



## Background

It is difficult to overstate the importance of electricity to modern societies around the world. The generation and delivery of this power is an enormous industry – about \$300 billion in operating revenue and \$40 billion in net profits in the United States, or about 2% of GDP in 2005.

To support the production of this electricity, the utilities have enormous supply chains which reach throughout the entire economy of the United States and across the world. In 1997 nearly \$30 billion was spent on the procurement of coal, petroleum and natural gas to fuel the generation of power. An additional \$12 billion was spent on transportation to get these fuels from their extraction points to the power plants, and \$40 billion more was spent in over 150 service, manufacturing and maintenance sectors.

And yet, these economic numbers pale in comparison to the large role that the generation and consumption of electricity plays in our environment. The raw tonnage of a myriad of pollutants that the burning of fossil fuels expels into the atmosphere is large, but difficult to comprehend. Easier to understand is that the generation phase alone of electricity, produced nearly 40% of the CO<sub>2</sub> emissions from the United States in 2002.

## Statement Of Work

In this work, we build upon the framework of an existing aggregate model – the Economic Input-output Life-cycle Assessment tool – by adding data about the electricity industry. We add information to the Power Generation sector of the detailed input-output model of the U.S. economy by splitting up, or disaggregating, this single sector into additional sectors, each representing a specific construction or operation portion of the electricity industry.

When all the new sectors are inserted into an existing framework, we build a more accurate picture of electricity in 1997, and

build both current and future generation scenarios – each with a specific mix of generation types and investment in future technologies – and we can look at the

economic and environmental results which include not only the top-level emissions, but the impacts from the entire supply chain, like this example showing an LCA of coal mining comparing an average and disaggregated result.

## Implications

The process to create specific mixes and scenarios is infinitely flexible and expandable. More power generation sectors can be added, and more emission factors developed to allow for an even greater level of accuracy; or, to enable the building of hypothetical generation scenarios. With industry sectors such as Power Generation & Supply, which are extremely important to many life-cycle assessments, and for which a large amount of more process-specific data exists, this type of work can make a large difference. For practitioners, this work enables a greater level of detail for LCAs which include industry, and also provides a framework and case study for sector disaggregation.

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