Global clean energy in 2017

During the November 2016 Climate Change Conference in Marrakesh, much talk centered on implementation of the political commitments made in Paris in 2015. Governments are now focused on putting their words into action as they prepare for the first official stocktake in 2018. Innovation will have an essential role to play.

In November 2015, 20 nations, including the United Kingdom, launched a new international initiative called Mission Innovation on the sidelines of the Conference of the Parties (COP 21) in Paris. The idea was to accelerate cost-effective solutions to eliminate greenhouse gas emission in energy production. A year later, the effort has grown to 22 countries, plus the European Union, that have pledged to double their public research, development, and deployment funding to a cumulative total of around $30 billion per annum in 2021. The initiative will support new developments in the science, engineering, and technology of low-emission energy solutions. In Marrakesh, an initial seven new Innovation Challenges were announced, with each led by a number of Mission Innovation members. Although each member will decide on priorities for its own expenditure, each challenge will be promoted through international conferences and workshops, and it is anticipated that many cross-country projects will be funded. The creativity and ingenuity that will flow from these projects will produce market-facing solutions through private finance and the engagement of private companies. It is critically important that the appropriate members of the research community are fully involved in these developments over the coming years.

Encouraging innovation in smart grids and energy storage technologies to match demand with supply is one challenge, and large-scale solutions will be location dependent. Brazil and Norway, for example, are well endowed with hydropower facilities that are adapted for pumped hydroelectric energy storage—a solution not available to flat terrains. Every solution represents another set of market-facing opportunities. Another challenge is to develop inexpensive but reliable systems that enable off-grid households and communities to access renewable electricity. At their last meeting in May 2016 in Japan, the G7 heads of government agreed to assist in the roll-out of these solutions to developing countries. The International Energy Agency estimates that in 2013, 17% of the world’s population—1.2 billion people—had no access to electricity.

Other challenges include carbon capture to enable near-zero CO₂ emissions from power plants and carbon-intensive industries; the production, at scale, of affordable, advanced biofuels for transportation and industrial applications; and the discovery of affordable ways to convert sunlight into storable biofuels. Perhaps of greatest interest to the theoretical physics, physical chemistry, and materials science communities that are working alongside the machine learning, robotics, and next-generation computing communities is the challenge of developing clean energy materials. The goal is to provide an integrated, end-to-end materials innovation approach, or platform, to deliver the mix of solutions.

The United Kingdom is focusing on the challenge of developing core heating and building systems that deliver competitively priced heating and cooling without carbon emissions. Globally, buildings account for almost a third of final energy consumption. Energy-efficiency technologies, design and materials to reduce demand for heating and cooling, integrated equipment and systems, storage solutions to match supply and demand, and efficient transfer of heat from production and storage to point of use will all be factors to deliver on this challenge. For the United Kingdom, this focus on innovation is an essential component of its continued commitment to tackle climate change. Mission Innovation is intended to spur the interest of the creative community in what is now the most urgent series of demands facing humanity. The opportunities are, simply, immense.

—Sir David King

Sir David King is the United Kingdom Foreign Secretary’s Special Representative for Climate Change.
david.king@fco.gov.uk

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