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Post-COVID-19 pathways to low-carbon industrialization

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Post-COVID-19 pathways to low-carbon industrialization

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Key messages:

- Pathways to a transition to low-carbon industrialization include the uptake of sustainable energy solutions and digitalization, especially by SMEs and hard-to-abate sectors.
- Major bottlenecks, such as limited access to technologies, skills, knowledge, finance, weak policy and regulatory frameworks and coordination failures need to be addressed.
- Necessary policy measures include policy coordination, regulation, knowledge brokerage, innovation promotion, demand creation and public procurement.
- Countries need to leverage the opportunity provided by the COVID-19 recovery plans to reap the benefits of sustainable energy solutions to ensure that we build back better.

Introduction

Industry (mining, manufacturing and construction) has long been characterized as "the main engine of growth" (Kaldor, 1967). Industrialization is generally associated with rapid and sustained economic growth (Felipe et al., 2014; World Bank, 2008), leading to shared prosperity. Yet many developing countries aspiring to industrialize face severe energy supply deficits. In 2018, industry accounted for over 37 per cent of global primary energy consumption (157EJ) and 24 per cent of global CO_2 emissions (8.5 $GtCO_2$). Many industries continue to rely heavily on fossil fuel use (IEA, 2020). This is especially the case in heavy industries (aluminium, cement, chemicals, steel) because of renewable energy's inability to produce the high-temperature heat required by many of their industrial processes. For example, the iron and steel industries still rely on coal for 75 per cent of their energy demand.[1]

Achieving a low-carbon industry is fraught with many challenges. They include a lack of carbon pricing, emissions trading and border adjustment taxes, which are key for ensuring the competitiveness of low-carbon technologies and bolstering weak policy environments – only 25 per cent of industrial energy use is covered by mandatory energy efficiency standards.[2] There is an additional knowledge gap among small and medium enterprises (SMEs) about energy saving opportunities, on the one hand, and they often face difficulty accessing finance for energy improvement projects, on the other.

In the midst of an unprecedented climate crisis, compounded by the current economic crisis resulting from COVID-19, how can we ensure that we have sufficient energy to power the 'engine of growth', i.e. the industrial sector, without compromising our commitment towards

[1] https://www.viennaenergyforum.org/sites/default/files/Discussion%20Paper-%20Industry%20Session%201.pdf
[2] https://www.viennaenergyforum.org/sites/default/files/Discussion%20Paper-%20Industry%20Session%201.pdf

meeting the Paris Agreement and Sustainable Development Goals 7 and 13? The following policy and scaling up section of this Working Paper presents some of the solutions provided during the 2020/2021 Virtual Series of the Vienna Energy Forum.

1. Sustainable energy and post-COVID-19 recovery packages

Industrial players are increasingly driving progress by actively engaging in sustainable energy (renewable energy and energy efficiency)-related projects. Through the application of renewable energy for low-carbon electricity and heat, 2018 saw a reduction of 4 per cent in fossil fuel in the industrial energy mix, and a 10 per cent increase in renewable energy for industrial heat (IEA, 2020), but there is further room for improvement. While industrial energy efficiency opportunities that arise from energy management continue to be important and need to be ramped up, especially for older industrial assets, half of the potential for decarbonization now lies in renewable energy (IRENA, 2017). Further integration of sustainable energy could help industry play a significant role towards achieving a carbon-neutral economy, increase energy security, improve the green product market's competitiveness, and create green jobs and wealth.

The world is still reeling from what began as a health emergency and quickly turned into an economic crisis. The COVID-19 pandemic has impacted people's health, lives and employment. The manufacturing sector has been one of the hardest hit sectors with sharp drops in demand, supply chain disruptions, slower production rates, and contraction of investments. The Industrial Index of Production for countries responsible for 90 per cent of the world's manufacturing value added (MVA) have continued to fall compared to December 2019 (UNIDO, 2020a). Governments have been actively putting in place economic support policies in the form of recovery stimulus packages to mitigate the pandemic's adverse effects. These recovery efforts must be used to channel investments towards more inclusive, resilient and environmentally friendly industrial development, including sustainable energy measures.

National industrialization plans will most likely be reviewed to include necessary adjustments to offset the effects of COVID-19. Governments need to leverage this opportunity to reap the benefits associated with the implementation of an Energy Management System (EnMS) and Energy System Optimization (ESO), for example, and ensure that we build back better.

Industry-related emissions abatement measures are included in many countries' climate change Nationally Determined Contributions (NDCs), which are a useful proxy to identify potential investment and support opportunities for low-carbon industrial growth in the respective country. It is highly recommended to update NDCs to reflect new emissions abatement measures.

2. Role of small and medium enterprises (SMEs) and hard-to-abate sectors

It is widely recognized that SMEs play a substantial role in countries' economic and industrial development, regardless of their level of development (Snodgrass and Biggs, 1996). SMEs are the backbone of the private sector, accounting for a staggering 70 per cent of employment worldwide (ILO, 2019). Manufacturing SMEs provide reasonable remuneration for productive employment, contribute to the building up of systemic productive capacities and to interlinkages of firms in value chains. Their dynamism, resourcefulness and risk-taking attitude trigger and sustain the equitable distribution of income, resilience and economic growth. COVID-19 has dealt a disproportionately severe blow to SMEs. Despite lifeline support provided by many governments, SMEs are expecting a larger decrease in profits and more job cuts than large firms (UNIDO, 2020b) as a result of halting production, low/no sales and dried up credit.

Manufacturing SMEs generally have a higher energy intensity than larger manufacturing firms (Kostka et al., 2013) because they more frequently use outdated technology. To thrive, the road to recovery must pass through a transition to efficient and clean energy. SMEs have limited access to technologies, skills, information, knowledge and finance. The adoption of sustainable energy measures by SMEs is, however, key to establishing carbon-neutral supply chains and to achieving climate goals.

Hard-to-abate sectors, which include heavy industry (aluminium, cement, chemicals, steel) and heavy-duty transport (aviation, trucking and shipping) are responsible for nearly one-third of global CO_2 emissions (WEF, 2019). Growing demand coupled with price pressure for these commodities makes for highly competitive markets, often resulting in a race to the bottom. Trade protectionism, which some countries have been engaging in post-COVID-19, is exacerbating this trend. Integrating sustainable energy in hard-to-abate sectors will result in a huge leap forward towards low-carbon industrialization.

3. Innovation and digitization

Investment in innovation and digitization are key drivers of economic growth, and increased resilience during and post-COVID-19. Hepburn et al. (forthcoming) show that horizontal policies based on clean research and development (R&D) spending and connectivity infrastructure spending, which were implemented after the Global Financial Crisis (GFC) not only had long-run economic multipliers, but also contributed substantially to reduce climate change.

COVID-19 has accelerated digitalization and spurred innovation. Embracing emerging innovations such as the Internet of Things (IoT), data science, machine learning and cloud

computing can lead to a digital revolution in the energy and utilities sector (Energy 4.0) and the industrial sector (Industry 4.0). Energy 4.0 has a high potential to lower the consumption of primary energy and to increase energy efficiency by harvesting, storing and managing renewable energy, building of smart grids, smart metering and distributed generation. Adoption of advanced analytics in industry results not only in an increase in the overall efficiency of industrial processes but also in improved cost control, energy performance and environmental reporting. A reduction in energy use of between 25 per cent and 40 per cent can be achieved without a major investment by simply improving firms' operational control. This also allows for improved capital utilization through the use of predictive and automatic maintenance reduced downtime, a lower inventory rate and increased cash-to-cash cycle.

Digitalization will also introduce innovations in the business models of both the industrial and the energy and utilities sectors. Innovations in the industrial sector facilitate the collection and analysis of real-time customer data, enable direct involvement of the demand side, and facilitate cost-effective mass customization of products and new pricing models (UNIDO, 2020c). The uptake of block chain can help unlock climate change and the circularity potential of industrial value chains by further facilitating flexible and decentralized production, supply chain connectivity, and delivery, performance and logistics in an agile, adaptive organization. In the energy and utilities sector, block chain technologies, particularly smart contracts, have the potential to integrate renewable energy sources and make end-to-end delivery of energy simpler and more efficient. This includes accounting for emissions and guaranteeing that energy supplies actually came from the sources attached to the contracts.

Nonetheless, the road to adoption of these technologies is fraught with challenges, aggravated by a widening technological divide between developed and developing countries. Many developing countries are currently using Industry 1.0 technologies, often limited by poor energy infrastructure, access to electricity, lack of technical skills, and high investment costs coupled with a lack of financing and weak business models. The transition to Industry 4.0 may seem unattainable to many. Some policy recommendations are provided to help make that leap a reality.

4. Policy recommendations for scaling up low-carbon industrialization

The previous section identified sustainable energy uptake and digitalization as the main pathways to low-carbon industrialization, especially for SMEs and hard-to-abate sectors. The major bottlenecks are limited access to technologies, skills, knowledge, finance and markets,

unexploited potential and coordination failure. The following section explores key policy intervention areas to address these challenges and to scale up of low-carbon industrialization.

4.1 Regulations and standards

The unexploited potential of ISO 50001 is still prevalent in energy-intensive industries, particularly in developing countries. According to the 2019 ISO survey (ISO, 2021), only a total of 6,415 industrial firms were ISO 50001 certified, 22 per cent of which are in the basic metal and fabricated metal sector. What is more worrying is that the uptake of ISO 50001 by industrial firms is not equally distributed geographically around the world. Germany alone accounts for 62 per cent of all firms that have adopted ISO 50001, while developing countries account for a mere 20 per cent. Information on the drivers, benefits and challenges of adopting an ISO 50001 EnMS is urgently needed to clearly communicate its business value to firms. This task would fall within the remit of a national agency for energy efficiency. The driving force behind increased ISO 50001 adoption would also require leveraging firms' purchasing power, and strengthen their commitment to only purchase from suppliers that are ISO 50001 certified. Promoting such a systemic approach to energy transition lends itself to increased digitalization. Synergies thus exist between digitalization policies and the uptake of ISO 50001 to identify energy efficiency opportunities.

Many countries have recourse to minimum energy performance standards (MEPS) to specify the minimum level of energy performance an energy-using device must meet or exceed before it can be offered for sale or used for commercial purposes. This is often implemented in tandem with financial support to meet these requirements. For example, the Green Climate Fund is working with countries on promoting energy efficient cooling and providing access to new financial mechanisms to introduce MEPS. In India, government regulations stipulate that outdated motors used in industry must be upgraded to improve energy efficiency. In Brazil, there are plans in place to introduce compulsory standards for increasing efficiency over the next few years (i.e. the government is already engaging with stakeholders). Egypt has witnessed a rapid increase in the uptake of sustainable energy in industry following the introduction of MEPS in 2016, coupled with a financing facility. The introduction of MEPS in South Africa had the additional effect of increased effort towards reporting and transparency around energy usage.

4.2 Skills and knowledge

Industrial resilience post-COVID-19 will take place at the intersection of smart industrialization based on knowledge and innovation; sustainable industrialization, the promotion of a more

resource-efficient, greener and more competitive economy; and inclusive industrialization, fostering highly productive employment and decent and green jobs. This means that the emphasis will be on valorising, protecting and investing in employees as well as practitioners throughout the entire value chain to make the most of opportunities offered by green technologies and to innovate.

One of the main drivers for integrating sustainable energy in industry is to increase competitiveness, which calls for SME capacity-building. This can take the form of reskilling, upskilling, demonstration programmes, information dissemination on key technologies and best practices. Grants or tax incentives can be provided for capacity-building and the training and hiring of personnel. Dedicated institutions, such as technical industrial vocational and entrepreneurship training (TIVETs) with green expertise, can be established to spearhead specific green skills to close the gaps identified in industry.

Information tools such as marketing, labels with product information that provide information on the product's sustainability, labels with certifications or quality marks that offer assurance and a guarantee that an independent external party has verified that the product was produced in a sustainable manner can considerably contribute to the creation of a market for green products (UNIDO, 2016) and incentivize the necessary investments for their production.

Building informational infrastructure, such as platforms for information sharing and learning among practitioners in industry, has also proved useful. For example, 'burning platforms' have been created which countries and their governments are using to actively promote the uptake of sustainable energy through various mechanisms. In South Africa, for example, industrial firms have paved the way themselves to spread their pooled knowledge and learn from each other, leading to the creation of guidelines and public policies.

Incentivizing behavioural change to share and create knowledge may generate new innovative business models as well, such as the leasing of industrial equipment and LED light bulbs, requiring a further level of social and political acceptance.

4.3 Demand creation

We have seen many products enter the market, such as organic food, electric cars, A+++ refrigerators, etc., which use labelling to indicate their environmental characteristics. Design can still go greener by optimizing product size and weight, using renewable materials, and increasing the lifespan and recyclability of products. Incentivizing behavioural change towards more sustainable growth implies not only more efficient production practices, but also more

environmentally-conscious consumers. Despite the fact that some environmental goods have gained significant market shares, the market is still dominated by traditional goods. The reasons for this are high production costs and consumer prices, gaps in consumer awareness of environmental concerns, and biases in purchasing behaviour. UNIDO (2018) concludes that large-scale production of environmental goods (massification) can lead to substantial price reductions that can stimulate further demand and production.

Governments can steer demand for environmental goods through market policies aimed at reducing the price of environmental goods and increasing the costs of conventional goods. These include regulation, knowledge brokerage, innovation promotion and public procurement (UNIDO, 2018).

On the production side, levelling the playing field for green and traditional producers can be achieved through fiscal measures related to tariffs for utility sectors and by adjusting subsidies. For example, as electricity prices are cheaper at certain times, industry can be incentivized to time their production accordingly. In Indonesia and Mexico, an increase in fossil fuel prices resulted in a drop in fuel consumption and an increase in electricity use as firms began replacing obsolete fuel-powered capital equipment with more productive electricity-powered capital equipment (UNIDO, 2018).

On the consumption side, policies aimed at increasing consumer awareness of environmental impacts and correcting information-related market failures for green products, such as labelling, are crucial. An ecosystem that supports the effective use of labelling is necessary. This includes the development of harmonized minimum standards, the development of guidelines for target setting and the creation of low-cost certification service.

In heavy industries, emissions are disproportionately distributed along the value chain, weighing heavily on upstream industries (e.g. mining industries for cement and steel) and decreasing downstream (e.g. automotive or construction industries), where profit margins are also much higher. A supply chain approach is therefore necessary in these industries for a more equal distribution of profit margin to abatement costs ratio. In addition, as civil engineering infrastructure projects account for 29 per cent of steel and 50 per cent of cement production, public procurement policies or imposing procurement standards for low-carbon materials could also play an important role. This requires the development of a standard evaluation process and tools for public procurement bids.

Several private initiatives also drive up demand for green goods. One popular business model focuses on lifestyles and behavioural changes through shared ownership of houses and cars.

Another private initiative that has had a tremendous impact on scaling renewable energy markets by increasing the provision of and reducing the costs of renewable energy and clean energy is the establishment of voluntary demand-aggregation spaces, such as the Renewable Energy Buyers Alliance[3] in the U.S. Such spaces, which have been replicated in other countries such as India, Columbia and China, bring together large-scale energy buyers from the commercial and industrial sector seeking to procure renewable energy and energy and service providers. The pooling of demand in such aggregated procurement schemes may be beneficial for SMEs.

5. Sustainable energy technology adoption and innovation

The risk of interruptions in production remain a significant barrier for manufacturing firms. Risks associated with the introduction of changes in production technologies can be minimized by creating technical environmental norms and certification for industrial appliances, equipment and services, documenting past transition measures and risks associated with implementing technology and learning from these. Setting up data banks on the experiences of enterprises with transition measures and technology implementation and the exchange of knowledge can be facilitated through knowledge networks, business conferences and market studies for improved sharing of information. The green technology selector tool (Carbon Trust, 2020) in China, for example, is used to mitigate risks for investors and producers.

Despite developing countries' substantial potential to leapfrog in energy transition, technology transfer to developing countries is still slow. As more decarbonization technology options become available, their deployment can be supported through credit support, tax credits and subsidies, including carbon contracts-for-differences. Support and cooperation between energy producers, transporters, distributors, suppliers and consumers can also be sought to ensure a harmonization of interests while striving to achieve the realization of national sustainable energy goals.

A dedicated technical institution to promote research in and implementation of scientific innovations in the field of sustainable energy is key for countries that are not at the forefront of technology development. Such institutions could also manage R&D subsidies and grants to increase local sustainable energy-related patents and adapt foreign sustainable energy technology to local needs. Recognition should be given to innovative SMEs, for example, through initiatives such as the SME Climate Hub[4] Race to Zero Campaign.

[3] https://rebuyers.org/
[4] https://smeclimatehub.org/

There is a lack of renewable energy solutions for industrial heat applications, with only few existing solutions for low-grade heat. Significant progress is needed in high grade heat applications, specifically those used in hard-to-abate sectors. Despite this, both public and private investments in heavy industry innovation are particularly low compared to other industries. If public funds are used to support R&D in renewable energy solutions for high grade heat processes, it will be important to balance how to reward innovators and incorporate intellectual property (IP) into the global setting. Public funds could be tied to the conditionality, for example, that technologies brought to market as a result of public funds (Mazzucato, 2018) should be open to licensing to prevent monopolies and to ensure a higher adoption rate.

6. Finance to adopt and to innovate

Access to finance to adopt sustainable energy technologies remains a significant barrier in developing countries. Credit lines, revolving funds, publicly backed guarantees and project loan facilities are funding mechanisms available to firms, but soft loans remain the most common form of finance accessed by firms to adopt sustainable energy technologies (UNIDO, 2011).

The financial sector also plays a key role in supporting investments in sustainable energy, whether in the form of technology adoption by firms or R&D for sustainable energy innovation, by providing uncomplicated and inexpensive access to the relevant finance; offering a blend in finance options to accommodate local idiosyncrasies; providing clear terms for third-party finance, particularly for on-site renewable energy generation. Green banks should be encouraged to provide low cost loans for the replacement of outdated technology.

The uptake of best performing technologies in the UK is facilitated through an established list of energy efficient (EE) and clean energy projects that serve as a route to finance. The list provides information on performance and paybacks of technologies that are certified. Technologies on the list are eligible for tax credits. To be included in the list, technologies need to be among the top 10 per cent performing products. There are calls to develop these technology lists at the international level as a key enabler of access to targeted finance.

Government grants and subsidies for sustainable energy technologies need to be stable, transparent and remain in place long enough for installation and payback to encourage investment. Recovery grants and subsidies need to also be tailored for and targeted at SMEs. Low-carbon transition investments are usually quite substantial, and Escrow agents could be instrumental in breaking them down into smaller sums of investment that are more affordable for SMEs. Revenue from carbon pricing could be used for SMEs interested in low-carbon

transition. One innovative business model that reflects the scale and technical capacity of SMEs is to collaborate with others to buy sustainable energy solutions.

Innovation financing gaps tend to be concentrated between the demonstration and deployment stages. UNIDO therefore recommends the bulk of public finance and technical cooperation to address the lack of capital and capacity *before* the technology reaches the diffusion stage (UNIDO, 2011).

7. Policy coordination (national and international)

Policy coordination is one of the oldest challenges policymakers face, but is crucial for the success of any government programme. As regards sustainable energy policies, for example, it is important to set long-term goals that drive action and call for commitment, and to look at the entire energy system rather than to focus on industry or specific applications only. This requires close inter-ministerial collaboration and coordination to align all energy policies to achieve the same vision and targets, especially since governments are currently drafting roadmaps for economic recovery. The European deal on the COVID-19 recovery package and Egypt's Vision 2030, which includes targets and sustainability goals, as well as 'Get Ready for Green' plans are examples of such coordination and a systemic approach to sustainable energy policy. These can then be translated into sector-specific measures, such as India's government-supported scheme for decentralized energy provision, which promotes the use of rooftop solar by industrial production users.

Policy coordination should not be limited to public entities, however, but requires an open dialogue with stakeholders about incentives for industrial and commercial sectors as well to implement sustainable energy systems, as is the case in Brazil. Public and private partnerships are especially important in terms of sending signals to industry and consumers. In South Africa, the private sector has been at the forefront of sustainable energy policy development.[5]

Coordinated sustainable energy policymaking also tends to be more inclusive of women and youth, who are under-represented in manufacturing, in industrial value chains and in the energy sector as a whole. Sustainable energy initiatives open up significant employment opportunities which can be leveraged when industrial energy policy is linked to employment goals. By bridging the gender divide gap, the education gap and career advancement paths, policymakers have the opportunity to develop policies for a more inclusive and sustainable economy.

[5] https://www.viennaenergyforum.org/sites/default/files/Discussion%20Paper-%20Industry%20Session%203.pdf

In addition to national policy initiatives, there is a need for international collective action for sustainable energy policies. One key area in which international cooperation is crucial is international technology innovation, transfer and knowledge sharing. The development and commercialization of sustainable energy technologies needs to be fast-tracked as the world cannot wait another 25 years – the time it took for solar, wind and other renewable electricity generation technologies to become competitive. The UNFCCC Conferences of the Parties (COPs) represent a great opportunity to face up to these challenges.

International collective action is also necessary to promote financial mechanisms in support of sustainable energy technology innovation and transfers. Global markets and mechanisms need to be leveraged and further developed to help cut the generation, transport and storage costs of hydrogen and other sustainable energy technologies for high-temperature heat applications. For heavy industry, where the relevant technology exists but is too costly, industrial energy transformation funds, such as Mission Innovation, have been introduced to turbocharge the low-carbon transformation. Mission Innovation is a global initiative comprising 24 countries and the EU to bolster and accelerate global clean energy innovation with the objective of making clean energy widely affordable. The pooling of funds at the regional level to invest in renewable energy generation is another option ripe for regional and international cooperation.

The most well-known international coordination for sustainable energy and its monitoring is linked to the Paris Agreement and its NDCs. The Paris Agreement was adopted in 2015 and ratified by 153 countries, entering into force in 2016. Unlike the Kyoto Protocol, the Paris Agreement places responsibility on all parties, irrespective of income level, to fight climate change through NDCs and to regularly report on their level of emissions and implementation efforts. International technical cooperation is needed in the form of capacity-building to assist countries at the operational and institutional level in making the NDCs more action-oriented and tailored to different industries. More work needs to be done to improve data reporting systems and data consistency for transparency. This needs to be implemented across different industrial sectors to feed into the national sustainable energy policy design cycle. The Green Climate Fund (GCF) serves the Paris Agreement as the world's largest climate fund and is mandated to support developing countries in enhancing and realizing their NDCs and promotes a paradigm shift towards low-emission and climate-resilient development.

In addition to the carbon trading market-based measure, which was also established under the Paris Agreement, a global carbon tax would go a long way to foster a faster transition to a carbon-neutral economy by internalizing the negative externality of carbon emissions. Carbon taxes provide an incentive for firms to use and develop more environmentally friendly

production processes and encourage innovation in the alternative energy sector. A global carbon tax would eliminate the need to make border tax adjustments and prevent carbon leakages from one country to another.

8. Call for action

While industry continues to be the engine of growth for most countries, its high reliance on energy, especially fossil fuels, makes it unsustainable. The COVID-19 pandemic has accentuated that the case for climate action is more urgent than ever and that the consequences of inaction are too costly to bear.

We urgently need pathways to a transition to low-carbon industrialization. The political climate is changing in favour of an economic transformation and green transition. A recent German court ruling (Connolly, 2021), for example, is a clear indication that assessments of the environmental impact of industrial production in tandem with its potential for economic growth will be indispensable going forward. Governments are currently drafting roadmaps for economic recovery; special attention should be paid to the following points:

- Policy coordination at both the national and international level to enhance coherence and alignment between industrial policies and energy policies;
- Introducing a global carbon tax to internalize the negative externality of carbon emissions;
- Improving data reporting systems for NDCs and data consistency for transparency;
- International technical cooperation in the form of capacity-building to assist countries at the operational and institutional level to make NDCs more action-oriented and tailored to individual industries. Capacity-building can take the form of reskilling, upskilling, demonstration programmes, and dissemination of key technologies and best practices;
- Developing inclusive policies by bridging the gender divide gap, the education gap and career advancement paths in the sustainable energy sector;
- Deploying decarbonization technology options through credit support, tax credits, and subsidies, including carbon contracts-for-differences as incentives to adopt new low-carbon technologies;
- Establishing a dedicated technical institution to promote research and implementation of scientific innovation in the field of sustainable energy;
- Targeting funds to fill in financing gaps that arise between the demonstration and the deployment stages;

- Balancing how to reward innovators and incorporating intellectual property into the global setting in cases of public funding to support R&D for renewable energy solutions for high-grade heat processes to rake up adoption rates;
- Introducing stable, transparent public grants and subsidies for sustainable energy technologies to encourage investment and adoption. These need to be tailored for and targeted at SMEs;
- investing in the ecosystem to support the effective use of labelling, including harmonized minimum standards, guidelines for target setting and low-cost certification service;
- Promoting green public procurement as a signal to manufacturers;
- Ensuring that market policies are aimed at controlling the price of environmental goods relative to that of conventional goods to increase national consumption of environmental goods;
- Creating global markets and mechanisms to help cut the generation, transport and storage costs of hydrogen and other sustainable energy technologies for high-temperature heat applications.

These actions should be complemented by the private sector through:

- Knowledge exchange by experienced enterprises through knowledge networks, business conferences and market studies for improved information sharing;
- Communicating the business value of establishing an ISO 50001 EnMS with evidence of the drivers, benefits and challenges of implementation;
- Leveraging firms' purchasing power and strengthening their commitment to only purchase from suppliers that are ISO 50001 certified.

The financial sector also plays a key role in supporting investments in sustainable energy through:

- The provision of uncomplicated and affordable access to the relevant finance;
- Offering a blend of finance options to accommodate local idiosyncrasies;
- Providing clear terms for third-party finance, particularly for on-site renewable energy generation.

Countries need to leverage the opportunity offered by the COVID-19 recovery plans to reap the benefits of sustainable energy solutions and ensure that we build back better. Not only will investing in sustainable energy technologies help address climate change, it will ensure that

post-pandemic economic recovery is based on long-term investment rather than short-term spending.

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