

Comparative Life-cycle Assessments Using Electricity Consumption and Generation Mixes

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The mix of electricity consumed by a product, process or industrial sector has a significant effect on the associated inventory of emissions and environmental impacts because of large differences in the methods of power generation used. Fossil fuel-fired or nuclear centralized steam generators, large and small-scale hydroelectric, and renewable options such as geothermal, wind and solar each have a unique set of issues which can change the results of a life-cycle assessment.

In previous work, we created electricity consumption profiles for each state and for key industry sectors in the U. S. based on existing state generation profiles, net state power imports, industry presence by state, and an optimization model to estimate interstate electricity trading. In this paper, we address some caveats for using this type of data in LCA and make recommendations for electricity industry data collection to make future analyses more accurate. In addition, we complete the list of industrial sector consumption mixes, and go through comparative life-cycle assessments of major manufacturing sectors using the original electricity generation mix and consumption mixes. The results confirm our original hypothesis and recommendation – for many sectors, there is little difference, but for some important sectors of the economy, the difference is significant. It is important to take this difference into account.