NREL develops more precise look at cradle-to-grave greenhouse gas emissions for energy technologies

May 7 2012

(Phys.org) -- A new approach to assessing greenhouse-gas emissions from coal, wind, solar and other energy technologies paints a much more precise picture of cradle-to-grave emissions and should help sharpen decisions on what new energy projects to build.

The method – a harmonization of widely variant estimates of greenhouse gas emissions by the U.S. Department of Energy's (DOE) National Renewable Energy Laboratory (NREL) – is being heralded as an important step forward in life-cycle assessments that paints a clearer picture of the environmental penalties and benefits of different technologies.

NREL analysts looked at more than 2,000 studies across several energy technologies, applied quality controls and greatly narrowed the range of estimates for greenhouse-gas emissions.

The harmonization found that cradle-to-grave greenhouse-gas emissions from solar photovoltaics are about 5 percent of those from coal; that wind and solar are about equal in emissions; and that nuclear energy is on a par with renewable energy.

And the analysis succeeded in narrowing the huge range of estimates – in some cases by 80 percent to 90 percent – to a robust median, improving precision, and giving stakeholders a much clearer look at the likely

environmental impacts of various projects.

NREL's findings appear in six articles and an editorial in the May special supplemental issue on Meta-Analysis of Life Cycle Assessment (LCA) of the *Journal of Industrial Ecology* (*JIE*).

Also helping with the findings were subcontractors and researchers from the DOE's Brookhaven National Laboratory.

"As a society, we need to better understand what the effects of our energy choices are," said Garvin Heath, a scientist with NREL and a leader of the project. "Greenhouse gases and climate change are a part of the discussion. As we try to envision what our future energy system will look like, we need an accurate picture of what that transition will mean."

Renewables such as solar and wind produce far fewer greenhouse-gas emissions than coal, oil, or natural gas while in operation.

But the meta-analysis by Heath, Technology Systems and Sustainability Analysis Group Manager Margaret Mann, and their team looked deeper, at emission estimates starting with the manufacture of solar panels, wind turbines, coal plants or natural gas lines, all the way to the emission estimates for decommissioning the sites. Increasingly, lenders, utility executives, and lawmakers are scrambling to get the best, most precise information on greenhouse gas emissions from various sources of energy. And they are frequently frustrated by the huge range of those estimates.

State and local lawmakers, weighing the merits of a new coal-fired plant versus a wind farm, for example, are eager to know not just the relative financial costs, but the impacts to the environment over the decades the project.

“This methodology allows you to arrive at a better precision, so you can say with more certainty that this is the benefit you get from using this technology rather than that technology,” Heath said.

Project developers, investors, manufacturers, and utilities all can use the harmonization estimates as building blocks to making their own estimates of specific projects or to guide policy.

JIE editor-in-chief Reid Lifset said NREL’s LCA Harmonization Project improves consistency and “goes well beyond much of the extant efforts at review articles on LCA.”

More information: onlinelibrary.wiley.com/doi/10 … 16.issue-s1/issuetoc

Provided by National Renewable Energy Laboratory