ADB

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Energy Policy
Supporting Low Carbon Transition in Asia and the Pacific

ABBREVIATIONS AND ACRONYMS

ADB	-	Asian Development Bank
CO_2	-	carbon dioxide
DMC	-	developing member country
GHG	-	greenhouse gas
IED	.	Independent Evaluation Department
LNG	-	liquified natural gas
NDC	.	nationally determined contribution
OP	-	operational priorities of ADB Strategy 2030
PPP	-	public private partnership
PRC	-	People's Republic of China
PV	-	photovoltaic
SDG	-	Sustainable Development Goal
SOE	-	state-owned enterprise

NOTES

In this report, "$" refers to United States dollars.

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A. BACKGROUND AND INTRODUCTION

1. Over the past few decades, the Asia and Pacific region has experienced unprecedented economic progress, modernizing its societies and improving the living conditions of its people. This process has been underpinned by economic reforms, international collaboration, urbanization, and lower labor and production costs. Expanded energy access and increased security of energy supply have contributed to countries' economic development and improved quality of life. The economic transformation has not, however, been equal across countries and between people, and has had harmful climate and environmental consequences.

2. In response to the various challenges faced by the region, in 2018, the Asian Development Bank (ADB) launched its Strategy 2030 to address, in its operations, the continuing issues of poverty and vulnerabilities, inequality, and the growing environmental pressures.[1] Strategy 2030 also reflects ADB's commitment to aligning with its global commitments to the Sustainable Development Goals (SDGs) and the related Financing for Development agenda, and the Paris Agreement on climate change (Paris Agreement).

3. Strategy 2030 expands ADB's vision to achieve a prosperous, inclusive, resilient, and sustainable Asia and the Pacific. To achieve Strategy 2030's vision, ADB will focus on seven operational priority areas, namely: (i) addressing remaining poverty and reducing inequalities, (ii) accelerating progress in gender equality, (iii) tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability, (iv) making cities more livable, (v) promoting rural development and food security, (vi) strengthening governance and institutional capacity, and (vii) fostering regional cooperation and integration.

4. In aligning its operations with Strategy 2030, ADB will expand its interventions in social sectors, such as education, health, and social protection. In addition, at least 75% of the number of ADB's committed operations (on a 3-year rolling average, including sovereign and nonsovereign operations) will promote gender equality by 2030. As ADB's developing member countries (DMCs) pursue more livable and sustainable cities and further rural development, they will meet complex and cross-sectoral development challenges in education, health, transport, water, and agriculture. To contribute to meeting these challenges, ADB's energy sector activities must follow from an understanding of how energy systems interact with broader society and environment.

5. In 2019, global carbon dioxide (CO2) emissions from the combustion of fossil fuels (coal, oil, and natural gas) amounted to 36.4 gigatons, representing 80% of the total anthropogenic carbon emissions and 68% of the total of greenhouse gas (GHG) emissions (as measured by their impact on global warming, through their global warming potential), which also includes methane, nitrous oxide, and fluorinated gases, stemming from all types of human activity—agriculture, industrial processes, land use and land use change, and energy.[2,3] Consequently, a vigorous intervention in the energy sector represents a direct and

[1] ADB. 2018. *Strategy 2030. Achieving a Prosperous, Inclusive, Resilient, and Sustainable Asia and the Pacific*. Manila.
[2] IIASA (2020). *Global Carbon Budget 2020*. Earth System Science Data. 12. 3269-3340. 10.5194/essd-12-3269-2020.
[3] OurWorldinData. https://ourworldindata.org/greenhouse-gas-emissions

effective response to tackling climate change and building climate and disaster resilience, one of the key operational priorities of Strategy 2030.

6. SDG Goal 7 aims to achieve universal access to affordable, reliable, sustainable, and modern energy, of which a key target is increased share of renewable energy in the energy mix to combat climate change. Globally, the energy transition to cleaner and more sustainable systems has already begun, and significant declines in the costs of renewable energy technologies are accelerating this transition. Between 2010 and 2019, the costs of solar PV decreased by 82%, concentrating solar power by 47%, onshore wind by 39%, and offshore wind by 29%, and costs are continuing to decline.[4] These trends, which are projected to continue, have resulted in a reduction in the cost differential between traditional fossil fuel power generation technologies and renewable energy generators. The cost of electricity from unsubsidized renewable energy can be lower than that from conventional generators, and, in some cases, renewable power costs are competitive with those of existing conventional generators.[5] The imperative to reduce GHG emissions and cost trends of cleaner technologies have resulted in significant reductions in financing support for new fossil fuel generation due to risks that plants would be retired before the end of their useful life, becoming stranded assets, and the availability of financially viable, cleaner alternatives.

7. SDG 7 also targets improved end-use energy efficiency, which can play a key role in driving down the costs of the energy transition. Energy efficiency can result in greater economic productivity and provide social and environmental benefits, including increased energy affordability, improved air quality, reduced pollution, and global climate change mitigation. Energy intensity has steadily declined across Asia and the Pacific, with efficiency gains in the region outpacing the global rate of progress. Still, energy intensity in the region—5.2 MJ per 2011 PPP $ in 2017—remains higher than the global average of 5.0, and the potential for the application of energy efficiency measures is still large.[6]

8. In view of profound changes in the energy landscape and considering the new emphasis of Strategy 2030, ADB's Independent Evaluation Department (IED) conducted a Sector-wide Evaluation: ADB Energy Policy and Program, 2009–2019 (IED evaluation).[7] While the IED evaluation revealed significant successes in energy sector operations, the 2009 Energy Policy was found relevant to the program during the evaluation period,[8] but it is no longer adequately aligned with the global consensus on climate change, the ongoing global transformation of the energy sector, and recent changes in the energy sectors of ADB DMCs. The three objectives of the 2009 policy were aligned at the time of its approval with the needs of the energy sectors in DMCs, Strategy 2020, approaches of other multilateral development banks, and climate change priorities at that time. However, the Paris Agreement of 2015, the SDGs, recent technological developments, and ADB's recently adopted Strategy 2030 have created new conditions and demands for ADB's energy assistance. ADB has not financed investments in coal power plants since 2013, even though the policy allowed such financing. The current energy and climate change contexts present ADB with the opportunity and rationale to support the phase-out of coal fired power plants in the region. Therefore, the 2009 Energy Policy needs an update that considers the opportunities provided by innovative

[4] IRENA. 2020. *Renewable Power Generation Costs in 2019*. International Renewable Energy Agency. Abu Dhabi.
[5] Lazard. 2020. Levelized Cost of Energy and Levelized Cost of Storage – 2020. https://www.lazard.com/perspective/levelized-cost-of-energy-and-levelized-cost-of-storage-2020/
[6] UNESACP. 2021. *Regional Trend Report: Shaping a Sustainable Energy Future in Asia and the Pacific*, Febirry 2021. Bangkok.
[7] ADB. 2020. *ADB Sector-wide Evaluation: ADB Energy Policy and Program, 2009–2019*. August 2020. Manila.
[8] ADB. 2009. Energy Policy. Manila

technologies and with its price dynamics, decentralized energy systems, digitalization, energy efficiency and new business models for enhancing sustainability, resilience, inclusiveness, energy access and security. The IED evaluation also proposed that guidance on energy sector operations be more frequently updated as ADB moves into the 2020s.

9. As highlighted in the IED Sector-Wide evaluation, the main challenges in the DMCs have been electricity access (coverage and affordability), energy security (reliability, quality of service, demand, and supply balances), sustainability (financial, resilience to climate change and extreme events, climate mitigation, health, and environmental impacts) and sector governance (regulations, utilities' performance, and private sector participation). While many DMCs have made significant progress in these areas, especially since the 2009 Energy Policy, ADB needs to continue to support DMCs to consolidate the achievements and address emerging new challenges. This policy paper has been prepared to seek Board approval of the proposed new Energy Policy in light of the IED evaluation's findings, global consensus on climate change, regional and global economic developments, innovation and technological developments, ongoing global energy transformation, and ADB's Strategy 2030. It also outlines guidance for the implementation of ADB's new Energy Policy.

B. CHANGING ENERGY LANDSCAPE OF THE 2020s

10. The Asia and Pacific region covers a vast territory, home to most of the world's population, and its economies represent a wide diversity of social and economic development strategies. The region's progress in poverty reduction and economic growth in recent decades represents one of the most remarkable changes in the global economy. Coal and other fossil fuels have played a large part in ensuring access to energy for the region's economic development, but they have not solved the energy access challenge, and their use harms the environment and accelerates climate change. Due to the region's reliance on fossil fuels for its energy systems, the region contributes a disproportionate share of global GHG emissions. DMCs in this region contribute 45% of global energy sector GHG emissions, although their share in total final energy consumption is 37%.[9] Though their aggregate contribution to global GHG emissions is high, the region's per capita emissions remain below the global average, reflecting the relatively low per capita energy consumption; with continued economic growth, emissions from these countries will further increase if energy systems continue to rely on expanded use of fossil fuels.

11. In addition to the challenges of climate change mitigation, many DMCs are highly exposed and vulnerable to natural hazards and impacts of climate change, such as the growing frequency and intensity of extreme weather events, sea level rise, changes in rainfall patterns, and increasing temperatures. Disaster related losses are already growing due to insufficient regard for climate and disaster risk in either the design or location of new infrastructure. Climate change impacts and disruption of ecosystem services can lead to severe effects on livelihoods and food security, which in turn would affect human health. Indeed, the region is known to be the most vulnerable in the world to natural disasters from typhoons and flooding to earthquakes and tsunamis.

12. To become truly sustainable, economic growth must be decoupled from environmental degradation. To support economic growth infrastructure investment planning must consider a time horizon that meets the needs of the present generation without

[9] IEA. 2020. IEA Data and Statistics online database for 2018.

compromising the ability of future generations to meet their own needs. Doing so requires that investment and financing decisions to support low-carbon development and build resilience to future changes and shocks, including avoiding carbon lock-in[10] and sharply curbing fossil-fuel use. At the same time, demand for affordable, reliable, sustainable and modern energy services continues to increase with economic expansion, population growth, urbanization, and developing countries catching-up in their social and economic development. To ensure that the next phase of growth across Asia and the Pacific is sustainable, economic development must be rapidly decoupled from its high dependence on energy demand, and energy supply must in turn be decoupled from its reliance on fossil fuels.

13. Energy transformation thus involves the following four intertwined changes:

- Implementation of incentives and policies to support structural and behavioral changes for improved end use **energy efficiency**.
- Transformation of the conventional carbon intensive energy systems to **low and zero carbon power** systems, with **digital technologies** to facilitate integration of variable renewable energy sources.
- Transition to **electrification** of the transport, industry, and space cooling and heating sectors in parallel with decarbonization of the electricity grid.
- Participation of **distributed renewable energy providers,** including consumers as producers ("prosumers").

14. **Energy efficiency.** Traditionally, economic and population growth results in greater energy demand for industry and agricultural processes as well as for energy services such as mobility, heating and cooling, and lighting. In this context, energy efficiency—"the first fuel"—is a key component of an energy transition in decoupling economic growth from energy demand. Energy efficiency can yield multiple benefits, such as reducing energy costs, GHG emissions, and air pollutant emissions, while improving energy security and increasing energy access. However, after decades of effort in promoting energy conservation and energy efficiency, the unrealized potential is considerable. The progress in energy efficiency has been modest due to various factors, including lack of legal framework and regulatory standards, insufficient financial incentives, and inadequate financing instruments. Globally, improving energy efficiency could lower GHG emissions by 37%, contributing significantly to climate stabilization goals.[11,12]

15. **Low and zero carbon power systems.** A transition to a low or zero carbon power system requires addressing many different challenges. Additions of new generating capacity should ideally come from zero energy sources or coupled with carbon capture, use, and storage. Grid regulatory, operations, and transmission systems must be expanded and upgraded to integrate and manage new sources of power. Energy storage opportunities should be exploited to further support grid stability and supply and demand management. Markets and regulation must support the access of new technologies and their providers and be flexible enough to accommodate emerging technologies as they reach maturity. There has been progress across Asia and the Pacific on all dimensions in the last decade, but opportunities remain to more rapidly bring about the region's energy transformation.

[10] The term "carbon lock-in" refers to the tendency for certain carbon-intensive technological systems to persist over time, "locking out" lower-carbon alternatives, and owing to a combination of linked technical, economic, and institutional factors.
[11] IEA. 2019, World Energy Outlook 2019. Paris.
[12] IRENA. 2020. Global Renewables Outlook 2020. Abu Dhabi.

16. **Cleaner Generation**. Wind and solar PV power are already mainstream technologies supported by various deployment policies, including feed-in-tariffs,[13] renewable energy portfolio targets/standards, tradable renewable energy certificates, and reverse auctions. Significant reductions in installed cost for these technologies have been realized globally, including in the People's Republic of China (PRC) and India, which are global leaders in solar and wind power installations. Asian economies are also major renewable energy technology suppliers, and therefore reap many of the economic benefits of the ongoing transition to renewables. The cost reductions of renewable energy are expected to continue, and the lessons learned on both technological and policy fronts can be applied for more widespread renewable energy deployment across the region. Offshore wind, floating solar PV, and concentrated solar power installations are increasing, which may result in similar cost reductions that accelerate deployment.

17. **Strong and Flexible Grid**. Increasing the share of variable renewable energy requires an electricity system to be flexible and balance the fluctuations in output from renewable generators without compromising security of supply, the viability of which has been demonstrated in many countries. A strong and expansive transmission grid, including high-voltage transmission networks that connect areas with the highest quality solar and wind resources on the same grid as a range of other generation sources can supply power across regions, including to large consumption centers. Countries with smaller national grids can develop regional interconnections and establish cross-border trading mechanisms to widen the balancing capacity of variable renewable energy.

18. **Energy Storage**. Energy storage systems can also support power system optimization and higher levels of integration of variable renewable electricity. The average price of battery storage has dropped significantly during the last decade, and it is expected to fall further as newer battery technologies go into mass production; these systems can provide grid stability services and store energy when production exceeds demand for dispatch during higher-demand hours of the day. Pumped storage hydropower can add similar value to a power grid and can also provide seasonal energy storage to help manage seasonal imbalances between supply and demand. Existing thermal power plants can also be operated more flexibly than they have been traditionally, and combined heat and power plants connected to heat storage to decouple supply of heat from electricity generation as well as electric heaters can be used to couple heating and electricity sectors.

19. **Sector Governance**. Accommodating increased flexibility and new technologies will require governance, market, and regulatory reform in many DMCs. Many of the electricity market systems and their supporting regulations in the region are developed based on a traditional centralized system not designed to deal with supply-side variability, the large role of renewable energy characterized by high capital costs and extremely low operating costs, deployment of distributed energy resources, and demand-side participation in the operation of the power system. The region's governments continue deregulating and reforming their power sectors to increase efficiency through restructuring sector entities and by introducing competition. New power exchanges are likely to emerge and existing ones strengthened. Newer power generation technologies and fuels are being placed on a more equal footing by accounting for the social and environmental costs of fossil fuel use through introducing

[13] Feed-in-tariff is needed to encourage investment in newer unestablished renewable energy technologies; other approaches, such as reverse auctions, are more efficient for procuring for a mature technology, such as solar PV, in an established market.

mechanisms, including carbon pricing instruments such as carbon taxes, emissions-trading systems (ETC—cap and trade), and international offset mechanisms. However, cost reflective tariffs and governance measures to ensure sector accountability and sustainability remain an issue in many countries in the region.

20. **Role of Natural Gas**. Across Asia and the Pacific, natural gas is used in buildings, industry, and power generation, including combined heat and power plants. The region imports 9% of the world's total pipeline imports and 75% of liquefied natural gas (LNG) (mainly PRC, Japan, the Republic of Korea, and India).[14] Though natural gas has played a key role in helping many countries reduce emissions from coal, the Paris Agreement calls for deep decarbonization to achieve climate stabilization. This has raised questions about whether continued investment in gas is aligned with the Paris Agreement objectives. Replacing coal with natural gas reduces but does not eliminate GHG emissions, and fugitive emissions from natural gas production and transmission have risen on both the energy and climate agendas. Despite these concerns, the current supply contracts and plans are expected to cause natural gas use to increase in the region during the next decade. LNG terminals and gas transmission and distribution infrastructure require high capital costs. In this context, it is a likely scenario that many of the region's economies will continue to include gas in their energy transition strategies to replace coal and fuel oil as a transitional fuel to reduce particulates and GHG emissions and to provide flexible thermal power generation capacity to balance intermittent renewable power sources.

21. **Emerging Technologies**. Green hydrogen, produced with electricity from renewable energy sources, has attracted a lot of investment in recent years for the role it can play in decarbonization. Hydrogen can be used for energy storage for variable renewable electricity in the system, with electrolyzers acting as flexible demand to the power system, especially for long-term storage to fill gaps of seasonal supply and demand. Hydrogen also has application in the more difficult to decarbonize sectors; it can be a power source for electric mobility in cars, aviation, and ships using fuel cells, and it can replace natural gas in some industrial processes. Hydrogen can also be a power source for mobility as a synthetic fuel, used in traditional combustion engines or turbines. DMCs would benefit from the move toward a hydrogen economy. On the supply side, developing countries could tap their renewable energy resources to produce hydrogen and export it to other countries. On the demand side, developing countries could start using hydrogen technologies in specific areas such as fuel cell vehicles with zero CO2, sulfur dioxide, or nitrogen oxide emissions. The PRC, India, and a number of DMCs have issued or are preparing their national hydrogen development strategies.

22. Bioenergy, and particularly liquid biofuels, potentially offer DMCs many advantages provided that their potential negative impacts on food security through crowding out of food production are properly managed. Bioenergy and biofuels contribute to decarbonizing sectors that are difficult to electrify. Sustainable sources of solid biomass, pellets, and biogas can provide for small- and medium-scale localized energy demands and substitute use of coal, and biomass collected unsustainably. Liquid biofuels are produced mainly for road transport and are deployed through blending mandates, but in the future advanced biofuels may also be applied by some industry sectors, shipping, and aviation. Biofuels have been proven technically feasible but are still costly and have problems with immature feedstock supply chains. There are also environmental (such as deforestation) and food security concerns linked with the production of biofuels.

[14] BP Statistical Yearbook 2020.

23. Alongside these possible energy sources for decarbonization, new opportunities for sustainable heating and cooling have arisen through coupling renewable electricity with heat pump technology. Heat pumps operating with shallow-depth or medium-depth geothermal resources represent a promising low-carbon and clean heating and cooling solution. Future space conditioning systems may also be hybrids, combining solar collectors, air- and ground source heat pumps, and heat storage technologies. District cooling systems based on absorption chillers, either stand-alone or integrated with district heating, can also use these heat sources and are gaining popularity in Asian cities.

24. The Asia and Pacific region has many of the world's largest cities. Cities, large and small, in general have emerged in the national and international energy policy arenas as important actors with highly dynamic and cross-cutting agendas. City administrations are now perceived as playing a key role, for example, in designing and managing transport systems as well as regulating the way buildings are designed and built, or how waste is collected and disposed of, and what kind of water, wastewater, electricity, gas, and district heating systems are promoted or discouraged. The role of cities is manifested, for example, in the way electric mobility is incentivized and charging infrastructure developed, whether waste is recycled and utilized as an energy source, or by allowing the use of waste water as a source for heat pumps to feed energy to the district heating network. There is also growing momentum for leading global cities to achieve carbon neutrality in the next 10–20 years.

25. Considering the level of energy services accessible to rural populations, the region's energy access agenda has advanced, but work remains to be done. During the last decade, countries in the region have made significant progress in providing electricity access to their citizens. Nevertheless, more than 200 million people still lack electricity access across developing Asia. In many DMCs, the economically viable potential for electrification through grid extension has largely been achieved and the focus is now placed on achieving the "last mile" through off-grid solutions such as mini-grids. However, the financial sustainability of mini-grids and affordability for consumers remain major challenges. Moreover, services provided through mini-grids are not always continuous and reliable, and can be insufficient to run, for example, flour mills or water pumps for productive purposes. The issue of how to achieve universal access to sustainable, reliable, and affordable electricity, therefore, will remain on the agenda of governments and national and international development financing institutions for the next decade.

26. While there has been good progress with the provision of electricity, access to clean fuels and technologies for cooking and heating continues to be a challenge for DMCs in both rural and urban contexts. Cooking using traditional technologies and fuels such as charcoal and cow dung is a major source of indoor air pollution and associated health problems. Every year, 3.8 million people die prematurely from illnesses (including pneumonia, stroke, ischaemic heart disease, chronic obstructive pulmonary disease, and lung cancer) attributable to the household air pollution caused by the inefficient use of solid fuels and kerosene for cooking.[15] As these impacts disproportionately burden women and children, lack of access to sustainable cooking solutions is also a social problem. In addition, using charcoal and wood to cook has a significant impact on climate change, contributing 3% of global CO_2 emissions every year. These challenges must be confronted during the 2020s. In addition to electricity, biogas, liquified petroleum gas, and natural gas, the decade will likely bring new

[15] World Health Organization. 2018. *Household Air Pollution and Health.* https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health

advanced biomass cookstove models, solar cookers, collectors, and discs for cooking and heating applications.

27. Improving energy sector resilience and security has been clearly identified as a need during the COVID-19 pandemic, and this will be needed as Asia and the Pacific recovers from the pandemic. Although energy systems have operated well so far, concerns over reliance on international access to skills and capabilities, technologies, and fuel resources mean that energy systems have been put at risk. Renewable energy technologies, when manufactured as well as deployed and maintained locally in DMCs, can create energy generation systems that are resilient to supply chain interruptions. While COVID-19 has reduced the cost of imported fossil fuels, the next shock or crisis could result in limited access or spikes in global fossil fuel prices as seen in the past, and therefore a reduction in the use of imported fuels increases resilience against probable future events. Moreover, increased use of ICT across energy infrastructure will require a focus on cybersecurity to ensure that such use of advanced technologies does not introduce other security vulnerabilities.

C. THE OBJECTIVE AND GUIDING PRINCIPLES OF ENERGY POLICY

28. In response to the challenges and energy sector outlook, and to reflect the findings of the Sector-Wide Evaluation, feedback from stakeholders concerned, lessons learned, and the policy analysis, ADB has prepared a new Energy Policy. This 2021 Energy Policy is developed based on greater awareness of climate risks, costs, and mitigation opportunities; greater knowledge of the needed scale and urgency of response to the climate change challenge; and evolving and highly differentiated DMC priorities and commitments for action under the SDGs and the goals of the Paris Agreement. The 2021 Energy Policy is consistent with Strategy 2030, enabling sovereign and non-sovereign energy operations (including lending through financial intermediaries) to align with ADB's vision of a prosperous, inclusive, resilient, and sustainable Asia and the Pacific and the seven operational priorities of the Strategy. The 2021 Energy Policy will ensure that ADB's energy sector operations are consistent with the goals of Sustainable Development Agenda and the Paris Agreement, and make all finance flows consistent with low-GHG emission and climate-resilient development pathways.

29. The objective of the 2021 Energy Policy is to guide ADB's energy sector operations to help DMCs develop sustainable and resilient energy systems. In this policy, ADB strengthens its commitment to climate change mitigation and adaptation. Strategy 2030 pledges that at least 75% of its committed operations, including sovereign and non-sovereign operations, will be designed to support climate change mitigation and adaptation by 2030. Climate finance from ADB's own resources will reach $80 billion cumulatively from 2019 to 2030.

Alignment with the Paris Agreement

30. ADB is committed to helping its DMCs pursue the goals of the Paris Agreement. ADB provides technical assistance and financing to these DMCs within the framework of planning and implementing their nationally determined contributions (NDCs), which embody their short and medium-term efforts to reduce GHG emissions and adapt to climate change. ADB will also support DMCs to set up a comprehensive and coordinated approach for the development

and implementation of long-term low GHG emission and resilient development strategies and long-term climate strategies as encouraged by the Paris Agreement to establish a whole-of-economy approach to transitioning to low-carbon and resilient development. NDCs and long-term climate strategies will sit within a coherent planning framework that also includes National Adaptation Plans established under the Cancun Adaptation Framework.[16]

31. Furthermore, the Paris Agreement Article 2 (1c) obligates the parties to the agreement to make finance flows consistent with a pathway towards low GHG emissions and climate-resilient development. ADB and the other multilateral development banks have jointly declared their intention to align their financing with the mitigation and climate resilience goals of the Paris Agreement and have worked to develop methodologies to assess and characterize their operations in this respect.

32. Accordingly, ADB will systematically assess the extent to which its proposed energy sector operations in its DMCs align with both the mitigation and adaptation goals of the Paris Agreement. On adaptation goals, it will identify and assess physical climate risk faced by the proposed operation and integrate climate resilience measures that are not inconsistent with national climate adaptation priorities. The assessment will also set the basis for follow-up reporting on how its operations have aligned with the agreement. It will rely on lists of types of projects that can be universally considered aligned or not aligned with the Paris Agreement's mitigation goals. For project types not included in these lists, assessment will consider specific criteria arising from the project's details, including its national and sectoral circumstances. The characterization of an operation as not aligned does not necessarily lead to non-engagement with the project proponent as the assessment may lead to ADB's opportunity to work with the client on developing an alternative low-GHG, resilient climate strategy or project for the targeted impact. In planning its project or economic activities, ADB will apply a decision tree for assessing the alignment with the Paris Agreement.

33. In preparing energy sector projects, ADB will conduct least-cost stable energy supply (based on levelized-cost of energy) assessments. In doing so, renewables and energy efficiency should be considered carefully first, and support should be provided to DMCs to always use the best available technologies for reducing GHG emissions. ADB will consider the social cost of carbon across all energy projects. A review of the empirical estimates of the global social cost of carbon reported by the Intergovernmental Panel on Climate Change suggests a unit value of $36.30 per ton of CO2 (2016 dollar), [17] increased by 2% annually in real terms to allow for the potential of increasing marginal damage of global warming over time. This unit value can be used to estimate the value of avoided GHG emissions for projects that reduce emissions and the cost in damage created for projects that increase emissions. The unit value may be revised in the future as more and new estimates of damages caused by climate change become available.

Differentiated Approaches to Groups of Countries

34. In accordance with Strategy 2030, the 2021 Energy Policy underscores that ADB's work with and for the DMCs in the energy sector encourages urgent action to combat climate

[16] The United Nations Climate Change Conference was held in Cancún, Mexico in 2010 and established Cancun Adaptation Framework, which will strengthen action on adaptation in developing countries through international cooperation.

[17] See Intergovernmental Panel on Climate Change. Fifth Assessment Report (AR5). https://www.ipcc.ch/report/ar5/

change and its impacts and to protect environments while fostering economic growth. The policy steers ADB to be cognizant that the provision of energy services must be affordable and reliable for productive uses, urban populations, and rural communities. ADB realizes that these objectives cannot be achieved merely through infrastructure investments, but such developments require improved governance, favorable policy environments, more efficient institutions, and improved service delivery by public and private sector operators. To this end, ADB will support institutional development, policy reforms, and regional energy cooperation through knowledge, technical advice, capacity building, and financing.

35. In accordance with Strategy 2030, considering the significant diversity across DMCs, the implementation of Energy Policy 2021 will consider differentiated approaches to various groups of countries. ADB will prioritize support for providing essential energy access services in the poorest and most vulnerable countries, including fragile and conflict-affected situations and small island developing states,[18] through increasing use of low carbon and renewable energy sources. In low-income and lower-middle-income countries, ADB will continue to support energy sector reforms, including the reform of energy sector state-owned enterprises; development of green and inclusive energy infrastructure to enhance productivity and competitiveness; and increased participation of the private sector in delivering energy infrastructure and services. At the same time, ADB will encourage upper-middle-income countries to increase the ambition of their long term climate strategies and lead the low carbon transition in the region by deploying emerging zero-carbon and negative emission technologies.

Enhancing private sector operations

36. The ongoing energy transformation is causing a surge in the need for climate-safe energy investments in Asia and the Pacific on top of the already high demand for infrastructure investment that has been driven by urbanization, industrialization, and population growth. ADB will use its competitive advantage in the region to leverage international climate finance resources for its DMCs to achieve their national targets and international commitments expeditiously and make a rapid shift to greener and cleaner economies. The private sector also has a pivotal role in filling the investment gaps. Its role is not only based on the extensive resources of private capital but also on the private sector spearheading innovation in technology and business models that support creativity, dynamism, and efficiency in the pursuit of sustainable solutions.

37. ADB will expand its private sector operations in the energy sector and contribute to ADB's goal of private sector operations reaching one-third of ADB operations in number by 2024. ADB will crowd in private sector capital from the market, and promote commercial sustainability of the energy sector companies through high standards of corporate governance, integrity, transparency, and social and environmental safeguards; and address market failures without distorting those markets.

38. ADB can help make projects viable through project financing, public and private sector partnership, technical assistance, blended finance (with concessional funds and other trust funds), and other instruments to crowd in private sector capital from the market.

[18] ADB. Building a Differentiated Approach for Fragile and Conflict-Affected Situations and Small Island Developing States. 2020. Manila.

39. ADB will expand its private sector energy operations in new markets, including challenging markets such as fragile and conflict-affected situations and small island developing states. In the context, ADB will consider smaller deal sizes with potentially higher risk and development impact, including inclusive business models to achieve greater gender equality, job creation, and access to affordable clean energy for households and productive use of energy.

40. Through one ADB approach, ADB's private sector operations will work with its public sector operations to provide integrated solutions to DMCs in the energy sector. Public sector operations (both project lending and policy-based lending) can promote needed energy sector reforms and a regulatory framework for the private sector to prosper. In doing so, ADB will promote commercial sustainability of the energy sector companies in DMCs through high standards of corporate governance, integrity, transparency, and social and environmental safeguards; and address market failures without distorting those markets.

Guiding Principles of the Energy Policy

41. To achieve these objectives, policy implementation will be based on the following principles: (i) securing energy for a prosperous and inclusive Asia and the Pacific; (ii) building a sustainable and resilient energy future; (iii) engaging with institutions and framing policy reforms; (iv) promoting regional cooperation to enhance energy security; and (v) providing integrated solutions and cross sectoral operations to maximize development impact. The linkage between the guiding principles and seven operational priorities (OP) of Strategy 2030 is shown in Appendix 1.

42. **Policy principle 1: Securing Energy for a Prosperous and Inclusive Asia.** This principle is aligned with the objectives of OP 1 "addressing remaining poverty and reducing inequalities." As ADB promotes the provision of last-mile access for power, light, clean cooking and heating, it not only encourages DMCs to provide the benefits of modern energy to all, but it also enables the use of energy in productive activities in the DMCs, which leads to the creation of associated employment and business opportunities for those living in rural settings. Actions following this principle also contribute to reducing persistent gender gaps, addressing gender inequality, and reducing women's burden of care and unpaid work (OP2).

43. **Policy principle 2: Building a Sustainable and Resilient Energy Future.** This principle highlights the operational activities that respond to OP 3 "tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability." ADB will assist DMCs with tackling climate change, enhancing environmental sustainability, and building climate and disaster resilience through the increased use of renewable and low-carbon energy, and integrating climate and disaster resilience considerations in energy sector operations. ADB will support DMCs to achieve a planned and rapid phase-out of coal in the Asia and Pacific region, and ensure a just transition that considers the impact on people and communities will be critical in managing this process. In particular, ADB will withdraw from financing new coal power and heat plants. Clean and sustainable energy solutions, such as energy efficiency, renewable energy,[19] and electric mobility, will help make cities more livable by improving ambient air quality (OP 4). Renewable energy development contributes to rural development, particularly through off-grid electrification programs, to an increased share of

[19] In this policy, renewable energy includes solar, wind, hydropower, geothermal, ocean energy and biomass.

renewables under access agenda in SDG7, as well as to food security in rural communities (OP 5). ADB will also support needed infrastructure such as smart and resilient power grids and energy battery storage to ensure integration of increasing share of renewable energy sources.

44. **Policy principle 3: Engaging with Institutions and Framing Policy Reforms.** This principle contributes directly to the OP 6 mandate to strengthen governance and institutional capacity. Climate goals and technological innovations are accelerating a change in power generating fleets. ADB will support energy sector reforms, including strengthened regulatory frameworks and introduction of competitive markets, as well as market-based instruments, in particular carbon pricing. Strengthening DMCs' institutions will allow them to efficiently manage the sector and introduce progressive and enabling energy policies, attract private sector investment, and ensure the long-term financial viability of energy entities. This principle also recognizes that good governance includes environmental and social aspects; energy generation, transmission, and distribution companies should adopt corporate policies and procedures for pollution control and waste management, health and safety, and gender equality.

45. **Policy principle 4: Promoting Regional Cooperation to Enhance Energy Security.** This principle contributes to OP 7 on fostering regional cooperation and integration. ADB will promote regional cooperation through policy dialogue, knowledge sharing, and investments on electricity and natural gas network infrastructure and cross-border energy trading, including building of regional energy markets. The benefits of sub-regional and bilateral energy cooperation include cost savings, reduced GHG emissions and increased energy security by enabling more diverse energy mixes.

46. **Policy principle 5: Cross Sectoral Operations to Maximize Development Impact.** Policy principle 5 responds to Strategy 2030's aim for ADB to be stronger, better, and faster in its delivery to maximize the development impacts of cross sectoral operations. ADB will integrate its energy expertise across sectors and themes to address more complex development challenges. ADB will continue to combine finance, knowledge, and partnerships in its energy operations. ADB's country-focused approach will deliver integrated energy and cross-sector solutions that provide comprehensive and magnified development impacts.

D. THE ENERGY POLICY

1) Securing Energy for a Prosperous and Inclusive Asia and the Pacific

47. The Asia and Pacific region is progressing well towards SDG 7 target 7.1 for universal access to affordable, reliable, sustainable, and modern energy services by 2030. Some of the region's countries have made remarkable strides with electrification since 2010.[20] One of the notable successes is Cambodia, where the electrification rate increased from 31% in 2010 to 92% in 2018; about one-third of the electrification gains came from off-grid solutions. South Asia extended electricity service to a remarkable 286 million people in the same time period. Recent national electrification programs have benefitted from the rapid decline in the cost of

[20] World Bank Database (2020).

solar PV panels and other distributed generation technologies. These cost reductions have enabled development of cost efficient mini- and microgrid solutions and a faster spread of electrification to unserved populations. With these trends expected to continue, universal access to electricity in the next 10 years stands as an achievable target with clean technologies.

48. Even though more than 200 million people still lack access to electricity in the region, no country has an electrification rate falling below 50%. Those with rates below 80% include Myanmar, Pakistan, Papua New Guinea, Solomon Islands, and Vanuatu. As the electrification rate has increased, the population that remains without access to electricity is ever more composed of people living in hard-to-reach rural and mountainous areas and on islands. This includes in countries with relatively high total electrification rates such as in India, Indonesia, the Philippines, and the Pacific Islands. In spite of the progress in electrification rate, there are currently about 940 million people in Asia and the Pacific, particularly South Asia, experiencing frequent interruptions in electricity supply.[21]

49. Expanding access to clean cooking facilities in the region has been less successful. From 2010 to 2018, the rates of access to clean cooking facilities improved just slightly more than 10% for Central and South Asia, and East and Southeast Asia. These subregions had access rates of 49% and 67% respectively in 2018. In the Pacific access to clean cooking is higher at 76%, but the number has not changed notably for the last 20 years. The goal of having 100% of the population relying primarily on clean fuels and technologies for cooking by 2030 is clearly more challenging than electrification. It is also the largest challenge among the SDG 7 targets and requires mobilizing substantial effort and resources.

50. Adoption of biogas, pellets, liquified petroleum gas, natural gas, and electricity for cooking has been slow, and there remains a strong dependence on unprocessed biomass, charcoal, coal, and kerosene. Efforts to address clean cooking require a focus on the technical and the contextual issues of users' priorities in order to provide clean convenient, safe, reliable and affordable cooking alternatives. A cultural preference for traditional cooking methods plays a role in this, but so does the fact that in the absence of clean alternatives, the economically disadvantaged shift from unprocessed biomass to coal or other polluting fuel when seeking affordable and less laborious options for cooking. ADB will support DMCs in sharing the knowledge and piloting new technologies for clean cooking, tailored to the relevant local contexts. ADB will encourage DMCs to include cooking energy demand issues in national energy planning and development strategies and work to address clean cooking challenges related to consumer acceptance and affordability for the rural poor, particularly female headed families.

ADB's Commitment to SDG 7

51. ADB is committed to SDG 7 and will focus more intently on supporting DMCs with their "last-mile" electrification programs and a transition to cleaner fuels for cooking and heating as needed. People without access to modern energy in hard-to-reach areas are often not only energy-constrained but—compared to the rest of the population—may also have inferior social services and infrastructure for water, sanitation, transport, health, and education. ADB Strategy 2030 clearly emphasizes addressing the remaining issues of poverty and reducing inequalities as well as promoting social inclusiveness. Last-mile electrification is an appropriate vehicle with which to address all of these issues. ADB will

[21] UNESCAP, Policy Brief 2020 Advancing SDG7 in Asia and the Pacific, June 2020. Bangkok.

support deployment of new technologies such as renewable energy based microgrids, with active participation of local communities to achieve the for last-mile electrification. ADB will promote the active participation of local communities to increase access to and deploy clean cooking technology and fuel combinations in remote areas or islands in DMCs.

Energy for the Cross-Cutting Needs of Communities

52. ADB will seek opportunities to work with DMCs as they update and revise their electrification and rural energy plans. The most successful electrification strategies are based on a high-level political commitment to electrification reflected in a national masterplan with coherent prioritized targets and implementation plans to achieve them, including for the last-mile household connections. Planning can currently be supported by multi-criteria techniques applying geospatial least-cost algorithms on satellite imaging. A transparent, impartial, and socially sensitive multi-criteria analysis is needed to guide the choice between national grid extension and off-grid solutions. It is also needed to identify the type of off-grid solution best suited for each population center, as well as to set the implementation schedule, and off-grid solutions can be made "grid ready" for future connection with the national grid. The analysis needs to hear voices of vulnerable groups, minorities, and refugees. The responsibilities for electrification should be allocated to those electricity sector entities that possess, or are granted, the necessary human, technical, and financial resources for the task as well as incentives to bring the process determinedly forward.

53. Bringing modern energy to unserved populations addresses multiple development goals, some of which may provide an opportunity for ADB to support DMCs in a cross-cutting manner combining infrastructure with social interventions. Bringing electricity service to a community, whether through grid extension or off-grid solutions, necessitates consideration of the kind of end-uses that may be prioritized, ranging from domestic demands to economically productive uses, street lighting, health centers, and schools.

54. In this context, community participation is vital, as it is also for organizing the operation, maintenance, and commercial services related to the system. Off-grid systems create new localized employment and business opportunities in sales, installation, and maintenance of the distributed grids as well as of end-use equipment such as solar powered pumps, flour mills, dryers, milk coolers, meat storage, lighting, household appliances, and electronics. ADB will support needed skill development and training in local communities.

55. Energy infrastructure also enables improvements in water supply and irrigation. If not managed well, however, water pumping for agricultural production can become a major user of subsidies, a source of losses for utilities, and lead to the waste and depletion of underground water. In designing possible energy interventions for water supply, ADB will consider support for smart metering and dynamic control of pumping based on water availability, cost-reflective electricity tariffs for farmers, solar-powered off-grid irrigation systems, and reductions in system losses and theft through medium voltage power distribution networks in farming areas. ADB can also consider providing cross-sectoral support for multipurpose dams that address water supply, power generation, irrigation, and flood control.

56. ADB acknowledges that sustainably sourced bioenergy can spur rural economies and provide a low-carbon alternative for a wide variety of energy end uses. Therefore, ADB will help DMCs develop policies to support use of agricultural wastes for energy, including uses such as for direct combustion in boilers and briquets (to replace charcoal), bio

compressed natural gas for households and industries, biogas digestion, and ethanol and biodiesel production. One avenue for this will be encouraging national biogas programs that deploy digesters using livestock manure and other agriculture waste as feedstock. ADB will also support efforts to scale up the technology through development of larger centralized biogas units providing methane for power generation, transport, or to be fed into the natural gas network.

57. To ensure sustainability of bioenergy expansion, ADB will encourage synergies in land use between food supply and energy production. Rural biomass investments could potentially help address air pollution issues caused by open burning of crop residues if adequately coupled with regulations. Restoring degraded land with agroforestry, for example, can contribute to the production of sustainable wood fuel, nitrogen-fixing wood crops, or oily plants, all of which would support farming, small-hold forestry, and developing more value-adding biomass-based energy supply for power and advanced biofuels for transport.

58. ADB is mindful of the fact that energy poverty in urban and peri-urban settlements is often not given the same attention as rural energy poverty. While it is common to have a programmatic approach to addressing rural energy needs, such as an electrification strategy and a specialized agency to promote and facilitate improved access to modern energy services, including clean cooking, the same attention is often not given to energy poverty in urban and peri-urban areas. The rates of rural-urban migration are high in many DMCs. This results in growing informal settlements and slums within and around cities with inadequate access to legal and safe electricity connections and clean cooking and heating solutions. ADB will support DMC efforts to eliminate urban energy poverty, including support for clean heating and cooling systems using renewable energy to support the urban poor while reducing pollution.

59. Household indoor air pollution is one of the leading causes of disease and premature death in the developing world. In partnership with local civil society organizations, ADB is ready to participate in pursuing substitutions of inefficient biomass cooking stoves for modern, clean cooking stoves or for those using gaseous alternative fuels such as liquified petroleum gas and pellet gasification. ADB also recognizes that it is important to consider electricity for cooking (rice cooker, induction cooker) when analyzing and designing rural and urban electrification projects. The deployment of electric cooking necessitates higher load carrying capacities for distribution networks or off-grid systems than if the system is designed only for lighting needs and powering small appliances, and is not technically feasible for the solar home systems and small mini-grids.

60. Many countries in Asia and the Pacific have long coastlines and large population centers by the sea. The oceans have a double significance for developing sustainable energy resources. The organisms they support, such as seagrass, seaweed, mussels, and starfish, can be used for food, feed, and biofuels, but the oceans are one of the main natural carbon sinks. Oceans also provide regenerative ecosystem benefits, such as those specifically targeted by ADB's Action Plan for Healthy Oceans and Sustainable Blue Economies. Marine energy can also be harnessed for electricity by exploiting tides and waves or differences in sea temperatures and salinity although these technologies are mostly pre-commercial.[22] ADB

[22] Offshore wind is a mature industry in developed countries, and is in the early stages of commercial deployment in Asia and the Pacific; the only deployments so far are in the PRC. Offshore wind and other offshore renewable energy are eligible for ADB assistance. ADB will continue to support commercially-proven technologies and systems, with selective support for pilot or prototype operations resulting in commercial deployment and scale-up.

will encourage such initiatives and provide technical assistance to DMCs willing to pursue these paths for developing the energy potential of oceans. However, both of these suggested paths are at an early stage of research, development, and piloting.

61. Women are disproportionally affected by lack of access to clean and modern energy services, and ADB remains committed to ensuring gender equality in its energy sector operations, as indicated in the operational framework for OP2 of Strategy 2030. [23] Services enabled by modern energy in both rural and urban environments have a major impact on citizens' day-to-day lives. The services prioritized in ADB-supported interventions should consider their potential to empower women, such as through opportunities for earning and for the education of women and girls. ADB will develop comprehensive approaches to increase and promote women's productive use of electricity, through provision of knowledge and skills on how to use electricity for income generating activities with access to credit for business development. ADB's project designs should take into account women's participation and will act to prevent their exclusion from crucial decision-making related to project activities by the implementing agencies and project beneficiaries, such as by village and township authorities and community-based organizations. ADB will promote energy-based livelihood and employment for women in project installation, maintenance, and operation, as well as encourage female entrepreneurs as private sector partners for the project activities.

Wrestling with Challenges

62. Delivering energy services, either by extending the grid or building mini-grids, to remote and difficult-to-reach communities presents not only technical and maintenance challenges but also economic challenges. Therefore, strong public sector support is needed to create awareness, build up a market, and develop the local ecosystem of associated entrepreneurial activities. Although many DMCs have well-established subsidy schemes for electrifying unserved populations, the last mile brings even greater challenges, challenges, including relatively low electricity usage per connection and relatively high electrification costs, leading to greater financial risks for such investments. In urban areas, the economic risks are exacerbated by the fact that areas that are not connected to the grid are often poor informal settlements where house occupants do not own land, houses may not be legally registered and are even at risk of being demolished in the future.

63. There are examples from within the region of possible ways to address these economic challenges. For example, a range of financing solutions have been tested in the region to support electrification through solar home systems and microgrids based on renewables and integrated battery energy storage. These solutions include micro-credits for equipment and appliances or fees for services that can be paid through various methods, including prepaid card payments or mobile phone applications. The private sector can play a major role in the customer interface by supplying equipment and appliances as well as offering financing.

64. Mini-grids can significantly improve gender equality and contribute to women's livelihoods and resilience to climate change. In ADB-supported mini-grids projects, gender mainstreaming should be done in all phases of project development: consultations and planning, construction, operation and maintenance, and end use of electricity. For example, involving women in community consultation for mini-grid planning taps into their knowledge about the natural resources and their potential electricity demand for mini-grid sizing. During

[23] ADB. Operational Priority 2: Accelerating Progress in Gender Equality. September 2019. Manila.

the operation and maintenance phase, women can play a supporting role in the administration of the mini-grid operations, or have a seat in the management committee, bringing the women's perceptive on board.

65. In alignment with its commitment to SDG 7, ADB seeks to ensure it is equipped to support actions to increase the adequacy and stability of electricity supply to grid-serviced low-income communities and enabling market-driven off-grid systems. Where there is an opportunity and DMC demand, ADB will engage with other development partners and civil society organizations to support DMCs with technical assistance and grants, results-based lending, or other appropriate financing modalities to set up investment programs for last-mile electrification and the provision of clean cooking.

2) Building a Sustainable and Resilient Energy Future

66. Strategy 2030 underscores the point that ADB's vision of a prosperous, inclusive, resilient, and sustainable Asia and the Pacific hinges on the success of the region tackling climate change, enhancing environmental sustainability, and building climate and disaster resilience. If the current trends of climate change are not addressed, this region will be one of the hardest hit by the effects. Climate change heightens the risks of exceptional weather phenomena occurring with increased frequency and greater magnitude, including cyclones, floods, landslides, droughts, and heat waves. Pacific countries, many small island states, and some areas in South Asia are the first to encounter the impacts of rising sea levels resulting from warming trends. Furthermore, many Asian DMCs are in seismically active regions and, therefore, are faced with the ever-present risk of earthquakes and tsunamis. Finally, while combustion of fossil fuels is the primary source of the GHG emissions that cause global warming, it is also the main source of conventional air pollutants, which result in immediate and lasting harm to public health and ecosystem services. These risks are already materializing and thus undermine the steadiness of the development efforts and pursuit of well-being in the region's DMCs.

67. All energy sector investments will comply with ADB safeguards policies regarding the environment, involuntary resettlement, and indigenous peoples to ensure that affected persons are protected from impoverishment risks and development programs for such vulnerable groups are incorporated and implemented. In particular, energy sector projects will need to uphold safeguards to avoid, minimize, mitigate, and offset the adverse environmental impacts.

68. ADB's direct response to the risks resulting from unsustainable energy systems will be:

i. to improve energy efficiency across energy supply and consumption chains,
ii. to accelerate the deployment of renewable energy,
iii. to pursue strategic decarbonization and rapid phase-out of coal around the middle of the 21st century, and
iv. to increase the resilience of energy infrastructure.

These actions support the transition to sustainable, lower-carbon, and resilient energy systems.

Improving Energy Efficiency

69. Harnessing energy efficiency is one of the most effective ways to meet growing energy demand and decrease upward pressure on energy prices while addressing climate change. The costs of deploying proven energy efficiency measures are normally lower than adding new supply or generation capacity. The potential of energy efficiency in Asia and the Pacific remains high, and many of the regions' large DMCs have taken determined measures to systematically address energy efficiency in their policies and regulation and have thus demonstrated declining energy intensities. ADB aims to become a leader in Asia and the Pacific for energy efficiency by utilizing innovative financing instruments and leveraging private sector resources.

70. The success of the quest for demand-side energy efficiency depends largely on policy actions in the public sector. ADB stands ready to provide the DMCs with technical assistance, grants, and loans to set up legal and regulatory framework, policies and programs that support energy efficiency and to develop incentive mechanisms for consumers, utilities, energy service companies and other market players to increase efficiency. ADB stands ready to support DMCs to resolve both downstream and upstream barriers to energy efficiency with respect to their national circumstances and to realize the long-term gains of energy efficiency. In particular, results-based loan instruments can be deployed to support DMCs in scaling up their energy efficiency programs.

71. ADB will also seek to support energy efficiency in its DMCs by collaborating with industry associations, banks, and specialized energy efficiency agencies, including through loans for onlending under the financial intermediary loan instrument. Funneling programs through such locally based entities and combining financing with capacity building and technical assistance can help reach the scattered opportunities in the industry, commercial, and residential sectors and to induce the necessary behavioral changes for energy conservation.

72. Energy efficiency targets and plans should be thoughtfully designed to meet the needs and enforcement structures of the individual DMCs. International references and best policy practices for energy efficiency measures are available. Those include, for instance, minimum energy performance standards set for appliances and equipment, fuel economy standards for vehicles, standards for electric motors in industry, mandatory energy audits and energy management policies for large industrial and commercial companies and building codes for various kinds of buildings. Codes, standards, and obligations, however, are not effective without properly planned enforcement mechanisms. Measures should also follow priority orders established by their effectiveness proven under local circumstances and consumer behaviors. They should take into consideration affordability in the targeted consumer group in light of trade-offs between the higher first costs of more efficient buildings, vehicles, appliances, etc., versus the benefits that accrue later through better energy efficiency.

73. Meanwhile, transmission and distribution loss and inefficiency remain a significant problem in many DMCs. ADB will continue supporting DMCs to increase supply-side energy efficiency and build on its experience in providing loss reductions in electricity transmission and distribution, including use of high temperature low sag conductors which can withstand higher operating temperatures, thus carrying higher power compared to conventional conductors. ADB also supports use of drones with advanced sensors for inspection and maintenance of transmission lines and identifying and mitigating risks in power distribution in advance. Moreover, ADB will support use of digital technologies such as smart meters to support demand side energy efficiency.

74. District heating through centralized heat production—often in combined heat and power plants or using waste heat, heat pumps, geothermal and natural gas, and through district or city-wide insulated distribution networks—is more efficient and cleaner than decentralized heating in buildings by smaller coal-based boilers. District heating for densely populated areas delivers higher energy efficiency, lower air-borne pollution levels, and more comfortable living conditions. Heating infrastructure is essential in most Central and East Asian DMCs. ADB therefore supports the construction, expansion, efficiency improvement, and rehabilitation of old district heating networks. Waste-to-energy plants can contribute to improved waste collection and sorting and is one supply-side option for centralized heat production.

75. The heating sector is today undergoing a transition as electricity and renewable energy have been introduced to the subsector to replace fossil fuels. This is leading to hybridized and distributed heating solutions that are connected to a network. ADB will work with the DMCs to support this transition. Heat pump technology is the key driver in the transition as it is powered by electricity, which is gradually becoming increasingly decarbonized and free from local pollution. Heat pumps can draw heat from a wide variety of sources, which is one of the technology's major competitive advantages. The most frequently used energy sources include outdoor air, building exhaust air, shallow ground geothermal, vertical heat wells, river water, sea water, city sewage water, industrial exhaust heat sources, and medium deep geothermal energy.

76. With growing economic prosperity and global warming, the demands for cooling buildings and maintaining cold chains in product deliveries are rapidly increasing in Asia and the Pacific. Air conditioners and electric fans globally represent one-fifth of the total electricity consumption of buildings. This escalating growth in the use of air conditioners causes stress and investment needs for electricity distribution and power generation and contributes to higher GHG emissions. To manage this process in alignment with the Policy Principle one, ADB is ready to support DMCs in devising policies and investment programs needed to introduce new technologies, including energy efficient air conditioners and renewable energy for cooling solutions. At the same time, energy efficiency measures should not lead to expanded use of fluorocarbons including hydrofluorocarbons (HFCs) for cooling, contributing to higher GHG emissions. Phase-down/phase-out of fluorocarbons and energy efficiency measures need to be coordinated across the life cycle of fluorocarbons.[24] ADB will support its DMCs in achieving the phase-down of HFCs as scheduled by the Kigali Amendment to the Montreal Protocol. As absorption chillers are driven almost entirely by heat, their cooling capacity does not contribute to the peak electricity demand. Therefore, many new solutions introduced for district heating are also applicable for cooling large buildings or driving district cooling systems for shopping malls, educational institutions, hospitals, hotels, and residential complexes. These include waste heat from industrial processes, solar collectors, and geothermal heat.

Accelerating Renewable Energy Deployment

[24] ADB is a signatory of the Initiative on Fluorocarbons Life Cycle Management. The life cycle management of fluorocarbons requires (i) development, manufacture, and use of refrigerants with zero or low global warming potential as an alternative to fluorocarbons including replacement of old cooling equipment (upstream), and (ii) recovering, recycling, and destructing the discarded fluorocarbons (midstream and downstream).

77. The energy sector transition to a low-carbon pathway includes coal being replaced by renewable primary energy sources in electricity production. In parallel, electricity will also increasingly replace fossil fuels as an energy carrier in the final energy consumption. This two-fold strategy focuses on expanding the capacity of the power sector while ensuring a transition to sustainable power supply. This will require increased investments in renewable electricity generation capacity and ensuring the ability to integrate more variable renewable electricity into power systems.

78. Final energy consumption remains dominated by direct use of fossil fuel, with limited share of electricity in final consumption, reflecting that industry accounts for the largest share in total final consumption. Many industrial processes are difficult to decarbonize, including those requiring very high temperatures that cannot be met by heat pumps or solar thermal and those requiring fuel to contribute to a chemical process. Therefore, decarbonization solutions must include interventions beyond the power sector to decarbonize the various direct uses of fossil fuels through modern electricity-based processes and green hydrogen. As such, in parallel with supporting a decarbonized power system, ADB will support knowledge sharing and demonstration of these new technology options for the more difficult to decarbonize industrial segments.

79. ADB will support a transition to cleaner power systems by supporting accelerated deployment of renewable energy including sustainable hydropower,[25] solar PV installations and concentrated solar facilities for power, solar energy from collectors to heat, and on-shore and off-shore wind power. In addition to wind and solar, long-term decarbonization targets are expected to require investment in a wide portfolio of technologies, including sustainably sourced bioenergy for fuels and power and geothermal energy for heating and power. ADB also recognizes the importance of next-generation renewable energy technologies, such as technologies that harness tidal and wave energy, for meeting the targets under the Paris Agreement, and will support their deployment in ADB's DMCs.

80. ADB's approach to supporting large hydro power plants (including pumped storage) with seasonal storage reservoirs with multipurpose benefits will be highly selective. ADB will only support large hydropower schemes that have been evaluated as part of a robust strategic environmental and social assessment that has considered both alternative locations and designs. This assessment will need to have been informed by current environmental and social baseline data, with particular attention paid to assessing cumulative impacts on aquatic and terrestrial ecology and affected communities. At a project level, independent environment, social, and dam safety experts shall be involved from the start in project design and implementation, with particular attention paid to ensuring eco-sensitive design, such as an ecologically led e-flow assessment and the inclusion of fish passes, ecological offsets, compensation for land acquisition and resettlement, and livelihood restoration in accordance with ADB's safeguards as well as international good practice for large hydropower. In view of the number of ageing hydropower plants in the region and the associated risks, ADB will support DMCs in rehabilitating or replacing electrical, mechanical, and electro-mechanical equipment in these facilities.

81. ADB will support the deployment of various kinds of energy storage, be it for electricity or heat, increasing demand-side flexibility and system capacity to integrate variable renewable electricity into the systems. The declining cost of storage technologies, especially

[25] Sustainability of hydropower can be assessed with the Hydropower Sustainability Tools governed by a multi-stakeholder body, the Hydropower Sustainability Assessment Council.

battery energy storage system, allows for applying the technology to smooth the load curve of renewable energy generation, provide peaking and reserve capacity, and help maintain frequency. This helps critical services continue operations and thus replaces diesel-powered generation sets. Behind-the-meter household batteries also contribute to managing peak demand, improving load factor, and reducing network congestion. It is noted, however, that use of battery energy storage system will lead to a build-up of used batteries over time, a hazardous waste, which most DMCs do not have the capacity to dispose of. Left unaddressed, this could well become a major environmental issue. Therefore, as ADB supports energy storage, it will also offer support to DMCs for developing battery waste management systems at both policy and operational levels.

82. ADB will support waste-to-energy investments provided that the feedstock for combustion prudently follows the waste management's order of priority, which considers first reducing waste generation, then opportunities for materials re-use and recycling, then using waste to generate energy or basic material (such as in civil construction), followed by landfilling as the last option. Support for waste-to-energy investments and waste value chains, as they provide an opportunity for integrated cross-sectoral projects that can create sustainable livelihoods for the poorest-of-the-poor working in the waste value chain and at landfills. Waste-to-energy investments also improve local environments and health in cities and rural areas, by removing the environmental hazards caused by open waste dumping. Potential environmental and social impacts of waste-to-energy investment can be managed through appropriate design and operation using international best available technologies. A detailed guidance note will be issued to staff in processing waste-to-energy projects.

83. ADB's safeguard policies help DMCs to address environmental and social risks in energy projects and to minimize, mitigate, and avoid adverse project impacts on people and the environment. The low-carbon transition will increase the amount of solar and wind energy in use. It will also expand electricity transmission networks and set new requirements for mitigating projects' environmental and biodiversity impacts and sensitivities, which differ from those of past fuel-based projects or hydropower. Solar, wind, and transmission projects, for example, have little effect on inland waters, but they cover more expansive areas of land and sea and have an impact on birdlife. Most risks can be mitigated and avoided through effective early planning, ensuring developments will be sited at areas or zones of low biodiversity and other sensitivities.

Role of Specific Energy Sources

84. Coal consumption accounted for 43% of final energy use in industry in Asia and the Pacific in 2019. The projections of international agencies for carbon neutrality by the middle decades of this century include assumptions of (i) rapid transition of power systems to renewable energy, (ii) increased use of electricity in industry and transport; (iii) application of carbon capture, utilization and storage technologies to remaining coal and natural gas operations; (iv) shifting to the use of hydrogen and hydrogen-derived synthetic fuels; and (v) using more sustainable alternative fuels and feedstock such as bioenergy.[26]

85. ADB will supports DMC in preparing long term energy plans, roadmaps, strategies and policies, that include the rapid phase-out of coal from their power generation subsector

[26] International Energy Agency. 2020. Energy Technology Perspectives 2020. Paris.

as part of long term climate strategies. ADB will encourage plans that are strategic, goal-based, and time-bound and underpinned by a systematic analysis of technological options, costs, and social and environmental impacts. Such plans should include three key quantitative and timebound targets: (i) decreasing CO2 emission intensities; ii) peaking of CO2 emissions; and iii) achieving carbon neutrality. ADB will seek to identify and finance priority investments arising from these long term plans.

86. ADB will not finance any coal mining, oil and natural gas field exploration, drilling or extraction activities. ADB will not finance any new coal-fired capacity for power and heat generation or any facilities associated with new coal generation. ADB will support DMCs to mitigate the health and environmental impact of existing coal-fired power plants and district heating systems through financing of emission control technologies. However, ADB will not participate in investments to modernize, upgrade, or renovate coal facilities that will extend the life of existing coal-fired power and heating capacity unless it is to re-engineer such plants for use of cleaner fuels, such as natural gas or renewable energy sources. For re-engineering to natural gas, the project must demonstrate how it will contribute to a country achieving net neutrality by mid-century, such as through retirement or adoption of carbon capture, utilization and storage by that time. ADB will support DMCs in planning for early retirement of coal power plants and will support decommissioning of coal power plants and site redevelopment for new economic activity, including cleaning of hazardous materials, restoring soil and water, redevelopment of the buildings, and upgrading existing infrastructure. In providing support for coal phase out, ADB will support new job creation in cooperation with the local communities and stakeholders. The development of an approach for just transition will support ADB in this development.

87. ADB may finance natural gas projects (including gas transmission and distribution pipelines, LNG terminals, storage facilities, gas-fired power plants, natural gas for heating and cooking) when the following conditions are all met: (i) provides energy services to those who currently are without said energy service or will provide a more modern means of providing the same energy service (e.g., natural gas stoves to replace traditional biomass stoves or natural gas power to provide last-mile electricity); ii) demonstrates that no other technology can provide the same energy service at an equivalent economic cost that considers the social cost of carbon (i.e., natural gas power would be compared to renewables plus storage to provide the same level of service); iii) uses high-efficiency and internationally best available technologies for new plants, retrofit or fuel switching, replacement, energy efficiency improvement, or heating projects; (iv) for natural gas power generation, will result in a net reduction in grid emission factor (e.g., natural gas or replacing diesel or coal power); and v) demonstrates alignment with targets to achieve carbon neutrality by mid-century, avoiding long-term lock-in into carbon infrastructure and significant risk of creating stranded assets. ADB will define sound screening criteria for other fossil fuel-generation projects, notably natural gas. A detailed guidance note will be issued to staff.

88. ADB may participate in financing projects with hybrid electricity solutions involving fossil fuels as backup systems together with renewable energy for isolated grids, remote areas, and in fragile and conflict-affected situations when the following conditions are all met: (i) configurations without fossil-fuel backup are not technically viable; (ii) standalone renewable energy and storage systems without fossil-fuel backup is not economically viable; and (iii) there is a clear plan to reduce the system's dependence on fossil fuel by enhancing renewable energy and/or renewable energy storage solutions over time.

89. ADB will continue providing capacity development, technical assistance, and advice

on enabling regulatory measures in support of DMC programs to identify and remove hurdles to the development, demonstration, and commercialization of carbon capture, utilization, and storage technologies. Realizing the crucial role of these technologies in the long-term, particularly for the difficult-to-decarbonize industry sectors, ADB will support carbon capture, utilization and storage investments for power plants and industries. ADB will not finance carbon capture, utilization and storage in the context of enhanced oil recovery.

90. Liquid and gaseous fuels and energy carriers represent another important avenue for providing a stable supply and storing energy from various renewable energy sources, including sustainably sourced biomass, waste, and variable renewable electricity. In the future, sustainable biofuels, and synthetic fuels based on carbon capture or hydrogen, may also provide alternatives that can replace the use of fossil fuels in various industries. ADB will support such advanced biofuels in DMCs to reduce their dependence on oil and their transport sector emissions.

91. ADB will not finance investments in nuclear energy. Despite its ability to provide low-carbon baseload electricity, nuclear power development faces many barriers, such as public acceptance, risks related to nuclear proliferation, waste management, safety issues, high investment costs and long time needed for preparation and construction. As a result of these barriers, there is not strong demand among DMCs for ADB to support this technology.

Increasing the Resilience and Efficiency of Electricity Infrastructure

92. Electricity infrastructure is a lifeline system. It is essential for the most critical services that societies provide, as well as for the daily functioning of people's lives, economic activities, and public services. Managing climate change and disaster risks calls for careful attention to resilience and requires strong awareness and quantification of risk in power system planning, including risks stemming from climate change, disasters triggered by natural hazards, malicious attacks, and human errors, and assessment of the net benefits of investments in resilience to help inform power system planning.

93. ADB has decades of financing experience in developing robust power transmission and distribution (T&D) infrastructure. ADB's assistance in transmission and distribution helps DMCs improve the reliability of the electricity supply, connect additional supply capacity to the grid, reduce technical losses, power theft and reach outlying and previously unserved regions. ADB will support deployment of digital technologies including smart meters to reduce technical and commercial losses and encourage demand side energy efficiency, peer to peer trading using blockchain technology for energy markets, AI for predictive grid management and resilience leveraging on the availability of 5G telecommunication networks.

94. For many DMCs building resilience means a serious consideration of the trade-off, due to funding constraints, between building greater climate and disaster resilience versus expanding the network to reach additional households. Many advanced economies of the region have developed, for example, high levels of grid redundancy or shifted from overhead lines to underground cabling at high cost to enhance their disaster resilience. Such measures may not be within the reach of DMCs where there is an imperative to invest in extending services to those lacking it or strengthening the grid to tackle serious service deficits. However, not investing in resilience measures can lead to higher costs due to infrastructure failure and the rebuilding requirements after extreme events.

95. ADB will support DMCs in building higher resilience for the transmission and

distribution subsector, which is at the forefront of combating the effects of disasters triggered by climate change. Electricity supply is a uniquely critical enabler across all other infrastructure sectors. This makes it also a uniquely vulnerable target of cyber-attacks as well as disasters triggered by natural hazards. The ever-increasing dependence on electricity, such as in cities, combined with the increased climate and disaster risk, translate to a heightened need for system-wide resilience, i.e. the grid's ability to withstand disruptive events, limit their impacts, adapt to their consequences, speedily recover, and re-establish the electricity service. This will require undertaking climate and disaster risk-informed system-wide planning of the energy sector, integrating structural and non-structural resilience features in energy infrastructure design, construction and operations and maintenance, and strengthening disaster preparedness for energy sector.

96. In working with the DMCs, ADB will also pay attention to the long-term impacts of climate change. Such impacts include hydrological changes, accelerated growth of biomass with consequences for renewable energy production, and the increasing number of hot summertime days causing stress to the electricity system by high system peak and cooling energy demands. ADB will support DMCs in integrating assessments of such impacts and consequent investment considerations in their long-term energy supply strategies and National Adaptation Plans.

97. ADB will encourage the utilities and transmission and distribution companies to incorporate recent advancements in grid technology and to consider emerging demands, such as greater variability in load flows due to variable renewable electricity, in their planning of transmission and distribution subsector projects. ADB supported projects may therefore consider advanced conductors, dynamic line ratings, advanced grid control systems including anti-blackout technology, various demand response mechanisms, on-grid electricity storage, distributed generation, cyber security and digital smart grid solutions, which are among the available options to increase grid reliability, flexibility, and resilience. ADB will support energy utilities to address their environmental liability as transformers in some DMCs may still contain Polychlorinated Biphenyls (PCBs) that need to be removed from service or dechlorinated by 2025 and disposed of by 2028 under the Stockholm Convention. In addition, ADB will support DMCs to set up emission control standards and encourage use of alternatives to use of sulfur hexafluoride (SF6)—the most potent greenhouse gas—in gas insulated switchgear substations.

Ensuring a Just Transition

98. The transition to a carbon-neutral economy will affect every aspect of how we produce goods and provide services, particularly in conventional energy industries, and will considerably affect workers and communities, as well as future jobs and required skills. Planning for a just transition will be critical in managing this process to mitigate negative socioeconomic impacts and increase opportunities associated with the transition, supporting affected workers and communities, and enhancing access to sustainable, inclusive, and resilient livelihoods for all. ADB will support DMCs to undertake transparent and inclusive planning and policies for a just transition that involves all relevant stakeholders and affected groups at all stages of the energy transition.

3) Policy Principle 3: Engaging with Institutions and Framing Policy Reforms

Supporting Institutions

99. Whether focusing on rural electrification, energy efficiency or integrating more renewable energy to the grid, the desired outcomes of policies and plans can only be achieved if DMC institutions and sector utilities and companies are financially healthy, operationally efficient, and their human resources are equipped for the tasks in hand. ADB will continue to help DMCs perform institutional reforms, build capacities, and advance sector restructuring by bringing expertise and best practices to guide the reforms and strengthen energy sector institutions.

100. ADB will help DMCs improve governance and create an enabling environment for sustainable growth by strengthening the quality and capacity of energy sector institutions to undertake policy reforms. In doing so, ADB's energy sector reform activities will be carefully tailored and sequenced to achieve the desired policy outcomes, taking into consideration the political and economic contexts of DMCs. The reforms will target good governance and efficiency of operations, ability to implement and attract investments in the sector by removing price and other distortions, and financial independence and sustainability of the sector utilities and companies. In consequence, the reforms should lead to measurable improvements in energy supply security, quality, affordability, resilience, and environmental sustainability.

101. ADB will encourage the energy sector institutions, utilities, and companies of DMCs to increase diversity and improve gender balance in their workforce by providing equal opportunities for women to serve as employees and advance their careers in the organization. ADB will also support energy sector institutions, utilities, and companies of DMCs to increase their corporate sustainability through introduction or strengthening of internal pollution control and waste policies and procedures, ensuring compliance with national laws and regulations; and strengthening internal labor and health and safety policies and procedures.

102. Addressing energy inequalities and accomplishing the energy transition will also require careful attention to the electricity distribution sub-sector entities and infrastructure. Electricity distribution utilities and companies are the primary contact point to the end-users of electricity, including consumers in the low-income and vulnerable groups. A great share of the deficiencies in service quality needs to be solved at the distribution level. Power distribution also needs to transform and modernize in order to meet the new demands for cooling, e-mobility, smart meters and eventually the internet of things to facilitate energy efficiency and integration of distributed renewable energy sources. ADB will support increased operational efficiencies and commercialization of loss-making distribution utilities. Furthermore, ADB will support introduction of performance-based regulations to incentivize and guide distribution sector natural monopolies to improve its operations.

Subsidy Reform

103. Energy subsidies represent an important policy challenge in the region. Fossil fuel subsidies help governments maintain regulated low prices on their domestic markets regardless of international fuel prices or the economic value of domestic fuels. Subsidies may include direct transfers to fuel companies, tax exemptions, subsidized credit, provision of underpriced public services, and bailing out bankrupt companies of fuel companies from state budgets and other forms of circular debt provisions. The second category is subsidization and cross-subsidization through differentiated electricity tariffs, most commonly provided by charging higher rates to large consumers and lower rates to household consumers.

104. Fossil fuel subsidies create market distortions, both across and within sectors, that

hamper investments in renewable energy and energy efficiency and a transition to sustainable energy systems. Furthermore, subsidies disproportionally benefit the more well-off population who consume substantially more fuels and electricity than an average or low-income consumer through their ownership and use of cars and various electric household appliances.

105. ADB will encourage DMCs to phase out fossil fuel subsidies and advise on tariff reforms designed to create sound electricity tariff structures and time-of-use pricing that reflect the full cost of the operations, promote energy efficiency, and penalize peak-hour and peak-season electricity consumption. When removing subsidies on electricity, lifeline tariffs may be introduced for vulnerable groups of consumers. In particular, it is necessary to incorporate dedicated support to female customers, particularly poor, marginalized, and female-headed households for whom connection charges may be prohibitive. Such social support should be recognized by regulation and funded through cross subsidies on other customer groups.

106. International experience shows that a comprehensive package of policies is necessary to ensure that fossil fuel subsidy reform leads to the right incentives and ultimately successful and sustainable policy change. A reform strategy ideally addresses the following: pricing mechanisms and institutions, the impacts of reform, and the political economy barriers. The strategy should include welfare measures to shield the poor and vulnerable from high fuel prices, independent pricing mechanisms, and public awareness and support campaigns through consultation and communication. The current period of low fuel prices would allow governments to pursue subsidy reforms with more fiscal flexibility and less resistance.

Private Sector Participation

107. The energy sector reforms of most DMCs have increased opportunities for private sector participation, particularly in the electricity generation subsector when renewable energy technologies have become increasing competitive. ADB public sector support to build smart and strong electricity grids will help to integrate renewable energy sources developed by private sector. Even though a fully open generation subsector with a competitive electricity market remains a rarity in the region, many DMCs have opened the subsector for private sector investments through regulated entry points, such as public-private-partnerships, renewable energy auctions, feed-in-tariffs, and independent power producers with long-term power purchase agreements. ADB will continue supporting public-private-partnerships and independent power producers as vehicles for attracting private capitals into the energy sector.

108. In this context, ADB will actively catalyze private investments in energy efficiency and renewable energy projects in the region through direct financing to companies, banks, financial intermediaries, and projects. To achieve this, ADB will use various tools, including loans and equity, credit enhancements, and risk mitigation instruments, such as in favor of foreign and local commercial banks lending to energy projects that contribute to sustainable, affordable, and secure energy supply in DMCs. ADB will provide policy advice and support for the preparation and structuring of projects. It will also provide transaction advisory services and assistance for drafting project agreements and managing the procurement processes. Through its participation in these processes, ADB will promote sustainability, integrity and transparency, high standards of corporate governance, gender equality, social and environmental safeguards, and address market failures without distorting the market.

109. ADB pursues the development of competition and private sector participation as these often lead to higher operational efficiency, cost-effectiveness, and better responsiveness to customer needs. Private sector actors are expected to contribute greater dynamism to the sector and be better geared to take advantage of opportunities created by new technologies and business models. The next generation of electricity market reforms should also focus on open access to transmission system and retail competition. ADB will offer support in the unbundling of vertically integrated utilities, corporatization of specific utility functions, securitization, asset recycling, and, if requested, the privatization of public enterprises created in the process. In particular, as part of the wider state-owned-enterprise (SOE) reform work pursued by ADB in DMCs, any project lending to an SOE including in the energy sector will require a dialogue on how to introduce SOE reforms. The government steering of the operations of natural monopolies particularly with respect to electricity transmission and distribution, requires strong regulatory bodies and enacting a carefully designed set of regulations. ADB is also positioned to support the DMCs in this context.

Greater Impact Through Sector-Wide Long-Term Planning

110. ADB will seek to increase the impact of its support to DMCs by giving priority in its financing of energy infrastructure to priority projects identified through rigorous long-term energy planning. Integrated resource plans, energy and power system masterplans, and consequent road maps and sub-sectoral plans create dialogue between DMCs and ADB, facilitate project due diligence, and reduce the project transaction cost and time as opposed to taking a reactive approach to DMCs' financing requests for infrastructure projects. Such long-term plans should be supported by strategic environmental and social assessment. For example, strategic environmental assessment of transmission or renewable energy master plans could help ensure that resulting projects are environmentally sustainable having considered location constraints upfront.

111. Given the recent changes in the energy landscape—including technological advancements, emerging new business models, and the more significant role of demand-side for system planning—ADB will encourage the adoption of a holistic approach in the energy sector that focuses not only on optimizing electricity supply but also considers how electricity and fuels are interchangeable for the evolving consumption patterns in industry, building (heating and cooling), and transport. It is particularly important to conduct independent energy planning at city or district levels, which will facilitate the development of integrated energy systems on the ground. Planning exercises should apply integrated resource planning techniques, use proven methods for optimizing long-term generation expansion and simulating short-term dispatch, and use geo-spatial planning for transmission. System optimization should internalize greenhouse gas and other emission costs in accordance with reputable consensus estimates and ADB guidance for such costs. System modeling should consider the systemic properties of variable renewable energy and incorporate flexibility measures to integrate variability.

112. ADB will increase its engagement with DMCs to support integrated energy planning. Decision making relies increasingly on technoeconomic assessment to inform policy development and to set national targets. Planning and simulation are not, however, a mere techno-economic cost-benefit analysis, but should also include constraints stemming from climate, sustainability, resilience, and social equity demands. The planning process should be a consultative one in its creation of various scenarios for planning, modeling, and testing,

and in setting criteria and indices for a multicriteria analysis of the results, which then leads to choosing the recommended way forward for the energy sector. ADB will also support an enabling institutional structure to deliver and implement such an integrated energy plan at a time the energy sector is increasingly decentralized and deregulated.

113. Sector-wide planning provides overarching goals for preparing sub-sectoral plans and targets. ADB encourages DMCs to develop consequent masterplans and roadmaps that include low carbon energy transition, rural and urban electrification programs, energy efficiency and conservation masterplans, hydrogen development roadmaps, and others. ADB can provide technical assistance to DMCs to familiarize them with the best practices and lessons from countries that have reached demonstrable stages of piloting, for instance, renewables-based hydrogen infrastructure and related roadmap development. Sector-wide long-term plans valuably inform the dialogue between DMCs and ADB on policy design and institutional reforms, infrastructure financing, and improving the electricity markets.

114. National climate policies, including long-term climate strategies with goals of reaching carbon-neutrality by mid-century, are also being announced by a number of DMCs. In this context, ADB will continue and reinforce its assistance to DMCs in enhancing their climate ambitions. ADB will help refine energy strategies aligning with the goals expressed in the NDCs and long-term climate strategies and identify energy sector and cross-cutting projects that can translate climate goals into action. ADB will work with DMCs to mobilize skills, technology, and financing to implement priority projects. ADB has established NDC Advance as a dedicated technical assistance platform to continue its work with DMCs aimed at mobilizing finance, building capacity, and providing knowledge and other support needed to implement their NDCs. During the 2020's, DMCs will face two rounds of updating their NDCs. ADB will provide assistance in this process to refine energy strategies to align with the climate goals and to express the energy strategies in the NDCs.

Partnering to Shape National Energy Policies

115. ADB is committed to providing DMCs with support for the creation of enabling policy frameworks for the provision of affordable, reliable, and sustainable energy and to manage the energy transition from fossil fuels to low-carbon energy. The energy landscape is changing ever more quickly, and policies must be adjusted to integrate emerging new technologies and business models while also considering specific circumstances of countries and maintaining an appropriate degree of stability to ensure investor confidence. Strategic approaches and policies will also be needed to ensure a just transition in the energy sector by addressing the socioeconomic consequences of efforts to transition away from fossil fuels. ADB will support DMCs in exploring this issue, particularly with respect to how improving the sustainability of energy systems can create new opportunities for employment and entrepreneurial activity.

116. The possible selection of policy measures is extensive and ranges from technology neutral policies, such as carbon trading and tax, to highly specific regulation aimed at individual technologies, such as building codes for energy efficiency or feed-in tariff for the accelerated deployment of on-shore wind power. International experience provides ample references of successful and failed policy measures for DMCs to draw on in their policy design. Several examples confirm that seemingly small weaknesses in details of regulation may cause policy measures to fail.

117. ADB is committed to continuing its support for enhancing the use of carbon pricing

instruments in the region. Carbon pricing is an integral element of the broader policy architecture and can be implemented in tandem with other policies such as removal of fossil fuel subsidies. Clear and predictable carbon price signals in domestic and international markets can enhance the economic viability of low carbon technologies and help ADB's DMCs in achieving climate targets articulated under their respective NDCs cost effectively.

118. Carbon price signals can be achieved through carbon taxes, emissions-trading systems (ETS—cap and trade) and international offset mechanisms. Carbon pricing can be effective in raising domestic revenues (carbon tax or ETS) as well mobilizing international carbon finance to incentivize investments in advanced low-carbon technologies (international offset mechanisms). If designed and implemented appropriately, robust carbon pricing instruments can be effective in achieving energy transition by accelerating diffusion of advanced low carbon technologies, enhancing deployment of renewable energy technologies, e-mobility, incentivizing fuel switching and use of different forms of non-fossil fuel energy.

119. Carbon finance mobilized through any of the bilateral, regional, or international carbon markets can alleviate financial barriers and facilitate cross border trade of electricity, enhanced share of renewables in the overall electricity supply mix, and foster regional integration. Momentum is growing for the use of carbon pricing instruments in the region, including domestic and bilateral as well as international carbon markets. ADB has a long-standing engagement with carbon markets, providing technical capacity building and mobilizing carbon finance to support GHG emission mitigation activities in the region. ADB will continue to adopt a holistic approach by mobilizing international carbon finance through its trust funds and provide technical support for policy development, capacity building, and strengthening institutional infrastructure for enhancing DMCs' ability to participate in and take advantage of emerging carbon markets.

120. Deployment policies are purported to accelerate investments in potential new technologies through various kinds of financial incentives. These include, for example, feed-in-tariffs, renewable energy auctions, tradable certificates, tax incentives, and investment grants. These are typically applied to the power sector. In the transport sector, the most common mechanisms are quotas, blending obligations, and mandates related to the use of ethanol, biodiesel, advanced biofuels, drop-in liquid fuels, synthetic fuels, and biogas. These mandates drive the fuel producers, blenders, or distributors to sell these products to a certain share in their total portfolio. In particular, ADB through technical assistance can support piloting these technologies in DMCs crowdsourced through ADB's open innovation platform (challenges.adb.org). ADB has also established ADB Ventures Investment Fund to support impact technology startups and leverage ADB's operational networks and industry expertise to generate technology pilot opportunities in DMCs.

121. ADB will help DMCs formulate new types of policy measures and regulations, which are needed as the reduced cost of wind and solar PV electricity increases the share of variable and intermittent electricity supply as well as distributed generation in electricity systems. Commercially, increasing share of variable renewable energy would require power utilities to adopt new business models to ensure their financial health. Technically, the integration of renewable energies into existing systems calls for the reinforcement of ancillary services through energy storage, digitalization, and other innovative technologies as well as grid management. Increased system flexibility is a property of the whole power system rather than its components. Creating flexibility therefore depends on a wide array of factors and requires the cooperative operation of assets by different independent entities in the power

system, including power producers, district heating utilities, large consumers, grid owners and operators, market exchanges and single-buyer hosts, and government agencies. The challenge of regulation is to navigate this complex landscape in order to effectively mobilize the flexibility resources.

122. ADB will help DMCs plan and implement improved electricity market designs that enable short-term efficiency through competitive and optimized dispatch and long-term efficiency with sufficient price signals and incentives for investments in new resources to ensure capacity adequacy. In doing so, particular attention will be paid to the market design to avoid large fluctuations and sharp spikes in prices. ADB will also support DMCs in building institutional and technical capacities to operate the improved electricity markets.

4) Promoting Energy Security and Regional Cooperation

123. Fostering regional cooperation and integration is one of ADB's seven operational priorities under its Strategy 2030. In addition to supporting bilateral economic cooperation, ADB has supported subregional economic cooperation platforms such as the Greater Mekong Subregion Program, the Central Asia Regional Economic Cooperation, and South Asia Subregional Economic Cooperation Programs and has engaged with Association of Southeast Asian Nations and countries in Northeast Asia. ADB's support for energy cooperation plays a significant role in all these contexts and has included power trade and natural gas pipeline projects.

124. ADB's support to DMCs on cross-border electricity trade has sought to address barriers and complexities in international and domestic politics and finance as well as technical and operational risks. Moving forward from bilateral cross-border trade to sub-regional competitive markets has proven particularly challenging. However, ADB will continue to advance cross border energy trade and markets through provision of knowledge and support for crucial intercountry dialogue in order to address political barriers and strengthen cooperation. Overall, intensified transboundary economic cooperation contributes to maintaining and deepening peace and stability in the region.

125. Cross-border interconnections and long-distance high voltage lines enable DMCs to tap into hydropower, solar, wind, and geothermal energy resources in remote areas and across borders. Larger balancing areas can allow for higher renewable electricity shares in the DMCs' power systems, reducing emissions of greenhouse gases and other air pollutants. Temporal complementarities in the production and consumption patterns between the trading countries create cost differences underpinning mutually beneficial energy exchange. Transboundary trading with electricity and grid services can also improve energy security and system stability and reduce generation costs and system losses. ADB will also advance demand side collaboration opportunities such as harmonization of grid codes and other energy performance standards.

126. In addition to technical assistance, ADB supports DMCs in cross-border and sub-regional electricity interconnection infrastructure development. To help DMC's meet their climate goals, ADB will prioritize projects that pursue the large-scale deployment of renewable energy resources and the integration of variable renewable electricity at scale to wide-area grids created electricity interconnection. ADB will refrain from supporting dedicated cross border transmission lines linked to coal-fired power plants.

127. The development of ultra-high voltage technology for both alternating and direct current electricity transmission, together with the rapid cost declines for solar and wind power, have extended the quest for large-scale development and utilization of hydro, wind, and solar resources to inter-subregional contexts. ADB will continue to encourage subregional interconnectivity initiatives in Central Asia, Southeast Asia, and South Asia. At the same time, ADB will also recognize the emerging possibilities for extended interconnectivity, among other Asia and Pacific interconnection initiatives, from Central Asia to South Asia and Central Asia to East Asia.

5) Integrated Cross Sectoral Operations to Maximize Development Impact

128. ADB will also continue to use a wide range of financial instruments to provide the most targeted and effective support for its DMCs. It will continue financing energy infrastructure and other interventions through financial assistance, primarily project loans, and associated technical assistance. These methods represent the traditional, proven, and most common mode of ADB support.

129. Other instruments, however, may offer particular value for achieving the energy sector reforms still on the agenda for many of the region's DMCs. The use of policy based lending is a long-standing modality to support a DMC's reform agenda, that has been increasingly used by some DMCs. Policy based lending can play an important role in supporting the energy sector reforms, commercialization, and enactment of new energy policies necessitated by more stringent climate commitments. Given the central role of disbursement-linked indicators in results based lending, energy sector operations can generate objectively verifiable indicators backing the results based lending modality, be it on the access agenda, emissions, energy efficiency, or the share of renewable energy. Consequently, when its assistance is requested by a DMC, ADB will seek to apply these instruments to maximize their use and benefits.

130. ADB will respond to the need to improve efficiency in supporting development programs that involve small and widely dispersed subprojects. Such subprojects are common in rural electrification, clean cooking, island energy supply, and demand-side energy efficiency programs, all of which this policy lends ADB's support to. ADB will apply the financial intermediation modality partnering with local banks and specialized financial institutions. In addition, ADB will collaborate with other development partners that have experience and presence in the DMC and the field in question. Through the broader aggregation of subprojects to a subregional level, ADB may also seek higher implementation efficiency on selected programs and with such technologies as cannot be applied in scale on the national level. In this context, ADB will cooperate with national banks and private financial institutions signed to Equator Principles[27] to ensure its goals are achieved.

131. Building on its strong track record of collaboration, ADB will coordinate and work with a range of development partners in the energy sector, including other multilateral development banks, international development agencies, multilateral and bilateral institutions, private sector entities, civil society organizations, community-based organizations, and philanthropic foundations in formulating policies, designing, implementing,

[27] The Equator Principles is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence and monitoring to support responsible risk decision-making.

and monitoring projects. In particular, with support of development partners, ADB established the Clean Energy Financing Partnership Facility to support the deployment of new, more efficient clean energy technologies, and support policy, regulatory, and institutional reforms that encourage clean energy development.

132. Through its activities with DMCs, ADB has accumulated a wealth of experience and knowledge base on energy sector policies, structural and institutional set-ups, project designs and implementation, financial modalities, technologies and innovation, as well as how all of these have been proven on-the-ground. ADB's interventions have been subject to systematic professional validation and evaluation against several criteria, most notably for their relevance, effectiveness, efficiency, and sustainability. From this basis, ADB supports the DMCs by producing research, knowledge products, manuals, and advisory services that convey the best practices and lessons learned for their energy sector development and transition. This complements the toolkits and staff guidance notes to enhance internal ability to better respond to ADB clients.

133. ADB will continue improving its processes to generate, capture, and disseminate knowledge, while also paying attention to collecting and documenting the valuable tacit knowledge accrued through its work. Knowledge will be shared internally so that staff can integrate it into day-to-day work. It will also be shared externally to help DMCs build their capacities to shape policies and regulations and to identify, assess, and implement programs and projects. ADB will expand and nurture its existing knowledge partnerships with bilateral and multilateral agencies and institutions, think tanks, academia, civil society organizations, and the private sector. It will promote knowledge sharing across the institution and communicate externally through capacity building and advisory services, publications, training, and workshops. ADB will also continue its dialogues on critical energy sector issues with DMCs, development partners, the private sector, and civil societies within the framework of the Asia Clean Energy Forum.

134. Strategy 2030 pledges that ADB will reinforce a One ADB approach, bringing together ADB's own diverse expertise and knowledge in a range of areas from across the institution, including collaboration and joint development of projects by public and private sector operations. Through better management of its own knowledge resources, ADB will be better able to develop integrated solutions that incorporate advanced technologies with support from sector and thematic groups.

135. Energy sector operations are coupled closely with other sectors and thematic groups, and this linkage must be understood as reciprocal. Firstly, energy services are part of the necessary infrastructure for society. They enable and provide critical support to economic activities, public services, and everyday life. When ADB addresses social and economic development challenges, the adequacy of energy supply and consumption is a part, small or large, of the equation. This inter-reliance can be easily seen in integrated solutions where the energy supply side is linked to multi-thematic end-uses.

136. ADB's energy operations encounter increasing proposals with development objectives in other thematic areas than energy but with a considerable need for energy sector contributions. Such may include developments for carbon neutrality communities, developing a sustainable tourism island, or a hybrid solar PV mini-grid designed to drive village water pumps for irrigation that will support agriculture, provide water for sanitation, cold storage for medicine in a health center, and cold chain for delivery of vaccines.

137. However, the energy sector is not just a means of tackling development challenges arising from other sectors or themes. It is the locus of a complex array of development challenges connected to pressing social and environmental needs. DMC energy sector policies, programs, and projects, motivated by climate commitments and supported by ADB, drive various consumer side responses. The challenges raised by responding to these policies and needs are multifaceted.

138. Deployment of electric mobility, for example, can be considered in the contexts of climate change, power distribution development, transport and urban planning, private sector participation, and social equity. ADB will support development of charging infrastructure to meet the requirement of electric passenger cars and electric buses in DMCs. Such charging infrastructure will be included in the power sector development plan, and prioritize use of renewable energy sources. In the long run, battery powered electric vehicles have the potential to serve as electricity storage capacity and interact with electricity grids to integrate more renewable energy.

139. Maximizing ADB's development impact in rapidly changing and interconnected energy sector will therefore require new and more comprehensive and cross-cutting approaches. The energy transition will bring with it projects that require ADB to integrate cross-sectoral perspectives to its interventions in a more sophisticated and holistic manner to the energy–transport and water–energy nexus through new technologies such as electric or fuel cell vehicles and solar water pumps. ADB will also provide support education, health, agriculture, and other sectors through deployment of energy technologies. ADB will meet the challenges of the changing energy sector by providing DMCs with its knowledge and expertise through cross-sectoral and cross-thematic teams to help design new policies and manage demanding projects with broad and complex environmental, social, and economic implications.

E. REVIEW OF THE ENERGY POLICY

140. A review of this energy policy will be conducted in 2025 to reflect the progress in energy technologies to support DMCs to enhance their commitments towards carbon neutrality. Accordingly, the specific guidance notes on energy sector operations (natural gas, large hydropower, and waste-to-energy) should be updated.

141. Implementation of Energy Policy requires adequate human and financial resources. The staff skills mix and technical capacity must be enhanced in energy policy reforms, energy efficiency and emerging new low carbon technologies. These requirements would be met by reprioritization of available staff positions and consultant positions under budget funds, and the Clean Energy Financing Partnership Facility, and technical assistance sources. The needed staff strength and other resources will be reviewed in 2025 to ensure ADB's effectiveness and ability to meet the requirements of DMCs in their long-term energy transition.

Appendix 1

Linkage between the Guiding Principles of Energy Policy and the Seven Operational Priorities of ADB Strategy 2030

Guiding Principles of Energy Policy	Support to Operational Priorities (OP)
1. Securing energy for a prosperous and inclusive Asia and the Pacific	OP 1—Addressing remaining poverty and reducing inequalities: provision of last-mile access for power, light, clean cooking and heating. OP 2—Accelerating gender equality: reducing persistent gender gaps, addressing gender inequality and reducing women's burden of care and unpaid work.
2. Building a sustainable and resilient energy future;	OP 3—Tackling climate change, building climate and disaster resilience, and enhancing environmental sustainability: through the increased use of renewable and low-carbon energy, achieve a planned and rapid phase-out of coal in Asia and the Pacific. OP 4—Making cities more livable: energy efficiency, renewable energy, and electric mobility, will help make cities more livable by improving ambient air quality. OP 5—Promoting rural development and food security: off-grid electrification and solar pumps to support agricultural activities to enhance food security in rural communities.
3. Engaging with institutions and framing policy reforms	OP 6—Strengthening governance and institutional capacity: support energy sector reforms, including strengthened regulatory frameworks and introduction of competitive markets, attract private sector investment, and ensure the long-term financial viability of energy entities.
4. Promoting regional cooperation to enhance energy security	OP 7—Foster regional cooperation and integration: promote regional cooperation through policy dialogue, knowledge sharing, and investments in cross-border energy trading to reduced greenhouse gas emissions and increase energy security.
5. Providing integrated solutions and cross sectoral operations to maximize development impact.	Supporting all seven OPs through integrated energy and cross-sector solutions to address more complex development challenges.