

Innovation in Clean Energy

ISSUE Of the 7.5 billion people on Earth today, over 1.1 billion cannot access electricity, and about 2.8 billion face indoor air pollution due to the use of solid biomass, kerosene, and coal for cooking. Most of these people are living in sub-Saharan Africa, South Asia, and Small Island Developing States. If the current energy access rate and population growth rates keep their trends, in 2050 there will be 2.6 billion people in the world without access to power, and six billion without clean cooking facilities.

Despite the availability of energy efficiency technology and proven approaches, the adoption and uptake of energy efficiency policies, measures, and technologies has not reached its full potential. The fact that energy efficiency continues to lag behind its potential is a key challenge to achieving a clean energy transition and limiting the global temperature rise in line with the Paris Agreement. Other key challenges are the need for greater access to clean energy technologies and integration of renewable energy into electric grids.

Grid modernization and integration of energy storage are critically needed to facilitate the rapid growth of renewable energy in a cost-effective manner. While integrating low shares of renewable energy is relatively manageable, higher shares can require additional measures to increase the flexibility of the electric system, while maintaining grid stability. In some developing countries, the rapid growth of renewable energy has been met by structural, regulatory and/or operational constraints, thus impacting the ability of the utility grid to provide reliable low-carbon electricity.

Based on technology advances and market trends, the electric vehicle market is already growing rapidly and is poised to radically change the need for fossil fuels in the transport sector. Coupled with new, low-carbon sources of renewable energy, electric vehicles are both efficient, low-carbon, and can improve grid reliability and significantly reduce local air pollution. Still, barriers to adoption of electric mobility are substantial and true commercial scaling has not yet been achieved. Enabling a transition to electric vehicles is another key challenge to innovation in clean energy.

Increased innovation in clean energy technologies is vital to tackle the challenges of energy access, improved energy efficiency, grid modernization, improved energy storage, and the transition to electric vehicles. Furthermore, achieving many of the 17 Sustainable Development Goals (SDGs), not just Goal 7 (Affordable and Clean Energy) is dependent on increased access to clean energy technologies. All of these issues are hampered by low participation from the private sector, ranging from emerging small to medium-sized enterprises to large corporations.

The lack of an effective clean energy innovation ecosystem in many countries severely restricts the generation, deployment, and dissemination of suitable technologies. Supportive policies and strategies are fundamental to catalyze much needed innovation, create new partnerships, and support technology transfer for climate change mitigation and enhance private sector investment.

SOLUTION

Sustainable energy is vital to the achievement of the Paris Agreement and the SDGs, as energy-related carbon emissions are the major driver of climate change. Transforming the energy sector requires a shift from fossil energy-based systems to sustainable energy systems. With increasing advancement of technologies, clean energy options are becoming progressively viable and desirable for the developing world. The capital cost of solar photovoltaic technology, for example, decreased by 50% from 2012-2017, and it is expected to continue decreasing by another 50% over the next five years.

Despite this potential, scaling-up clean energy investment and deployment in developing countries still faces financial and operational barriers and challenges. Moreover, energy demand in many developing countries is expected to continue to rise rapidly, driven by economic and population growth. Emissions from the transport sector are growing in tandem with high urbanization rates. Countries are thus seeking support for the transfer of sustainable energy technologies and other innovative solutions, coupled with regulation and policy support, and the development and enhancement of local technical capacity and expertise.

In order to transform energy systems at the pace and scale needed to meet national development priorities, including those in Nationally Determined Contributions to the Paris Agreement, developing countries must ensure that the rapidly growing supply of low-carbon energy is connected to consumers in the most efficient and cost-effective manner. Thus, broad, sectoral interventions and innovative business models that go beyond business as usual must be fostered.

There has been significant progress in some areas. Decentralized power generation and microgrids are providing electricity access. In the Democratic Republic of Congo, for example, new mini- and micro-hydropower stations in rural areas will provide electricity for 200,000 homes. Innovative financial instruments and business models have helped promote energy efficiency and new digital technologies, and energy storage solutions are also leading to progress in renewable energy integration. Furthermore, there are pilot efforts to use public-private partnerships to foster the spread of electric vehicles, such as a program in Yangching, China, which will increase the city's fleet of electric vehicles to 20,000 by 2020.

LOOKING AHEAD

Innovation can help create and expand markets for products and services, generating jobs and supporting economic growth. In GEF-7, partnership with the private sector to promote technology innovation and deployment will be a key priority. Existing support has played a key role in piloting emerging innovative solutions, including technologies, management practices, supportive policies and strategies, and financial tools that foster private sector engagement for technology and innovation. To take advantage of the GEF's comparative advantage in a complex financial architecture, resources will seek to reduce risks and enhance enabling environments to facilitate the replication and scale up of additional investments by other international financing institutions, the private sector, and domestic sources. In GEF-7, investments in the energy sector for climate change mitigation will focus on continuing to promote innovation for sustainable energy breakthroughs in four key areas: decentralized renewable power with energy storage; electric drive technologies and electric mobility; accelerating energy efficiency adoption; and cleantech innovation.

Decentralized, renewable generation is challenging traditional utility models, creating opportunities and challenges for rapid growth of low-carbon energy. Energy storage technology has emerged as a new disruptor, changing market dynamics with rapidly improving technology capacity and declining costs,



but the technology is not yet available in many countries. Countries that have identified power sector transformation through mini-grids, energy storage, and new innovative business models need support to test, prove, and gain experience with these new technologies.

Existing support for low-carbon transport options has covered the full spectrum of investments, from alternative fuel vehicles and fuel-efficient vehicles to bus-rapid-transit and bicycle-sharing programs. With the rapid advancement of electric vehicles, countries may now be ready to develop appropriate regulatory frameworks, plan for disruptive market changes, and foster integration of electric vehicles into the grid.

On transforming the energy system, particularly on energy efficiency, technology is not the problem. Where innovation is needed is in the process—process innovation on procurement, inertia and behavior change, monitoring and evaluation and local capacity. Then, how do we overcome the deployment challenge? One solution is through aggregating similar activities, for example in cities, which are engines of action, public street lighting, energy efficiency in municipal buildings, water pumping—all are very similar developments and can utilize standardized procurement and deployment strategies. One example was Argentina, where 42 secondary cities will unlock the next level of energy efficiency deployment simultaneously.

To get the finance part of the equation right, the financial toolbox should include a sector by sector approach: technical understanding of financiers of specific sector, technical channels that allow new technologies to be supported, financial innovation and variation of instruments, and aggregation and packaging of investments through local banks and ESCOs depending on the local context. Beyond that, to achieve greater scale, the financial toolbox should include blended finance, green bonds, and to the very end the redirection of finance through, for example, the task force of climate disclosure.

Equally important is eliminating barriers to local entrepreneurs. Early stage entrepreneurs often face difficulties in getting the acceptance of the market,

convincing local banks that investments are not that risky, finding the intermediaries, backing up their business ideas with scientific research on energy efficiency appliances. From a global perspective, entrepreneurs are everywhere and the appropriate business ecosystem exists in many countries, but they're not strong enough; they still require further mentorship and support to help them connect the dots to reach the global scale.

Looking ahead, building on a successful partnership with Sustainable Energy for All (SE4ALL), energy efficiency accelerators will continue and expand their support to more countries. The accelerators share common approaches across sub-sectors, including buildings, district heating and cooling, energy management in industry, equipment and appliances. They promote global best practices, foster harmonization of testing and performance standards, and provide technical assistance to countries for targeted engagement. These accelerators also identify critical barriers to adoption of energy efficiency and pilot approaches to overcome them.

Countries may wish to foster clean technology innovation, deployment, dissemination, and transfer through entrepreneurship, with a special emphasis on small and medium-sized enterprises and private sector partnerships. The GEF Global Cleantech Innovation Programme in GEF-6 featured eight countries promoting innovation in energy, water, and buildings. Over 900 companies have been trained, mentored, and introduced to funding and business opportunities. Hundreds of these companies are women-owned and operated; and in many cases these companies are already up and running, attracting investment, making innovative products, creating new jobs, and delivering environmental benefits today. Through fostering innovation and supporting a new generation of entrepreneurs, countries will be able to partner with the private sector to accelerate technology development, increase clean energy deployment, support SMEs, create jobs, and help address climate change.

