FACT SHEET

ASSURING ACCURATE ESTIMATES OF THE AVOIDED EMISSION BENEFITS OF ENERGY EFFICIENCY AND RENEWABLE ENERGY TECHNOLOGIES

Introduction: The electric power sector is responsible for approximately 40 percent of the carbon dioxide (CO_2) emissions in the U.S. According to leading energy experts, this sector will need to be transformed dramatically to meet national targets for greenhouse gas (GHG) emission reductions during the next several decades. A key part of this transformation will be the adoption of strategies employing energy efficiency and renewable energy. In order to provide comprehensive reporting of GHG emissions and to measure the cost-effectiveness of GHG reduction programs, it is necessary to improve the accuracy and lower the costs of the most widely used methodologies for measuring the avoided emission benefits of energy efficiency and renewable energy (EERE) technologies. In work completed in 2008 and 2009, the U.S. Department of Energy's (DOE) Clean Energy/Air Quality Integration Initiative compared alternative methodologies that can play a major role in achieving greatly improved accuracy and reduced costs.

Findings from DOE Research:

1. Most commonly used methodologies for calculating air emission reductions from EERE technologies rely on avoided emission factors compiled in the Emissions & Generation Resource Integrated Database (eGRID) funded by the U.S. Environmental Protection Agency (EPA). Although the eGRID database was not developed for the purpose of calculating the avoided emission benefits of EERE technologies, it has been used for this purpose because there is no other available public database of electric generation that can meet this need.
2. Analysis conducted under the DOE's Initiative found that the eGRID system average methodology that has been adopted by the Climate Registry and other entities **understates** the CO_2 and nitrogen oxide (NO_x) reduction benefits of five EERE technologies in the PJM Interconnection and the Upstate New York power markets by approximately 70% to 120% compared to a methodology based on hourly marginal emissions (TMM methodology). These five technologies are wind energy, solar photovoltaic energy, high-efficiency commercial air conditioning, high-efficiency commercial lighting, and LED traffic light retrofits.
3. A time-matched marginal (TMM) methodology provides a far more precise estimate of emission reductions from EERE programs and projects than the eGRID system average. Moreover, the TMM method can be used to produce worksheet calculator tools providing a low-cost approach that can easily be implemented by government officials.
4. Improved methodologies and calculator tools based on the TMM methodology or other similar hourly methodologies based on marginal emissions can enable State and local governments to more accurately evaluate the cost-effectiveness of EERE programs in reducing emissions of GHGs and other air pollutants.
5. An investment of limited funds by the DOE, EPA, and/or State agencies to create calculator tools using the TMM methodology or a similar hourly methodology would empower government agencies and businesses to enhance the deployment of EERE technologies to meet State climate, energy, and air quality goals.

The following hypothetical example highlights the problems faced by state and local governments in preparing GHG inventories and conducting other GHG accounting because of inconsistencies in avoided emission methodologies. [1] For example, take the case of a municipality in western New York that is tracking its GHG emissions and reporting under the Climate Registry protocols -- using system average emission rates for its purchase of electricity. Assume that the municipality decided to reduce its GHG emissions to meet a target in its Climate Action Plan and decided to install a municipal wind farm to power its own facilities and generate 10,000 MWh per year. The reported avoided emissions from three alternative emissions measurement methodologies are shown in Table 1.

Table 1: Avoided Emissions in Tons /Year from 10,000 MWh of Wind Energy Generation in Upstate New York. Based on 2005 Data.

Avoided Emissions Methodology	Avoided Emissions (Tons per Year)	Organization Using Methodology
eGrid System Average	4,100	Climate Registry and ICLEI
eGRID Nonbaseload Average	8,500	Center for Resource Solutions
Time-Matched Marginal (TMM)	9,160	MWCOG, Wind Developers

Implications of Research: During 2008, a large majority of States and hundreds of local governments adopted protocols that rely on the eGRID system average emissions methodology for calculating CO_2 emission from grid-connected electricity. Reliance on this methodology for calculating avoided emissions from EERE substantially understates the avoided emission benefits of most EERE technologies. This has significant ramifications because of the likelihood that other government entities and the authors of national climate legislation will follow this precedent.

ADDITIONAL INFORMATION

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[1] In this example (and for simplicity), we only have considered avoided emissions from operational changes in generation in the near-term. We have not considered the added complexity that arises in accounting for the impacts of EERE projects on reducing the need to build new fossil fuel-fired electric generating capacity in the future.