Memo

To: Keri Enright-Kato, Director, Office of Climate Change, Technology, & Research, Connecticut Department of Energy and Environmental Protection and Robyn DeYoung, Environmental Specialist, US Environmental Protection Agency;

CC: Denise Mulholland, Senior Analyst - State Climate and Energy Program, US Environmental Protection Agency

From: Lucy Charpentier, Manager of Evaluation, Measurement and Verification; Eric Shrago, Director of Operations

Date: February 6, 2017

Re: Connecticut Green Bank use of AVERT for Air Pollution Avoidance Measurement for Individual Projects

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BACKGROUND

The Connecticut Green Bank (Green Bank) would like to standardize its methodology on quantifying the air emission benefits (e.g., nitrogen oxides (NO_x), sulfur dioxide (SO_2) and carbon dioxide (CO_2)) from its energy efficiency and renewable energy investments.

The Green Bank currently calculates an expected annual and lifetime kWh savings of energy and production of clean energy[1] with associated CO_2, NO_X and SO_2 emissions per project using ISO-New England information. This methodology was followed by our predecessor, the Connecticut Clean Energy Fund, which used the results of the 2007 New England Marginal Emission Rate Analysis.

The U.S. EPA created the Avoided Emissions and Generation Tool (AVERT).[2] In an effort to update its methodology, which both DEEP and NREL recommended we review, the Green Bank explored the use of AVERT.

Once the methodology for the use of AVERT is standardized, the Green Bank will:

- Calculate and disclose the air emissions benefits anticipated from the issuance of "green" bonds that finance clean energy projects; and

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[1] It should be noted that the Connecticut Green Bank collects actual clean energy production data from all renewable energy projects it has invested in.
[2] https://www.epa.gov/statelocalclimate/avoided-emissions-and-generation-tool-avert

- Publicly report the air emissions benefits resulting from its investment activity in clean energy through its Comprehensive Annual Financial Report.

OVERVIEW

AVERT uses regional Air Market Program Data (AMPD) from the EPA Clean Air Markets Division (CAMD) for nearly all operating fossil-fuel energy generating units with generating capacities great then 25 MW[3]. Data collected in AMPD include reported gross generation (MWh), steam output (tons from CHP facilities), heat input (in MMBtu), emissions of sulfur dioxide, oxides of nitrogen (NO_x), and carbon dioxide (CO_2).

The current structure of AVERT requires the submission of a single project or aggregate of multiple projects into the Microsoft Excel model at a time. This takes significant time by Green Bank staff to input each project to retrieve air emission benefits. To operationalize these calculations, the Green Bank is proposing using factors derived by average projects through AVERT and then taking an average based on technology. The factors using ISO-New England 2015 emissions data are the following (see Table 1):

Table 1. Factors

Technology	CO_2 tons factor	NO_X lbs factor	SO_2 lbs factor
Solar PV	0.5446	0.6630	0.6535
Energy Efficiency	0.5409	0.6167	0.6208
Wind	0.5456	0.6123	0.6787

To confirm these factors, the Green Bank has run indicative projects (based on average size) through the models and replicated these results and compared to results obtained from AVERT. The average of the differences is as follows (see Table 2):

Table 2. Average differences from AVERT

Technology	CO2 tons Difference	CO2 % Difference	NOX lbs Difference	NOX % Difference	SO2 lbs Difference	SO2 % Difference
Solar PV	-16.67	0.00	-33.33	0.00	-166.67	0.00
Energy Efficiency	0.00	0.00	0.00	0.00	0.00	0.00
Wind	0.00	0.00	-16.67	0.00	-66.67	0.00

RECOMMENDATION

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[3] The AVERT 2015 Northeast Regional Data File contains 328 fossil units. Generation is fully represented for CT, MA, ME, NH, NY, RI and VT and NJ is partially represented (23%). See the Disclaimers tab for additional details.

The Green Bank proposes to automate the calculation of these avoided emissions (multiplying the expected generation by the factors) initially manually and eventually through our data warehouse. The Green Bank will implement a process to update the factors annually, using the same methodology used to derive the above factors, once the EPA updates the model with new emissions factors based on the ISO-New England generation mix. The Green Bank will evaluate building an API to query the AVERT model once it is available online.

Factors will be used to determine actual emissions avoided for the year's factor used and for projected future avoidances. Future avoidances will be projected using the newest factor. The Green Bank will continue to use EGRID to estimate actual emissions avoided for projects completed prior to January 1, 2015.