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Cost-effective implementation of the Paris Agreement using flexible greenhouse gas metrics

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Greenhouse gas (GHG) metrics, that is, conversion factors to evaluate the emissions of non-CO₂ climate forcers on a common scale with CO₂, serve crucial functions upon the implementation of the Paris Agreement. While different metrics have been proposed, their economic cost-effectiveness has not been investigated under a range of pathways, including those temporarily missing or significantly overshooting the temperature targets of the Paris Agreement. Here we show that cost-effective metrics for methane that minimize the overall cost of climate mitigation are time-dependent, primarily determined by the pathway, and strongly influenced by temperature overshoot. The Paris Agreement will implement the conventional 100-year Global Warming Potential (GWP100), a good approximation of cost-effective metrics for the coming decades. In the longer term, however, we suggest that parties consider adapting the choice of common metrics to the future pathway as it unfolds, as part of the global stocktake, if cost-effectiveness is a key consideration.