon-generating activities, examining product input sourcing, and adopting smart product design. Apple will invest an amount equivalent to the 25 percent of remaining emissions in clean energy and in projects that aim to permanently remove carbon from the atmosphere. It has developed a Supplier Clean Energy Portal to share its experience with suppliers, and provide training materials with economy-specific information to assist in their transition to renewables. Through the Portal, Apple has trained over 100 suppliers in China, Japan, and the Republic of Korea. To-date, the company has over 100 suppliers from 24 countries that have committed to 100 percent renewable energy for Apple's production.

2

RECOMMENDATION 2: Engage in innovative public-private partnership models

PPPs are the most tangible and sustainable way that governments and corporates can collaborate to share knowledge & expertise, pool resources, and reduce risk.

USAID's *Viet Nam Low Energy Emission Program (V-LEEP)*, for example, works to mobilize private sector investment to increase deployment of advanced energy systems, support project design for clean energy developers, and provide technical assistance to lenders for clean energy investment. A key deliverable was the development of a Direct PPA model, discussed earlier in this report, which was only possible through V-LEEP's engagement with the Electricity Regulatory Authority of Viet Nam. These efforts resolved how the DPPA could operate within Vietnamese legal and regulatory systems, and collaborated with potential corporate buyers and the developers to ensure that a synthetic DPPA design would be acceptable to both buyers and sellers in Viet Nam. A total of 26 companies signed on to the eventual DPPA, representing employment of over 700,000 Vietnamese, over US \$1.5 billion in investment, and electricity consumption of more than 16 million MWh.

Building on experience with the Viet Nam DPPA and following consultations with stakeholders, USAID has launched the *Corporate Clean Energy Alliance*, a regional platform for corporate leaders to share and promote innovative solutions that drive clean energy economic transition in Southeast Asia. The Alliance has issued a call to action encouraging companies to sign on to a Commitment Statement to increase private sector investment on "high-performance clean energy solutions" to aid in decarbonizing power systems in Southeast Asia. And the recently launched *Clean Energy Demand Initiative (CEDI)*, led by the U.S. Department of State's Bureau of Energy Resources and other international and local stakeholders, aims to bring government and corporate actors together to deploy additional clean power capacity and drive growth.¹⁶



3 RECOMMENDATION 3: Promote transparency in reporting on corporate energy usage to stakeholders

This can be done directly by corporates through annual corporate sustainability/ESG reports or through reporting frameworks and collectives such as the RE100, SBTi, or the CDP, a global non-profit which manages a worldwide disclosure system for environmental reporting on corporate measures.¹⁷

A first step for many corporates is to map their own carbon footprint using the guidance provided by the Greenhouse Gas Protocol.¹⁸ Others start their clean energy journey by identifying renewable energy procurement goals among internal targets, and subsequently disclosing them in public ESG reports. Google has mapped its own footprint and portfolio of data centers and offices globally to track its energy load down to the hour. Apple maps the carbon footprint at its facilities, and takes into account employee commute and corporate travel, among others. Both companies are already carbon neutral and have committed to 100 percent renewable energy, or 24/7 carbon-free energy by 2030 in Google's case.

Energy Attribute Certificates (EACs) also play an increasingly important role around disclosure and reporting. As noted, the I-REC is an example of an EAC instrument that is widely used across APEC economies, and is being adapted to meet new end-user procurement objectives, such as denominating PPAs, being distributed via utilities, and supporting increased data granularity to enable time-based tracking. APEC member economy governments can promote a more enabling environment for corporate clean energy purchasing by supporting EAC schemes that ensure environmental integrity, transparency, avoid double counting, and that align with domestic laws and clean energy development initiatives.

As companies look to better substantiate carbon and clean energy claims, there is growing interest to evolve EACs to become more granular in nature, and expand their use to track electricity generation on an hourly basis. Innovations in issuing hourly RECs are a game-changer, given the increased transparency they bring to tracking energy sources around the clock. Most corporates currently purchase clean energy and the corresponding EACs on the basis of their annual electricity consumption. However, this does not track when the energy was produced on an hourly basis (current EACs generally track production on a monthly basis) or account for variability of renewable electricity in the grid due to factors like time of day, location, and weather, which leads to the company receiving electricity from fossil-fuel fired power plants at some times. Granular EACs allow for electricity use to be tracked and matched with actual clean power generation at an hourly resolution, and in some cases, down to 15-minute intervals. This can help companies identify when their power consumption is not fully matched with carbon-free electricity and encourage them to purchase clean energy from portfolios of projects that cover more of their consumption around the clock. It is also critical, as all corporate commitments under major reporting frameworks, like the RE100, require end users to track and report renewable consumption using EACs.

Corporates are not the only ones piloting the use of hourly RECs. The Netherlands Embassy in Bangkok has signed a *24/7 REC Pilot Project* with EGAT (who acts as issuer of I-RECs in Thailand) to trial the delivery of electricity generated from renewable energy according to the Embassy's real-time hourly demand throughout 2022.¹⁹ The project is meant to support Thailand's goal of carbon neutrality by illustrating the utility of hourly RECs, and is tracked using the I-REC instrument. Thailand is also planning to launch a renewable energy tracking and trading platform where clean energy can be traced in close to real-time.



4 RECOMMENDATION 4: Support development and deployment of next-generation low-carbon technologies

Companies are often first-movers when it comes to development and deployment of innovative new energy technologies.

While public-private partnership models with government stakeholders are often critical in reducing risk for investors and companies, corporate actors can play a leadership role to demonstrate the practical viability of new energy solutions in the marketplace.

Google has developed the first-ever battery backup system to replace diesel generators at its hyperscale data center in Belgium. The 3 MW, 2-hour-duration battery also provides flexible capacity to the grid and is meant to support Google's goals of meeting round-the-clock electricity demand with carbon-free sources by 2030.

Ramping up its push towards 24/7 carbon-free energy, Google is currently exploring how geothermal energy can be deployed to complement wind and solar generation. In May 2021, it signed the first corporate agreement with a "next-generation" geothermal energy technology to produce carbon-free power to the grid that will bring "always-on" clean energy to Google's data centers and infrastructure in Nevada. The initiative uses advanced drilling, AI, and machine learning to increase productivity of the geothermal plant. According to the U.S. DOE, advancements in policy and technology could see geothermal energy providing up to 120 GW of energy in the United States by 2050.

Google and Microsoft have both joined the new Long-Duration Energy Storage Council, an industry initiative intended to spur the development and commercialization of advanced energy storage technologies that can store renewable energy for longer periods than traditional batteries and dispatch it when wind and sun are less available.

Corporates may also increase and/or facilitate access to much needed capital, given the investment-intensive nature of the transition to renewable energy. Apple, together with ten of its suppliers, launched the China Clean Energy Fund in 2018, a first in China, connecting suppliers with renewable energy projects. The US \$300 million Fund aims to develop projects totaling 1 GW of renewable energy. Also in China is the Asia Green Fund, a green impact private equity firm seeded by business and government leaders from the U.S. and China to promote sustainable development through cross-border investments in green technology, including energy-saving and low-carbon models.²⁰



5

RECOMMENDATION 5: Use the company's voice to advocate for impact

Corporate voice is powerful, and can be used to drive awareness – and raise urgency – among the public and policymakers in governments. This enables the private sector to push for fundamental, oftentimes difficult, changes or measures to facilitate societies' and businesses' transition to renewables. This could include participation in global collectives like the RE100, exercising positive influence over corporate supply chains, or using global institutions and events as platforms for advocacy. Apple's CEO, Tim Cook, for instance, spoke at the U.N. Climate Ambition Summit 2020, and called for a carbon-neutral global economy. Apple is also part of the United Nations Framework Convention on Climate Change's *Race to Zero* coalition which rallies support from actors outside of federal governments to achieve net zero carbon emissions by 2050, and has signed on to the SBTi.

In September 2021 during the lead up to the COP26 Conference in Glasgow, Google launched the 24/7 Carbon-free Energy Compact in partnership with Sustainable Energy for All and the United Nations, enjoining stakeholders across the energy ecosystem to commit to advancing policies, procurement practices, tools, and data that are critical to enabling all organizations to achieve 24/7 carbon-free energy and to accelerating decarbonization of the world's electricity systems. To date, over 60 action partners have signed on to make 24/7 Carbon-Free Energy a reality – including most recently, Thailand's EGAT. Google also published a decarbonization roadmap for policymakers and committed to advocate for specific policies to accelerate electricity decarbonization.²¹

Finally, many companies have also joined organizations dedicated to working with policymakers to remove barriers to corporate clean energy adoption and to increase deployment through clean energy purchasing. This includes the Clean Energy Buyers Association (CEBA)²² in the United States, and the Re-Source Platform in Europe.²³



Conclusion

Society must dramatically accelerate progress in reducing carbon dioxide emissions in order to limit global temperature rise to well below 2 degrees Celsius, the goal of the Paris Agreement. The power sector is key to creating a low carbon future, as it is both a large source of global carbon emissions today and it is also key to decarbonizing other sectors of the economy, including buildings, transport, and industry. Advances in technology have made decarbonization of electricity systems possible, but government policies will be key to accelerate the transition and do so cost-effectively.

The APEC EWG workshops discussed in this report identified a number of policies that are particularly important. These include setting strong decarbonization targets, regional energy connectivity technology investment incentives, open and competitive electricity market structures, competitive auctions, and removing regulatory barriers to clean energy adoption.

Private sector companies are also leading in deploying clean energy across the globe, and partnerships between public and private sectors can be an accelerant for the clean energy transition. One such partnership is the *24/7 Carbon-free Energy Compact* launched by Sustainable Energy for All and the United Nations - a group of energy buyers, energy suppliers, governments, system operators, solutions providers, investors and other organizations dedicated to decarbonizing electricity systems.²⁴ APEC economies are encouraged to join this effort to collaborate with others and move towards fully carbon-free electricity systems.

To promote and advance APEC's transition to a low carbon future, this report recommends the following best practices and policy recommendations:

FOR APEC MEMBER ECONOMY GOVERNMENTS AND POLICYMAKERS –

- ✓ **Set ambitious, government-driven targets and energy portfolio mandates**
- ✓ **Promote robust, competitive energy markets with innovative energy procurement mechanisms**
- ✓ **Remove regulatory hurdles and other “soft costs” that hinder the deployment of clean energy solutions**
- ✓ **Enable direct access to clean energy**
- ✓ **Enable low-cost financing and introduce incentives to spur clean energy investment**
- ✓ **Promote regional energy cooperation**

FOR CORPORATES AND PRIVATE SECTOR PARTNERS WORKING IN APEC ECONOMIES –

- ✓ **Set ambitious corporate targets for clean energy procurement and utilization**
- ✓ **Engage in innovative public-private partnership models**
- ✓ **Promote transparency in reporting on corporate energy usage to stakeholders**
- ✓ **Support development and deployment of next-generation low-carbon technologies**
- ✓ **Use the company's voice to advocate for impact**



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Two APEC workshops were organized to identify best practices to create open and competitive electricity markets that would reduce the cost of clean energy; encourage voluntary clean energy markets, and accelerate decarbonization of electricity grids.

The first workshop, *Driving Power System Decarbonization Through Public Policy*, on 6 August 2021 discussed how APEC member economy governments can reduce the price of clean energy, formalize and develop clean energy markets, and accelerate electricity grid decarbonization by raising up best practices and innovative policy and regulatory frameworks in the APEC region. It examined the implementation of wholesale and competitive energy markets, creating credible and transparent processes for energy attribute certificates, facilitative legal and policy frameworks for clean energy projects, and technological and infrastructure investments to support carbon-free electricity generation and use.

The second workshop on the *Role of Corporations in Accelerating Decarbonization* on 1 September 2021 focused on corporates' role in driving transformation, including how government incentives can spur investment, the role of public-private partnerships, and how a successful, mutually beneficial energy policy might be structured. It highlighted innovative partnerships and corporate action in Asia, alongside global best practices and standard-setting commitments for further collaborative action within APEC economies.

Approximately **80 stakeholders** comprising government officials, senior private sector leaders, and energy industry experts across **12 APEC economies** participated in the workshops, which saw panelists from the Asia Pacific Energy Research Center, International Energy Agency (IEA), Google, Bloomberg New Energy Finance (BloombergNEF), Apple, United States Agency for International Development (USAID), and the International Renewable Energy Certificate Standard Foundation (I-REC), among other expert stakeholders, as well as policy and regulatory officials from the governments of the United States, Thailand, Singapore, and Viet Nam.



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¹ <https://www.eia.gov/todayinenergy/detail.php?id=42342>

² “We recognize the importance of promoting diversified energy supplies, and market-based competition and pricing mechanisms that reflect demand and supply fundamentals as appropriate to each economy. We encourage member economies to take actions to eliminate trade protection and restrictive measures that may impede progress in renewable energy technologies and development of this sector, and we endorse the Energy Ministers’ aspirational goal to double the share of renewables including in power generation by 2030 in APEC’s energy mix.” 22nd APEC Economic Leaders’ Declaration, Beijing, China (November 2014). Available here: https://www.apec.org/meeting-papers/leaders-declarations/2014/2014_aelm

³ <https://aperc.or.jp/publications/reports/outlook.php>

⁴ In these scenarios, “Southeast Asia” includes Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Viet Nam; “Oceania” includes Australia, New Zealand, and Papua New Guinea.

⁵ For best practices on energy auction design, see primers from the International Renewable Energy Agency (IRENA), available here: <https://www.irena.org/policy/Renewable-Energy-Auctions>; and from the U.S. Agency for International Development (USAID), available here: <https://www.usaid.gov/energy/auctions>

⁶ For background on the Western Renewable Energy Zones, see here: https://www.energy.gov/sites/prod/files/oeprod/DocumentsandMedia/WREZ_Report.pdf

⁷ www.there100.org

⁸ www.sciencebasedtargets.org

⁹ <https://www.energy.gov/lpo/title-xvii>

¹⁰ For other examples and case studies of the ADB’s work to finance clean energy development across Asia, see here: <https://www.adb.org/sites/default/files/publication/706641/financing-clean-energy-developing-asia.pdf>

¹¹ <https://about.bnef.com/blog/corporate-clean-energy-buying-tops-30gw-mark-in-record-year/>

¹² www.theclimategroup.org/EP100

¹³ <https://acee.princeton.edu/24-7>

¹⁴ “Taking stock: A global assessment of net-zero targets,” Energy & Climate Intelligence Unit and Oxford Net Zero, March 2021.

¹⁵ https://www.apple.com/environment/pdf/Apple_Supplier_Clean_Energy_Program_Update_2021.pdf

¹⁶ <https://www.state.gov/the-clean-energy-demand-initiative-cedi/>

¹⁷ <https://www.cdp.net/en/info/about-us>

¹⁸ <https://ghgprotocol.org/>

¹⁹ <https://www.egat.co.th/en/news-announcement/news-release/netherlands-embassy-egat-join-hands-to-implement-24-7-rec-pilot-project-towards-the-goal-of-thailand-s-carbon-neutrality>

²⁰ http://www.asiagreenfund.com/html/en_index/

²¹ <https://www.state.gov/the-clean-energy-demand-initiative-cedi/>

²² <https://cebuyers.org>

²³ <https://resource-platform.eu>

²⁴ <https://gocarbonfree247.com>

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