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Title: The Climate Mitigation Opportunity behind Global Power Transmission and Distribution

Abstract: Inefficient transmission and distribution (T&D) infrastructure—caused, for example, by losses from technical issues, pilferage, poor planning and management—contributes to compensatory power generation and therefore to greenhouse gas emissions (GHG). Yet, mitigation efforts are concentrated on electricity generation and heat production that together contribute to a quarter of global GHG emissions. The mitigation potential of modernizing the grid and improving its efficiency is often understated. The Nationally Determined Contributions to the Paris Agreement highlight that only 32 countries mentioned grid efficiency in their GHG mitigation strategies. For comparison, 110 countries mention some form of renewable energy. Furthermore, assessments of life cycle power sector emissions tend to focus on estimates of electricity generated rather than quantifying the differences per electricity delivered across countries. As a result of a combination of these factors, the mitigation potential of reducing T&D losses is often overlooked and compensatory emissions remain poorly characterized. Using data primarily from the National Renewable Energy Laboratory and the International Energy Agency, we combine life cycle assessments of power generation with uncertainty analysis to bound potential emissions from compensatory generation from technical and non-technical losses in 142 countries. Results will be presented that describe potential improvements in T&D infrastructure and the resulting emissions reductions. By addressing such losses, not only are GHG emissions reduced but low carbon investments are protected from grid inefficiencies.

Key words: Life Cycle Assessment, greenhouse gas emissions, electricity generation, transmission and distribution