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Enabling Frameworks for Sustainable Energy Transition

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The Commonwealth Sustainable Energy Transition (CSET) Agenda encourages and promotes collaboration amongst Commonwealth member countries in the transition to sustainable energy systems and action towards achievement of the SDGs. It builds on the recognition at CHOGM 2018 of the critical importance of sustainable energy to economic development and the imperative to transition to cleaner forms of energy in view of commitments by member countries under the Paris Agreement. It is anchored on the following three key pillars drawn from the agreed outcomes of the inaugural CSET Forum in June 2019 and leverages existing programmes of the Commonwealth Secretariat:

- *Inclusive Transitions:* advocating equitable and inclusive measures for energy transitions that recognise and address impacts on economies, communities and industries.
- *Technology:* propagating advances in technology solutions and innovations as well as research and development for sustainable energy systems.
- *Enabling Frameworks:* supporting the development of enabling frameworks, including policy, laws, regulations, standards and governance institutions for accelerating energy transitions.

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Abstract

This paper examines enabling frameworks that encourage the investment needed for sustainable energy transitions, including policy, laws, regulations, standards, governance institutions and implementation tools. It recommends measures to accelerate transitions and suggests ways to overcome potential barriers, providing policy-makers and other key stakeholders with examples that might be replicated in Commonwealth countries to help achieve the Sustainable Development Goals and stimulate economic recovery in the wake of COVID-19.

JEL Classifications: O13, O16, Q01, Q48

Keywords: energy transition, sustainable development, low-carbon, investment, market reform

Contents

Abbreviations and Acronyms

CCS	carbon capture and storage
CO_2e	carbon dioxide equivalent
CSEF	Commonwealth Sustainable Energy Forum
°C	degrees Celsius
EU	European Union
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
LTSs	long-term low GHG emission development strategies
NDCs	nationally determined contributions
NEM	National Electricity Market (Australia)
SDGs	Sustainable Development Goals
UNFCCC	UN Framework Convention on Climate Change

Summary

During this twenty-first century global health, social and economic crisis, the pace of the sustainable energy transition needs urgent acceleration. The economics of the transition are such that low-carbon technologies are becoming increasingly competitive, risks are better understood[1] and investment in renewable energy is rapidly growing. However, strong political will and ambition by Commonwealth member countries is required to establish the enabling frameworks that set the policy, regulatory, economic and financial measures to further attract finance, scale up technology and lower costs. This will encourage the early action and investment necessary to achieve a low-carbon transition consistent with the Sustainable Development Goals (SDGs) and Paris Agreement.[2]

Policy frameworks set targets and develop the economic and financial instruments that provide direction and certainty in investment; regulatory frameworks provide the market rules and allow the integration of low-carbon technologies; and governance frameworks provide the oversight and enforcement to secure finance and low-carbon investment that align with the SDGs and the Paris Agreement and accelerate the sustainable energy transition. Commonwealth countries, especially now more than ever during the recovery from COVID-19, with the ability to do so and according to the circumstances of their own sustainable development, should adapt, adopt and implement these frameworks to ensure that investment in their economies is consistent with achieving the climate and sustainable development agendas and a sustainable energy transition.

Key recommendations

- Phase out of fossil fuel technologies and subsidies
  - Due to the declining costs of renewable energy and storage, Commonwealth member countries with the capacity to do so and least social costs and impacts should consider using either or both regulatory and economic measures to phase out fossil fuel technologies and subsidies.
- Renew ambition, align COVID, SDGs and Paris Agreement policies to give investment certainty
  - Declare a climate emergency.
  - Legislate absolute and binding net zero carbon dioxide equivalent (CO_2e) emissions, 100 per cent renewables, and economy-wide and sectoral targets.
  - Align and merge COVID-19 economic recovery stimulus measures with the mainstreaming of the climate and sustainable development agendas.
  - Make trade agreements conditional on this alignment.
  - Ensure revised nationally determined contributions (NDCs) are submitted and consistent with achieving long-term low greenhouse gas (GHG) emission development strategies (LTSs) and the Paris Agreement target of 1.5°C.
  - Invest in modernising and increasing energy efficiency (e.g. buildings, equipment and appliances), renewable energy, the electrification of industrial processes, heating and transport, energy storage, greening of gas networks, education and training, and low-carbon research and development.
- Reform energy markets
  - Ensure energy markets are open, competitive, transparent and flexible, so that they optimise the use of modern energy services and energy efficiency, allow the entry of new innovative technologies, for example, variable renewable energy, storage and green hydrogen etc., and permit new financial and business models to be integrated that further accelerate the sustainable energy transition.

1. Introduction

Transitioning to a low-carbon economy at the lowest social and economic cost is one of the major challenges faced by humanity today and made even more so during the global health and economic crisis caused by COVID-19. The energy transition brings uncertainties and challenges for all countries, but in particular those whose economies are heavily dependent on fossil fuel extraction and/or imports, in terms of future consumption trends, global investment flows, technology advancements and energy choices.[3]

> *…Let us be guided by our wish, our passion, to make a transition towards clean sources of power.*
>
> Deputy Secretary-General Arjoon Suddhoo, Commonwealth Sustainable Energy Forum, June 2019

Progress towards the energy transition is currently insufficient and too slow, as noted in the world leading scientific research journal *Nature* (Figueres et al., 2017), and is contributing to ecological collapse (ibid). Energy-related emissions have increased by approximately 1 per cent each year since 2015, which at current rates would see the world's 'carbon budget' exhausted by 2030 (IRENA, 2019a).

2. Review and findings

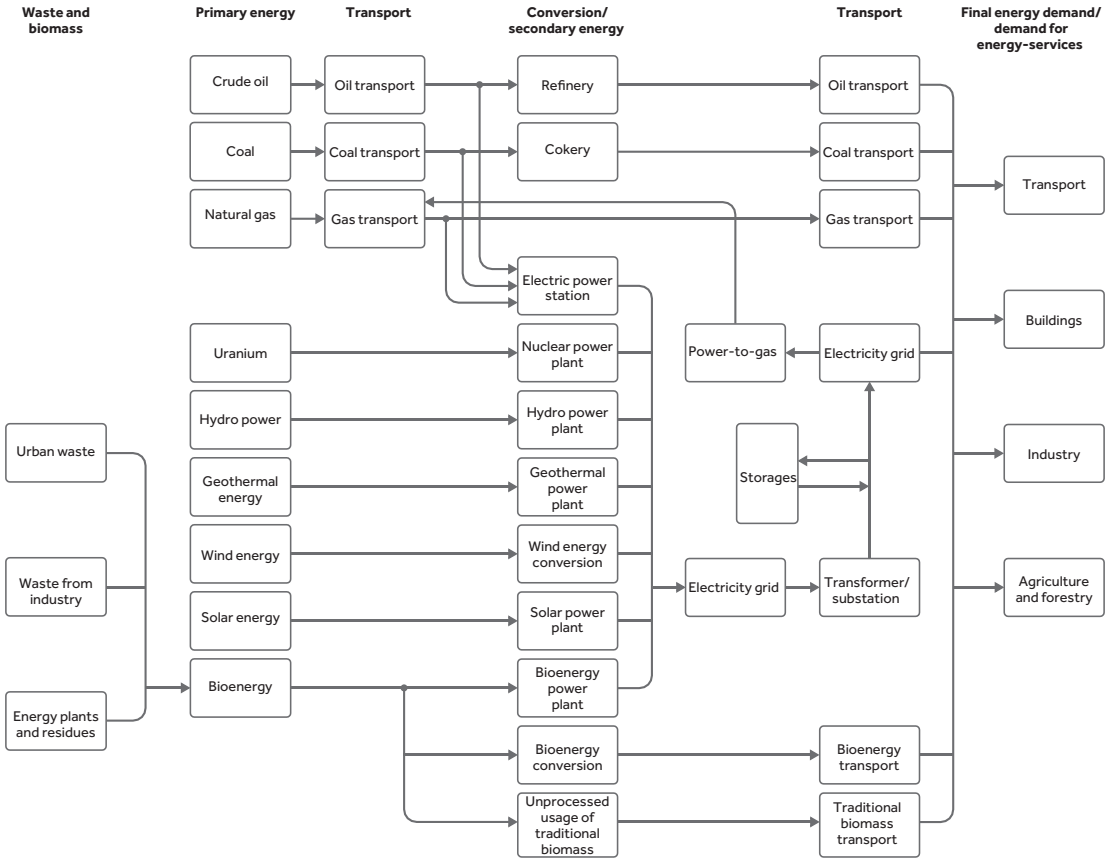
2.1 Energy systems

Energy systems are complex interrelated energy supply chains that have implications for the design of the enabling frameworks for a sustainable energy transition. They involve the production, conversion, delivery and use of energy (Figure 1), and also the underlying business and financial models. The enabling frameworks need to ensure that the energy systems not only deliver energy services, but also do this in a way that aligns with, and achieves, global and national policy objectives. The enabling frameworks must be holistic in their design, to be capable of encouraging the accelerated low-carbon transition of a country's energy systems. From an energy supply perspective, the energy transition involves a shift in primary energy sources[4] from an energy system historically dominated (˜81%) by the fossil fuels of coal, oil and gas to the fast-growing renewable energy sources of solar, wind, hydro and geothermal, for example.[5] The energy system converts these primary energy sources through power plants or industrial plants to generate secondary energy in electricity, heat, biofuels, and potentially synthetic gases and fuels based on hydrogen.[6] The energy is then transported and/or stored to meet the final demand for energy services in the residential, tertiary, buildings, industrial, transport and agriculture/forestry etc. end-use sectors.

Appropriate enabling frameworks can foster an energy supply that provides greater electrification and greater energy efficiency in the energy system through innovations, new technologies and technology transfer, and system improvements. The demand side of the energy system can be more engaged by influencing customer preferences, participation, and demand response and management, energy conservation, and behavioural change (e.g. choosing public transport over individual car use).

How the energy transition will take place and at what pace will be determined largely by the policy, regulatory and governance frameworks, including the incentives that are implemented and the underlying economics of the technologies involved. These influence the different roles and business and financial models of the key stakeholders, and how efficiently and

Figure 1. Physical components of a generic energy system supplying fuels and electricity (but not district heat) to end-users



Source: Diagram by Robbie Morrison, based on Figure 7.1 (page 519) in Thomas Bruckner, Igor Alexeyevic Bashmakov, Yacob Mulugetta, et al. (2014) 'Chapter 7: Energy systems'. In IPCC (ed.) *Climate change 2014: mitigation of climate change*. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press: 511–597.
Note: This diagram does not show the use of district heating.

effectively they participate in the global energy system (Table 1).

2.2 Optimal policy, regulatory and governance frameworks

Optimal 'good practice' policy, regulatory and governance frameworks create an enabling environment that delivers confidence and clear signals to attract finance and retain investment in energy businesses, technologies and the necessary measures to align this investment with SDG7 and the Paris Agreement's target of 1.5°C (Table 2).[7, 8] They also foster supportive infrastructure, energy and financial markets, and human capital, and accommodate innovation and change for the transition to a low-carbon economy.

Policy

In the case of the low-carbon transition, a policy framework may comprise policy statements, plans and targets. These provide short-, medium- and long-term coordinated and coherent direction to member countries to achieve the SDGs (energy access, clean cooking, clean cooling, renewable energy and energy efficiency targets) and the Paris Agreement (NDCs, LTSs and the 1.5°C target).[9]

The Paris Agreement, LTSs and the NDCs of member countries serve essentially as an overarching policy framework or 'blueprint'[10] of ready-made policies for the low-carbon transition. Many of the NDCs, however, were made prior to the finalisation of the Paris Agreement and are not sufficient to achieve the 1.5°C target (Höhne et al., 2020: 25–28). Further, these NDCs included conditional elements of finance and capacity that are reliant largely on developed countries and are, at this stage, not likely to be achieved. It is important then that subsequent revisions of NDCs, the first due in 2020,

Table 1. Key stakeholders of the energy system

	Key stakeholders
Energy companies	Oil and gas, electric utilities, renewables developers, service companies, technology and equipment providers, etc.
Industrial consumers	Chemicals, materials, metals and mining, mobility, manufacturing, etc.
End consumers	Residential, commercial
Policy-makers	Legislators, ministries of energy, environmental agencies, financial regulators, etc.
International organisations	International Energy Agency (IEA), International Renewable Energy Agency (IRENA), International Energy Forum (IEF), United Nations Climate Change (UNFCCC) Secretariat, Organization of Petroleum Exporting Countries (OPEC), Commonwealth Secretariat, etc.
Financial sector entities	Commercial banks, private equity, institutional investors, development banks, etc.
Cities	Mayors, city planners, mobility providers, etc.
Civil society	Academia, civil society organisations, philanthropists etc.

Source: Adapted from World Economic Forum with analytical support from McKinsey & Company (2018).

align with the Paris Agreement and the SDGs. It is only when global and national energy policies are more closely aligned that the magnitude of the gaps between the conditional elements of the NDCs and the finance and capacity pledged can be better understood and addressed.

If not already done, setting absolute short-, medium- and long-term, and not relative, CO_2e targets (for example, five-yearly carbon budgets, 50 per cent carbon reduction by 2030, carbon neutral by 2050 or earlier, with a high-probability and equitable 1.5°C trajectory) should be established as soon as possible.[11,12] This is because delayed action will result in a higher likelihood of overshooting 1.5°C, higher and longer-term economic impacts, the locking in of carbon-intensive infrastructure, greater emissions to be reduced, greater mitigation

Table 2. Benchmark indicators of policies and regulations that support achievement of SDG7

Target	Policies and regulations			
Electricity access	• Existence and implementation of electrification plan • Scope of electrification plan	• Grid electrification • Mini-grids • Standalone systems	• Affordability of electricity • Utility transparency and monitoring	• Utility creditworthiness
Clean cooking	• Planning	• Scope of planning	• Standards and labelling	• Incentives and attributes
Renewable energy	• Legal framework for renewable energy • Incentives and regulatory support for renewable energy	• Network connection and use • Carbon pricing and monitoring	• Planning for renewable energy expansion • Attributes of financial and regulatory incentives	• Counterparty risk
Energy efficiency	• National energy efficiency planning • Types of electricity rate structures • Mandates and incentives: utilities • Energy labelling system	• Energy efficiency entities • Mandates and incentives: large consumers • Financing mechanisms for energy efficiency	• (Net zero) building energy codes • Information provided to electricity consumers • Mandates and incentives: public entities	• Minimum energy performance standards • Carbon pricing and monitoring • Transport energy efficiency

Source: World Bank, ESMAP (2018).

costs, higher carbon prices, and greater reliance on carbon dioxide removal (Rogelj et al., 2018). The targets should be national and include sectoral (e.g. transport, industry, heating) renewable energy, job creation and individual company/organisation targets (scopes 1, 2 and 3).[13] This can provide the short-, medium- and long-term coordinated and coherent direction to member countries to achieve the SDG7 and the Paris Agreement 1.5°C targets.

The Commonwealth countries of Canada, Fiji, New Zealand, Singapore and the United Kingdom already have net zero carbon goals, along with Cyprus and Malta as part of the European Union (EU) and about 20 other countries. Also, Bangladesh, Canada, Cyprus, Maldives, Malta and the UK have declared a climate emergency, along with several other countries and the EU.[14] These actions also raise awareness and can be followed by education programmes and consumer behaviourial change programmes.

These can complement Green New Deal, New Social Contract and COVID-19 recovery stimulus measures that combine social welfare, economic development, employment and climate goals. An employment adjustment mechanism can be used to guarantee the employment of those whose jobs are transitioning or no longer exist and build equitable, inclusive and resilient economies.

Trade agreements can incorporate alignment with climate policies to assist in achieving Paris Agreement commitments, e.g. the free trade negotiations between New Zealand and the United Kingdom that are likely to support the achievement of New Zealand 's zero carbon bill and the UK's goal of zero carbon by 2050. This can be supported by carbon border tariffs or tax adjustments, such as the EU plan for a carbon price on imports which has been endorsed by the International Monetary Fund (IMF). Other measures include the lifting of tariffs/duties on, or providing tax exemptions to, low-carbon and climate-resilient equipment/products, encouraging foreign direct investment in low-carbon technologies, establishing a process whereby developing countries can access low-carbon technology patents, and fostering net zero finance that aligns all lending and operations with these climate policies (Pigato et al., 2020).

The heating and cooling, and transport sectors need greater policy focus, including their electrification using renewable energy, as currently the power sector receives the most policy attention and ambition (World Bank, ESMAP, 2018). For example, a study by the Renwable Energy Policy Network for the 21st Century (REN21) found that there are 143 countries with power regulatory policies, but there are only 70 countries with transport regulatory policies, and only 23 countries with heating and cooling regulatory policies. In response, some of the measures REN21 recommends are to create accessible market conditions, mandate for renewable heat technologies such as heat pumps, ensure electric vehicles maximise the use of renewable energy, undertake energy efficiency retrofits of housing and buildings, implement net zero building energy codes, establish fuel efficiency standards, encourage bans of fossil fuel, especially in heating and transport, and integrate planning among all energy sectors.

In recommending particular policies and measures, there is a need to recognise the divergent pathways adopted for the energy transition by Commonwealth member states and the challenges of sustaining economic growth and development. Developing countries, especially, may lack the resources and capacity to quickly make the transition, as they are constrained by a significant dependence on importing fuel or exporting extractive resources. They are also trying to alleviate energy poverty while curbing carbon emissions, but at the same time facing the risk of stranded assets[15] and the loss of stock market value and/or export revenues from their resources, for example, coal in South Africa and India. In comparison, developed countries like Australia, Canada and the United Kingdom may be better placed to lead the transition by mitigating risks and diversifying the energy supply to rapidly include more renewable energy, reduce emissions, transfer technology and assist developing countries to make their transition.

Also, there are interdependencies between countries that need to be recognised in bilateral cross-border energy trade, as they may present opportunities or barriers in energy transition to low-carbon economies. A coal mine in Australia may be supplying a power station in India, which may be importing equipment from China and exporting power to a grid that is interconnected to Bangladesh. The policies of one country may impact many others. For

example, a change of government in Australia may result in the closure of a coal mine, India may decide to increase domestic coal production, Bangladesh may decide to reduce planned coal power plant development from 41GW to 5GW, or China may decide to limit coal imports. Some phase out of fossil fossil investments may also be at the risk of investor-state dispute settlement if countries breach international investment obligations.

Finally, it is not just ensuring the implementation of these policies or measures, but also their timing. Early action and ensuring they occur with urgency, allows for them to be scaled and sped up as necessary and have the maximum impact in keeping cumulative emissions down.

Regulatory

Climate-related targets should be made binding through laws and regulations. This should be supported by complementary renewable energy portfolio standards, energy efficiency standards, mandates and quotas, and building codes (including a moratorium on gas connections for new housing/buildings). This will assist in reducing emissions from generation, transport (e.g. phasing out of fossil fuel vehicles and light trucks, and replacing air travel with train travel, where possible), equipment and appliances, and buildings. Energy markets should also undergo regulatory reforms to modernise and allow for greater adoption of low-carbon and least-cost technologies.

Laws and regulations should give greater certainty to the policy framework and express the rules for investment. Predictable and stable market and regulatory frameworks should be implemented or improved to remove barriers and encourage investments in, and reflect the economic value to the energy system of, renewable energy, battery storage, the development of distributed generation and mini-grids in areas not covered by national grids, and district heating and cooling systems. A pipeline of bankable projects could be established and approval of projects could be governed by legislating minimum emissions reductions or requiring retrofitting of existing equipment or technologies to ensure adequate or improved performance.

Finance

The policy and regulations of a country can influence the quantity and pace of available finance and encourage the introduction of innovative financial and business models. This can improve the ability to scale up renewable energy and energy efficiency and promote inclusive economic development and growth, secure and reliable access to energy, and environmental sustainability.

As discussed above, the LTSs and NDCs as implicit global policy frameworks must be aligned with the Paris Agreement. Therefore, all climate and development financing should also align with the Paris Agreement. There should be credible fiscal and financial regimes to encourage investors (whether they be individuals, communities, small-to-large businesses or institutions), the banks and capital markets to mobilise and scale up lending and investments from private and public finance. Also, credible fiscal and financial regimes are needed to develop the markets and industries to continue improving access to low-carbon modern energy and divestment from fossil fuels.

This could be achieved by introducing a form of carbon pricing[16] to internalise the cost of climate-related externalities (that is, the environmental cost of GHG emissions).[17] This would result in cost-reflective technologies and therefore make low-emission technologies more competitive and attractive. As a result, financial flows would be redirected towards a low-carbon economy and revenues would be raised to manage any negative social impacts. These revenues could be redistributed to those who use less carbon, so that those in lower-income groups, predominantly, are no worse off.

In the absence of an economic instrument, such as a carbon pricing scheme where they are not politically possible or in developing countries,[18] a fiscal and financial regime that encourages innovation, investments and voluntary changes may be preferred over economic instruments. This could be supported by legislation to mandate change to balance command and control, and market-based instruments. This regime would include the appropriate pricing of energy and infrastructure, security of property rights, energy trading rules, removal of information asymmetries, and de-risking of renewable and energy efficiency investments – which have high upfront capital costs.[19] The regime would also encourage lending to new technologies and attract private sector investment, which would enable investors to establish

viable business models for renewable energy investments. It would also foster already-existing and proven measures, such as:

- a scheme where payment is made for emissions reductions from a particular technology, like solar PV installations, efficient lighting or heat pumps;
- public green procurement, where governments buy in bulk to foster market development of specific renewable or energy efficient technologies;
- renewable energy tenders or auctions to minimise the need for subsidies or move subsidies from those that are now commercially viable to those that are not yet;
- increased access to financing through blended public and private finance, low-interest loans for green buildings and green conversions, renovations and retrofits (i.e. using renewable heating systems, rooftop solar, batteries, and other smart energy and energy efficiency measures), and project-based financing support; and
- investment tax credits for research and development.

Enabling frameworks are critical to allow technologies and business models to be implemented where currently this is not possible, such as supporting more variable renewable energy penetration and electrification. An example is large users of energy, such as:

- data centres where digital technologies are combined with energy efficiency and renewable energy to optimise operations and provide grid stability services;[20]
- battery storage (connected to and supported by renewable energy sources such as wind farms) to store and sell energy or grid stability services;
- green hydrogen (produced using renewable energy) supplying aluminium smelters, with these smelters using excess solar and wind when needed by grid; and
- the batteries of an electric vehicle fleet exporting excess electricity to the grid overnight to provide grid stability services or energy.

Financial institutions, asset owners, regulators and shareholders need to redirect capital/financial flows towards climate and SDG alignment, mainstream sustainability into risk management, e.g. stranded assets, and recognise the need for transparency and long-termism in investment decision-making.[21] Climate change and all other associated risks need to be internalised into the macro-fiscal and budgeting frameworks (taxation, prudential and capital markets regulations, climate budget tagging). New Zealand will be reportedly the first country to require the financial sector to report on these risks. There should be timely and transparent climate accounting of full lifecycle emissions, and a legal and fiduciary duty to include climate risks and revalue assets (capital), price assumptions and future profitability (performance) on company financial statements[22] and likely dividends – as recommended by the Task Force on Climate Related Financial Disclosures. Executive remuneration could be linked to the achievement of climate and/or company emission reductions targets, and companies' articles of association could be aligned with the Paris Agreement. Sovereign wealth, hedge and pension funds, and other asset owners divesting from fossil fuels, for example, towards green and climate resilience lending, investments and bonds should be continued and expanded.

Governance/Institutional

Institutions must be fit for purpose. They are critical to good policy implementation and enforcement of legislation. Government ministries, departments and agencies must be coordinated at the national and sub-national level, so as to cooperate and interact using an integrated approach to the energy sector, underpinned by thorough stakeholder engagement and community consultations. Institutional mapping can be used to assess how an energy system is governed and owned in terms of the relationships of government ministries, agencies, utilities and the private sector. These relationships can then be addressed to ensure that there is the relevant oversight, accountability and transparency to achieve the economic, environmental and social objectives of balancing energy, climate, development, and food security and poverty alleviation.

2.3 Barriers to creating successful enabling frameworks

Once the appropriate enabling frameworks have been identified, there are barriers that

must be overcome to ensure their successful implementation.

Garnering the political will for the transition is difficult when long-term certainty is needed, but political cycles are short term. Governments can also be captured by vested interests and shareholders who own the incumbent high-carbon technologies that have been providing revenues and income to the state. There may still be strong resistance to change, despite the overwhelming evidence of the increasing risk and costs of the potential of stranded assets. In some countries, voters who are employed in, or communities and informal sector workers who are supported by, these industries may also be resistant to change, as they associate their identity with their work and may bear the brunt of the economic and social impacts.

Fossil fuel subsidies can distort energy markets, be anti-competitive and involve governments as actors in financial markets rather than as regulators. The subsidies, whether they be grants, concessional loans, guarantees or interest subsidies should be phased out, especially while fossil fuel prices and demand are low.[23] These can be redirected to support climate-friendly activities, such as energy efficiency, electrification, renewable energy, community organisations and essential public services – for example, infrastructure, public/electric transport (charging stations, trains, cycling), healthcare and education. Low fossil fuel demand and prices also means a loss in revenue for fossil fuel-exporting economies, which may have otherwise been spent on infrastructure, education and health. This highlights the vulnerability of fossil fuel dependency and the need to manage these risks by developing broader sources of revenue from investment in growing energy transition-related industries like energy efficiency and renewable energy, for example.

Where there is an industry sector that is heavily reliant on fossil fuels and subsidies, and has high upfront costs of capital with little possibility of electrification – for example, cement, steel, the thermal heating sector – a technology barrier may need to be overcome. The development of green hydrogen as an alternative fuel to support the thermal heating sector will require accompanying policy and regulatory frameworks, along with a mandate, targets and standards to ensure that that there is a redirection of fossil fuel subsidies and investment in the supporting infrastructure that is needed to ensure its economic viability.

Countries also experience the barriers of capacity constraints, where they have limited institutional and technical capacity and need technical assistance to develop this capacity.

The World Bank RISE (Regulatory Indicators for Sustainable Energy) reports scores of countries on how attractive their policy and regulatory environments are for investment in improving universal access to energy (electricity and clean cooking), renewable energy and energy efficiency, and ultimately achieving SDG7. It also notes that investment in sustainable energy is heavily influenced by factors well beyond what can be governed by energy sector policies, namely the establishment of strong institutions, access to credible data, appropriate financing mechanisms and a robust private sector.

The World Bank RISE reports and data can be used to review the varied implementation of policy and regulatory frameworks performance across countries, so that lessons can be learned, challenges overcome and successes considered for possible adaption and adoption elsewhere. Cote d'Ivoire, for example, improved its RISE score by approving its rural electrification plan, developing a framework for grid connection and mini-grids, a legal framework for renewable energy, the holding of renewable energy auctions, the improving of regulatory and financial incentives, and the adoption of a national energy efficiency action plan.

Barriers can be also overcome by encouraging the sharing and exchange of information and research and international cooperation and innovative partnerships, e.g. the Commonwealth's Climate Finance Access Hub, the NDC Partnership, and the Climate Technology Centre and Network.

Other barriers include the lack of cost-reflective tariffs, currency risk, sovereign risk, off-taker risk, land acquisition risks, transmission/network constraints, net metering, lack of finance and the terms of finance.

2.4 COVID-19

COVID-19 is now a significant factor to enabling frameworks for the sustainable energy transition. It is important to 'build back better' while it is more economical to do so and

avoid further 'locking-in' and entrenching high-emission pathways and technologies. There are correlations between climate change and COVID-19. The global response to the COVID-19 pandemic has shown where expert evidence and science-based decision-making advice are heeded, advance preparation is initiated and global cooperation action is taken simultaneously then global outcomes can be achieved. However, it is also the most vulnerable that carry the greatest burden. There may also be a link between people exposed to air pollution (e.g. black carbon from coal power stations) suffering increased complications from COVID-19 (Hoang and Jones, 2020).

During the crisis, the importance of access to energy for health facilities, storing medicine, supplying water and communication etc., and other critical sectors of the economy, has been demonstrated. Energy wil also remain important for reliable refrigeration of the cold supply chain when COVID-19 vaccines are made available and deployed in large scale.

Nonetheless, the overall demand for energy declined during the pandemic. Although fossil fuel energy use dropped dramatically, along with the general demand for electricity, solar and wind generation remained steady.[24] It is important to ensure that COVID-19 does not cause underinvestment in energy efficiency and sustainable energy and miss the opportunity to retire inefficient polluting equipment.

Any COVID-19 economic recovery measures should be climate-friendly expenditures. At the same time, it is also important to ensure that employees are retained or retrained where possible or new jobs are created, levels of public health services are maintained, and a social welfare safety net is guaranteed during the pandemic. IRENA estimates that doubling annual energy transition investment to US$2 trillion over the next three years can leverage private sector investment by up to three to four times, creating 5.5 million jobs and boosting world gross domestic product (GDP) by 1 per cent (La Camera, 2020).[25]

3. Opportunities and approaches

3.1 Coal, gas and oil management

To accelerate the transition from fossil fuel-based economies to carbon neutral economies, Commonwealth member countries have to confront different transition pathways available to them to achieve their NDCs. These may include difficult policy choices on, for example, whether to ban or cut back from new coal mines and power plants, new gas extraction and power plants, imports of shale gas from hydraulic fracturing, and/or new oil drilling. The cancellation of imminent projects and/or the rapid phasing out of current coal and gas extraction and power plants consistent with the 1.5°C target could take place using both economic (e.g. extraction taxes) and regulatory (e.g. licensing moratoria) measures.[26] Whatever approaches are considered, they need to take into account varying individual country circumstances (Jakob et al., 2020).

Any subsidy for fossil fuel exploration, extraction, transportation and power plants should also be phased out, especially since falling fossil fuel prices means it is not necessarily economic or profitable to extract remaining reserves. To be consistent with environmental and social justice principles, those countries where the social impacts of the transition are likely to be least, e.g. developed countries like UK, Canada and Australia, should be urged to prioritise these actions. They are likely to be better able to mitigate and absorb the adverse impacts on workers and communities, as compared to countries where communities disproportionately experience the harms of extraction, such as pollution, and not the benefits. Renewable energy plants could be placed near the retired coal power plants to utilise the remaining transmission lines, as is planned in renewable energy zones in Australia.

IRENA states that replacing the highest cost 500GW of coal with solar PV and onshore wind in 2021 would reduce power system costs by up to US$23 billion each year and cut annual emissions by around 1.8 gigatons of CO_2, equivalent to 5 per cent of total global CO_2 emissions in

2019. It would also provide an investment return of US$940 billion, which is equal to around 1 per cent of global GDP (IRENA, 2020a).

It is estimated that replacing the entire fleet of global coal plants with clean energy plus battery storage could be done at a net annual saving as early as 2022 (Bodnar et al., 2020). The economics of the rapidly declining costs of renewables increase net annual savings to US$105 billion in 2025. All this is before considering the health, climate and environmental impacts of coal, or accounting for the social and environmental benefits of reducing pollutants (ibid). The energy return on investment (EROI) of large-scale wind and solar PV are projected to be above 10 per cent, while increasing and the amount of storage needed is relatively small (Diesendorf and Wiedmann, 2020; Brockway et al., 2019).

As an example of the changes taking place, renewable energy in India is expected to make up 51 per cent of total generation capacity by 2030, by which time coal-fired power is expected to reduce to 33 per cent – with the majority of coal expected to come from domestic sources (Government of India, 2020). At the global level, 42 per cent of coal capacity was loss-making in 2018; this figure is estimated to be 56 per cent by 2030 and 72 per cent by 2050 (Carbon Tracker Initiative 2018).

3.2 Green hydrogen

Establishing enabling frameworks for green hydrogen may also assist with the transition. As the costs of renewable energy become increasingly competitive or in locations where there is currently excess renewable energy, and the costs of electrolysers decrease, green hydrogen can be produced from solar and wind energy. It can then be used, for example, as a feedstock in sectors which have been thought as difficult to decarbonise, such as steelmaking and cement and in refineries, ammonia production and the chemical industry (Glenk and Reichelstein 2019). Green hydrogen can fuel buses, trains and heavy trucks and, in the future, potentially ships and planes. It can balance a renewables-based electricity system by turning electricity into hydrogen when the wind blows or the sun shines, storing large amounts of this power to be used later. Infrastructure developed or transitioned for grey (fossil gas) and blue (fossil gas with carbon capture) hydrogen could be later used for green hydrogen, as it becomes more economically viable.

3.3 Innovative financing

Green and climate bonds allow governments and multilateral development banks to raise finance and direct capital into renewable energy and other green infrastructure, assets and measures. A green and climate bond framework needs to be created that sets out the bond standards, the criteria for sectors and assets for investment, as well how the proceeds of the bonds will be used so as to enable more renewable energy and energy efficiency, for example (IRENA, 2020b). Sovereign bonds issued by countries should also seek alignment with investments that seek to achieve the Paris Agreement and SDGs.

Other innovative financing models should also be considered to encourage and leverage private sector finance, such as energy performance contracting (EPC), revolving funds, cooperative models and crowdfunding, for example, to bridge the gap between current climate finance flows and what is needed for the transition. Resource efficiency and transitioning to a circular economy, where products are designed and priced to ensure resources are reused, recycled and kept in the loop with no waste, should also be considered.

3.4 Energy market reform

Many national power grids and markets were established prior to the growth in development of variable renewable energy like wind and solar, and therefore the rules that govern market operation and trade have not evolved sufficiently to maximise the benefit from these newer technologies. Where this is the case, the regulatory environment needs to be improved and strengthened, and have the barriers removed.

Energy markets need to be reformed to transition power systems from those that favour incumbent centralised, firm, synchronous fossil fuel generation technologies to newer and innovative flexible power systems. These new power systems integrate decentralised, variable, non-synchronous generation technologies and energy services, for example, variable renewable energy and battery energy storage systems that also provide ancillary market services

such as grid stability services (Kujala, 2020; McKenzie, 2020; Parkinson, 2020). Innovations like the use of blockchain, artificial intelligence and smart grids also need to be accommodated.

Energy markets can also be strengthened by being open and competitive, and by allowing the entry of independent power producers (IPPs) and the signing of long-term standardised renewable energy power purchase agreements (PPAs) with industry and consumers to provide simplicity, stability and certainty. Any plans that forecast the future investment needed in gas and electricity networks should be made public and accessible to investors, with straightforward standardised connection agreements used to simplify and accelerate the investment in, and connection of, new renewable energy generation.

The use of new business models which create the business case for new services and offer new revenue streams for enabling technologies, markets designed with regulations to incentivise investments, value flexible renewable energy services, and which provide new business opportunities and innovative system operation, should be considered in accelerating the energy transition (see Table 3) (IRENA, 2019b).

Noting that not all solutions are applicable to all countries, markets for low-carbon technologies need to be created by building government and technical capacity and making finance available, accelerating the green hydrogen industry, along with installing behind-the-meter batteries at the individual household level. These actions should be combined with the right incentives to unlock demand-side flexibility and ease system integration of electricity from wind and solar energy. Any renewable energy target also requires complementary grid access and priority dispatch rules.

Continued innovations, as well as research and development, demonstration projects, intellectual property rights, partnerships between the public and private sectors, and technology transfer, should be explored. It should be noted that in respect to carbon capture and storage (CCS)[27] it is more cost effective to add renewables where this is a viable substitute to generate the required energy supply than to develop CCS technologies for coal plants – for example, the shutdown of the Petra Nova coal-fired carbon capture plant in Texas. However research on the economics of CCS for gas and industrial sources, for example, cement production and capturing CO_2 from the atmosphere, is ongoing.

3.5 Employment

Investment in renewable energy is expected to create more jobs per unit of energy generated and US dollar invested compared to fossil fuel-based technologies, with multiplier effects in employment and increased economic value in other sectors of the broader economy.

A study by the Global Green Growth Institute found that:

> *[…] establishing emission reduction targets for the electricity sector with renewable energy targets which enable both decarbonization and job creation… (and) By setting more ambitious goals in their NDCs countries could create a significant number of quality jobs and economic value added as co-benefits to reducing GHG emissions while simultaneously making progress toward multiple SDGs.*

Table 3. Innovation in energy markets

Business models	Market design	Innovative system operation
• Aggregators • Peer-to-peer electricity trading between and consumers (e.g. Malaysia, the UK, Australia and Bangladesh) • Energy as a service • Community ownership (e.g. community solar, pay-as-you-go models, on-bill financing model etc.)	• Increasing time granularity in electricity markets • Increasing space granularity in electricity markets • Innovative ancillary services • Redesigning capacity markets • Regional markets • Time-of-use tariffs • Market integration of distributed energy resources • Net billing schemes	• Future role of distribution system operators • Cooperation between transmission and distribution system operators • Advance forecasting of variable renewable power generation • Innovative operation of pumped hydropower storage • Virtual power lines • Dynamic line rating

Source: IRENA (2019b).

As an example, a report by Beyond Zero Emissions, an energy and climate change think-tank, says practical projects to decarbonise the Australian economy could create 1.78 million 'job years' over the five years from 2020 to 2025 – on average, 355,000 people in work each year – while modernising Australian industry (Beyond Zero Emissions, 2020).

The Philippines has a Green Jobs Act (2016), with a training programme and incentives for businesses and social protection, combined with a coal tax and renewable feed-in tariffs, and a strategy to improve the climate resilience of infrastructure. There is also a National Ecotourism Strategy Action Plan that includes jobs and livelihood support. This, however, has been contrasted against the lack of political support and the Philippines' road map of 10GW of coal-fired power plant capacity by 2025.

A job creation target could be set and a green employment mechanism established to retain, retrain or reskill employees that no longer have jobs. These jobs could be transitioned to green employment in manufacturing of battery storage, building and industry energy efficiency, making or converting electric vehicles, installing solar PV and on- and offshore wind, public transport, energy efficient appliances, power networks, biofuels, hydrogen, urban infrastructure, clean cooking, and methane reductions, as examples.

With the current decline in demand for oil and gas, asset write-downs, employee lay-offs, low prices and high costs, it may be that workers are not necessarily transitioning from high- to low-carbon employment but finding new employment in renewable energy, for example. The industrialisation and development of renewable energy throughout the value chain needs to be central to national development plans, to determine what jobs can be created domestically in these new markets.

4. Case studies

4.1 Grid-connected battery storage: South Australia

The recent installation of the 150MW[28]/194MWh Hornsdale Power Reserve, a large battery energy storage system, in the South Australia region of Australia's National Electricity Market (NEM) has highlighted the potential for renewable energy technologies with storage in the energy transition. This is especially so as some of Australia's coal power stations are ageing, becoming unreliable and experiencing rising maintenance costs, including requirements to install pollution controls. The battery supports the large capacity of wind and solar power (almost 50 per cent of total generation), by meeting some of the energy demand during periods of low variable renewable energy supply and providing ancillary services to balance frequency and provide greater stability in the grid. When there was an unexpected loss of load in the NEM and an islanding event, the battery contained the initial reduction in system frequency and then quickly changed generation back to load to reduce the over-frequency condition. The battery is able to stabilise the grid through instantaneous capacity for voltage and frequency support, support variable renewable energy, provide storage capacity for short outages, and has a financial model that combines a windfarm with the battery storage to provide the ability to arbitrage and supply the market when prices are high. A five-minute settlement market rule is expected to be introduced in the NEM to increase the attractiveness of investing in, and adopting, this technology to provide energy and network ancillary services.

4.2 Carbon tax: South Africa

South Africa is addressing climate change by using a carbon tax to mitigate its GHG emissions and also investing in renewables to benefit communities. The carbon tax initially covers 5 per cent of the economy up until 2022. As the South African coal industry employs some 80,000 people, the government has a New Growth Path and Jobs Resilience Plan to stimulate transitional jobs for a green economy that includes the manufacturing of renewables in areas with high economic potential and social needs. The experiences of South Africa

with a carbon tax should be monitored by other Commonwealth countries to assist with implementation of similar measures, especially as these measures are being undertaken in an environment where there is a strong coal lobby, a trade union movement that is protecting jobs in the mining sector, and criticism of a lack of policy coherence (REN21, 2020).

5. Conclusion

Policy-, regulatory- and governance-enabling frameworks are important in accelerating the sustainable energy transition in Commonwealth member countries, as they ensure that the finance and low-carbon investment that aligns with the SDGs and the Paris Agreement is brought forth. Policy frameworks are needed to set targets and develop the economic and financial instruments to provide direction and certainty in investment. A regulatory framework is required to provide the market rules and allow the integration of low-carbon technologies. A governance framework provides the necessary oversight and enforcement. Now more than ever, during the recovery from COVID-19, there is an urgency that Commonwealth countries with the ability to do so, and according to their circumstances, should adopt, adapt and implement these frameworks to ensure that investment in their economies is consistent with the climate and sustainable development agendas and achieves a sustainable energy transition.

6. Recommendations

6.1 Renew ambition, align policies, and build confidence in investment

Commonwealth member countries should consider taking the opportunity of the COVID-19-produced economic slowdowns to declare a climate emergency and legislate climate targets that are absolute and binding as soon as possible, if they have not already done so. These should be CO_2e neutral, 100 per cent renewables, economy-wide and sectoral targets for the short, medium and long term. They should also garner the political will to renew and amplify climate ambition, by aligning and merging economic recovery stimulus measures with the mainstreaming of the climate and sustainable development agendas. They should also make trade agreements conditional on this alignment, and ensure that revised NDCs are submitted and are consistent with achieving their LTSs and the Paris Agreement target of 1.5°C. This will give the certainty needed to bring forth the required low-carbon and climate-resilient investment. To boost investor confidence, any finance made available should be in alignment with this long-term planning and with corresponding environmental, social and corporate governance principles. Investment in modernising and increasing energy efficiency, renewable energy, electrification of industrial processes, heating and transport, building codes, equipment, appliances, energy storage, greening of gas networks, education and training, and low-carbon research and development should be considered. Progress should be tracked using measurement, reporting and verification.

6.2 Reform energy markets

Commonwealth member countries should ensure energy markets are open, competitive, transparent and flexible, so that they optimise the use of modern energy services and energy efficiency, allow the entry of new innovative technologies – for example, variable renewable energy, storage and green hydrogen etc. – and permit new financial and business models to be integrated that further accelerate the sustainable energy transition.

6.3 Phase out fossil fuels and subsidies

Due to the declining costs of renewable energy and storage,[29] Commonwealth member countries with the capacity to do so and least social costs and impacts (e.g. developed countries like the UK, Canada and Australia, as they can better mitigate and absorb the adverse impacts on workers and communities, as well as countries where communities disproportionately experience the harms of extraction and not the benefits) (Stockholm Environment Institute, 2020) should *consider* using either or both regulatory and economic measures to:

- ban or cut back on new coal power plants and mines, new gas power plants and extraction, imports of gas from hydraulic fracturing, and new oil drilling;
- where feasible, cancel any imminent projects in these areas;
- consistent with their NDCs under the Paris Agreement, phase out rapidly any current coal power plants;
- implement immediate, short-term and long-term measures for energy transitions from gas extraction and power plants, and nuclear power plants consistent with their NDCs under Paris Agreement;
- phase out subsidies for fossil fuel exploration, extraction, transportation and power plants; and
- redirect fossil fuel subsidies to energy efficiency, renewable energy and/or essential public services.

Notes

1 These risks include transition risks – the policy, regulatory, legal, technology, market, reputational and financial risks – as well as the physical (acute and chronic) risks of climate-related impacts, e.g. sea level rise etc.

2 Paris Agreement's Article 2.1 (c) on 'making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development'.

3 Without a smooth transition, there will be significant impacts on the world economy. The International Renewable Energy Agency (IRENA) estimates that to enable the energy transition and limit global temperature rise below 2 degrees Celsius (°C), cumulative investment must increase by 30 per cent up to US$120 trillion by 2050 in low-carbon technologies, averaging around 2 per cent of global gross domestic product (GDP) per year. Notably, the benefits of a smooth transition will outweigh the costs and are likely to result in increased economic growth and broader socioeconomic benefits. Through 2030, a shift to low-carbon, climate change-resilient economies could bring US$26 trillion in economic benefits and create more than 65 million jobs, according to the Global Commission on the Economy and Climate. The recovery from COVID-19 is an important time to ensure that the energy transition and SDGs are central to the recovery from the economic impacts of COVID-19, and not delayed but further accelerated.

4 Energy sources include coal, fossil oil products, fossil gas, uranium, waste, steam, bioenergy (biowaste and solid biomass), liquid biofuels, biomethane, biogas, electricity, biomethane heat, biogas heat, solar thermal heat, geothermal heat, aero/geothermal heat captured by heat pumps, industrial excess heat recovery, municipal solid waste (non-renewable), municipal solid waste (renewable), green/renewable-generated hydrogen, grey/gas-generated hydrogen, blue/gas-generated hydrogen+CCS, renewable ammonia, synthetic methane, liquid synthetic fuels, and ocean energy (tidal and wave). With new or at least upgraded/retrofitted infrastructure, bioenergy, green hydrogen, synthetic methane, liquid synthetic fuels and the circular economy could be used to decarbonise the industry/manufacturing sectors. Biomass, green hydrogen, and the circular economy could be used to decarbonise the chemicals/petrochemicals and steelmaking sectors. Biofuels, synfuels from green hydrogen, and behavioural change could decarbonise the aviation sector, and biofuels, synfuels from green hydrogen and electrification could be used to decarbonise the shipping sector.

5 In 2019, renewables contributed just over a quarter (27.3 per cent) of total global electricity production, according to REN21's *Global Status Report*. Hydropower is the single largest contributor of clean electricity at 15.9 per cent, followed by wind power (5.9 per cent), solar photovoltaics (2.8 per cent), bioenergy (2.2 per cent), and geothermal and other sources (0.4 per cent).

6 Hydrogen is a clean-burning molecule that can be used as a substitute for coal, oil and gas in a large variety of applications. But for its use to have net environmental benefits, it must be produced from clean sources, rather than from unabated fossil fuel processes – which is the usual method at present. Renewable hydrogen can be made by electrolysers that

split water into hydrogen and oxygen, using electricity generated by cheap wind or solar power. The cost of the electrolyser technology to do this has fallen by 40 per cent in the last five years, and can continue to slide if deployment increases. Clean hydrogen could be deployed in the decades to come, to cut up to 34 per cent of global greenhouse gas emissions from fossil fuels and industry (Bloomberg NEF, 2020). It can also be converted into ammonia for storage and shipping.

7 Climatescope defines an enabling framework as one that encompasses the fundamental structures and market conditions typically required for a given country to attract investment and interest from financiers, project developers or independent power producers looking to develop new low-carbon projects, companies or manufacturing facilities. It also takes into account how amenable such structures are to the deployment of distributed generation capacity, such as mini-grids, or residential wind or solar systems. A welcoming enabling framework is one where: a comprehensive, effective and stable set of rules is in place; the power market structure encourages and adequately rewards new market entrants; the private and public sectors foster universal access to clean and sustainable energy in rural or isolated communities; clean energy penetration of the power and primary energy matrices is ever increasing; adequate price signals are available; and growing demand for power and rapid electrification combine to create a substantial market.

8 The creation of enabling environments and associated policy and regulatory frameworks are considered by the Green Climate Fund (GCF) to demonstrate a paradigm shift.

9 Countries are invited to submit LTSs by 2020 to set long-term goals for climate and development and direct/guide short-term decision-making on climate and alleviating poverty.

10 This could even be described as a fossil fuel non-proliferation treaty.

11 Targets should be 'SMART' – specific, measurable, achievable, relevant and time-bound.

12 Including all greenhouse gases, e.g. CO_2, methan (CH_4), nitrous oxide (N_2O) and F-gases.

13 Scope 1 – All direct emissions from the activities of an organisation or under their control. Scope 2 – Indirect emissions from energy purchased, supplied and used by the organisation. Scope 3 – All other indirect emissions from activities of the organisation, occuring from sources that they do not own or control.

14 The EU plans to cut greenhouse gas net emissions by at least 55 per cent by 2030 and become climate neutral continent by 2050. The UK government has established a COP26 Energy Transition Council and a 50 million pound (£) Clean Energy Innovation Facility for developing countries.

15 Economic assets affected by premature write-downs or downward revaluations, or converted to liabilities.

16 Whether it be carbon or green taxes, an emissions trading scheme, a baseline and crediting mechanism, and/or the auctioning of carbon permits and linked to international markets.

17 'On average, carbon dioxide emissions fell by two per cent per year over the period 2007–2017 in countries with a carbon price and increased by three per cent per year in the others' (Best et al., 2020).

18 A global carbon trading system is yet to fully emerge, especially without agreement on Article 6 of the Paris Agreement.

19 Lending is often a form of relationship lending, where finance is made available to existing customers and technologies rather than to new customers and new technologies, while energy efficiency lending has a barrier in that there is not necessarily any collateral to recover if the loan is not repaid.

20 Power grid stability services, such as frequency and voltage control, black start, short circuit current, firm capacity, variable renewable energy ramp control, forecast error correction, fault ride through, fault recovery and generation time shift (Ratka and Boshell, 2020).

21 The International Finance Corporation (IFC) will no longer make equity investments in financial institutions that do not have a plan to phase out support for coal, and will use conditions attached to its exisiting and new equity investments to ensure the banks involved reduce their exposure to coal to zero by 2030.

22 Income statement – revenues and expenditures, cash flow statement, and balance sheet – assets and liabilities, and capital and financing.

23 There may be cases in developing Commonwealth countries where fossil fuel subsidies may be important to ensure energy access, e.g. kerosene for cooking fuel. Therefore, as discussed, difficult policy choices regarding the tradeoff between energy access, energy poverty, public health and emissions reductions need to be carefully considered.

24 Long-term contracts not exposed to variations in prices occurring during the period, equity performance for new build renewables and investor demand continued to increase.

25 Loans taken out by governments for energy transition investment could be paid back through the economic savings this action creates, along with the proceeds of green bonds and tax system reforms using carbon, environmental and digital taxes, for example, which further incentivises the energy transition.

26 Methane (natural gas) is an invisible gas that is more efficient at trapping heat than carbon dioxide. It therefore has a higher global warming potential, but it remains for less time in the atmosphere.

27 'There isn't one example of a CCS project anywhere in the world that offers a financial justification for investing in CCS' (IEEFA, 2020).

28 A world record at the time of the injection of energy into the grid.

29 Notwithstanding the health, climate and environmental impacts, or accounting for the social and environmental benefits of reducing pollutants (Bodnar et al., 2020).

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