

Decarbonizing the Global Economy – An Integrated Assessment of Low Carbon Emission Scenarios proposed in Climate Policy

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In 2015, the Conference of the Parties (COP 21) reaffirmed to targeting the global mean temperature rise below 2 °C in 2100 while finding no consent on decarbonizing the global economy, and instead, the final agreement called for enhanced scientific investigation of low carbon emission scenarios (UNFCCC, 2015). In addition, the Climate Action Network International (CAN) proposes Special Reports to address decarbonization and low carbon development including 1.5 °C scenarios (IPCC, 2016). In response to these developments, we investigate whether the carbon emission cuts, in accordance with the recent climate policy proposals, may reach the climate target. To tackle this research question, we employ the coupled climate-energy-economy integrated assessment Model of INvestment and endogenous technological Development (MIND, cf. Edenhofer et al., 2005, Neubersch et al. 2014). Extending MIND's climate module to the two-box version used in the Dynamic Integrated model of Climate and the Economy (DICE, cf. Nordhaus and Sztorc, 2013, Nordhaus 2014), we perform a cost-effectiveness analysis with constraints on anthropogenic carbon emissions. We show that a climate policy scenario with early decarbonization complies with the 2° C climate target, even without Carbon Capturing and Storage (CCS) or negative emissions (see van Vuuren et al., 2013, for negative emissions). However, using emission inertia of 3.7 percent annually, reflecting the inflexibility on transforming the energy sector, we find a climate policy with moderately low emissions from 2100 onwards at a cost in terms of Balanced Growth Equivalents (BGE, cf. Anthoff and Tol, 2009) of 0.764 % that requires an early (2035 vs. 2120) peak of investments in renewable energy production compared to a business-as-usual scenario. Hence, decarbonizing the global economy and achieving the 2 °C target might still be possible before 2100, but the window of opportunity is beginning to close.

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