Faster and Cleaner 2

KICK-STARTING GLOBAL DECARBONIZATION: IT ONLY TAKES A FEW ACTORS TO GET THE BALL ROLLING

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EXECUTIVE SUMMARY

Meeting the Paris Agreement's long-term temperature limit requires a decarbonization of the global energy system by mid-century. Decarbonizing the power sector is the first step in the comprehensive transformation of the energy system (Rogelj et al. 2015). This requires transformational changes in each sector of the energy system before 2050.

This report looks at the technology trends driving decarbonization in three sectors—power, transportation, and buildings—along with empirical evidence on what can drive these rapid transitions.

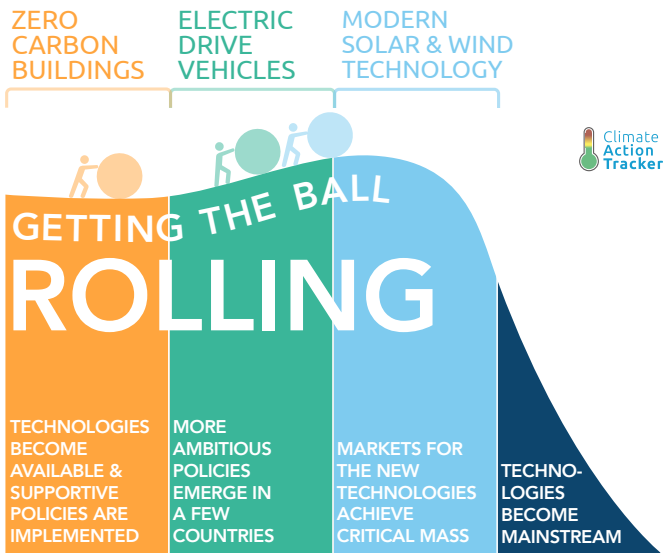
It identifies success factors that could support transitions in other areas to make the transformation scalable. The stringency of the Paris Agreement's aim to pursue efforts to limit global temperature increase to 1.5°C places significant additional pressure on the rate of transformation needed in each of these sectors.

Technological trends in these three sectors have experienced different levels of change, with the power sector witnessing the most transformation due to the rapid development of renewables that have far exceeded expectations. The accelerated uptake of electric-drive vehicles (EDVs) in the transport sector, if fully scaled, could trigger further transformation for that sector. The building sector, however, has seen limited progress and lags far behind its technological potential.

The transformational changes in the power and transport sectors have so far been triggered by policymaking efforts of only a few frontrunners –a small group of countries and regions with the right policy incentives—who have transformed the global market for the technologies and allowed the transition to move beyond the frontrunners to a wider circle. A transformative coalition of countries and sub-national actors in the building sector could accelerate the sector's decarbonization with approaches that take into account the considerable differences between the building stocks in various regions.

Lessons learned from these early-mover countries could enable these kinds of transitions to become mainstream, achieve critical mass—and transform not just the internal markets of countries participating but significantly influence development outside of those markets (Figure 1), eventually allowing for rapid global decarbonization.

Figure 1 – Stages of system change achieved by zero-carbon buildings, electric-drive vehicles, and modern solar and wind power technologies.



MAJOR FINDINGS

Renewable energy technologies are transforming the power sector, which, in 2014, was responsible for almost 42 percent of energy-related CO_2 emissions (IEA 2016a), making it the largest single sector contributing to climate change.

The increase in installed renewable energy capacity, particularly wind and solar energy, has consistently exceeded mainstream expectations. Support mechanisms in a few first-mover countries (Denmark, Germany, Spain) and regions (California, Texas), with stable government policies and financial incentives, spurred RD&D and demand. Adoption of similar policies in other countries, notably China, and now in India, led to rapid growth of low cost renewable energy products and manufacturing at scale.

Should recent trends continue, future renewable capacity installations are set to dwarf what seemed ambitious forecasts a few years ago. Current progress is encouraging, and needs to be bolstered with policies to support the integration of high shares of renewables and replacement of CO_2-emitting fossil fuel-based electricity generation in order to meet 2050 deep decarbonization targets—in particular through corresponding grid and storage development as well as transforming electricity markets. A decarbonized power sector plays an important role in decarbonizing the transport and building sectors.

Electric-drive vehicles are now beginning to transform the transport sector which, in 2013, was responsible for roughly 23 percent of global energy-related emissions, of which three-quarters were attributable to road transport (IEA 2016a). There are three commonly accepted ways to reduce emissions in the transport sector: avoiding motorized travel, shifting travel demand to more energy-efficient modes, and improving the fuel and carbon efficiency of vehicle technology.

Although the first two have seen limited development, the third has shown progress. Increasing fuel efficiency standards for conventional internal combustion engine vehicles have played a role in this progress but are not sufficient for deep decarbonization—the solution lies in a rapid diffusion of zero-emission vehicle technologies.

Norway, the Netherlands, California—and more recently China—have developed markets for electric-drive vehicles (EDVs) that have contributed significantly to electric car sales reaching close to a million in 2016 (Kuramochi et al. 2016), but EDV uptake needs to accelerate significantly.

Climate Action Tracker analysis indicates that half of all light-duty vehicles on the road would need to be electric-drive by 2050 for 2°C compatibility, and for 1.5°C compatibility nearly all vehicles on the road need to be EDVs, implying that no internal combustion engine cars should be sold after roughly 2035 (Sterl et al. 2016).

The building sector has seen modest progress, but lags far behind its technological potential. It represented some 19 percent of global energy-related greenhouse gas (GHG emissions) in 2010 (Lucon et al. 2014) through heating and cooling, use of appliances (including lighting), and cooking. Energy use related to heating and cooling, in particular, has shown little positive movement.

Although there are proven technological solutions, they are applied primarily at the margin and in niche markets. If these solutions were effectively combined, they could result in zero-carbon buildings and, some argue, be cost-effective over a building's lifetime. They have failed to reach critical mass because of financial, geographical and other barriers.

The evolution and adoption of new financial mechanisms can help increase the rate of retrofitting of buildings across geographies, both in markets with sizable existing building stocks—such as the E.U. and the US—as well as in large emerging economies such as Brazil, China and India (Energy Programs Consortium 2017). By 2050, this sector would need to see a 70–80% reduction in 2050 emissions for a 2°C compatible pathway (Rogelj et al. 2015).

We conclude that single countries and a diverse set of actors within them taking action in parallel has, in some sectors, led to dynamics that are shifting global markets. Nevertheless, the pace of technology deployment is not sufficiently rapid to meet the Paris Agreement's goal of limiting temperature rise to well below 2 degrees Celsius above pre-industrial levels.

One way to speed up technology deployment are "transformative coalitions." Under the umbrella of such coalitions, countries and sub-national actors interested in advancing a particular low-carbon technology can work together to create similar market dynamics. Our research shows that an important base factor in creating such dynamics is the implementation of effective policy packages.

The success of low-carbon technology deployment in the power sector and partly in the transport sector would suggest that some polices may be particularly supportive. Transformative coalitions can identify and develop best practice policy packages that then can be tailored to the particular situation in each country. This strategy would ensure effective policy implementation in a number of countries, triggering a global market dynamic.

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