Using EPA's eGRID to Estimate GHG Emissions Reductions from Energy Efficiency

Art Diem, U.S. EPA, Washington, DC
Cristina Quiroz, Manish Salhotra, Radium Consulting Group Inc. Fairfax, VA

ABSTRACT

This paper identifies procedures recommended by the U.S. Environmental Protection Agency (EPA) regarding the use of the Emissions & Generation Resource Integrated Database (eGRID) to estimate greenhouse gas (GHG) emission reductions from energy efficiency projects that reduce the consumption of grid supplied electricity in the U.S. It presents the most recent eGRID data available from the database available at http://www.epa.gov/egrid. It includes the generation based eGRID output emission rates and grid gross loss factors. eGRID total output emission rates can be applied to electricity use to estimate indirect (scope 2) carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) emissions as prescribed by various protocols, including those of the World Resources Institute, The Climate Registry, and the California Climate Action Registry. eGRID non-baseload output emission rates can be applied to electricity reductions to estimate indirect emission reductions from energy efficiency. The authors recommend the use of eGRID subregion level data for these purposes. They further recommend EPA's Power Profiler online application and spreadsheet to determine appropriate eGRID subregions for buildings with known U.S. zip codes in the 50 states and the District of Columbia. eGRID grid gross loss factors can be used to estimate the scope 3 line loss emissions from an emission inventory perspective, or to estimate further emission reductions due to line losses for energy efficiency. The authors also discuss how to best match which year of eGRID data with the year of electricity consumption or electricity reductions. The authors provide example scenarios and calculations.

Introduction

The purpose of this paper is to provide information to help energy program evaluators and other stakeholders concerned with the estimation of the environmental benefits of energy efficiency. The paper explains how to make the most appropriate use of the EPA eGRID database for estimation of greenhouse gas emissions reductions given the variety of analytical needs that this data can meet. Once annual electricity reductions from an energy efficiency project or program have been estimated, reductions of Greenhouse Gas (GHG) emissions can be easily estimated using EPA's Emissions & Generation Resource Integrated Database (eGRID), available at http://www.epa.gov/egrid. This database contains many types of information, and it is important to access the most appropriate information to estimate GHG emission reductions from programs and projects that reduce the use of grid supplied electricity.

Background

EPA's Emissions & Generation Resource Integrated Database (eGRID), is a globally recognized source of emissions data for the electric power generated in the United States. eGRID contains emissions data, generation data, and resource mix for all electric generators in the United States that are grid connected, report to the Federal government, and have at least one megawatt capacity. The air pollutants included in the most recent set of eGRID data are: three combustion related GHGs -- carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O); sulfur dioxide (SO_2), and nitrogen oxides (NO_x). These eGRID data

are aggregated at the plant level, and are also aggregated to state, electric generating company (EGC), parent company, power control area (PCA), eGRID subregion, NERC region, and the U.S. total levels.

eGRID2012 Version 1.0 contains year 2009 data, and is the eighth edition of eGRID. This edition also includes year 2007 data first published in eGRID2009, year 2005 data first published in eGRID2007, and year 2004 data first published in eGRID2006. eGRID2002, the archived edition, contains data for years 1996 through 2000.

Since its inception in 1998, eGRID has provided people with information about the environmental characteristics of the generation of electricity in U.S. so that people may better understand the impacts of electricity generation and use and how these characteristic vary across the U.S. Over the years, people have used eGRID for many purposes. One popular purpose is a uniform, credible way to estimate the indirect greenhouse gas emissions from electricity use. With such information, people can make smart decisions about investments that would reduce electricity consumption and seek to estimate the reduced amount of pollution associated with those policies, programs, and projects. This paper is intended to navigate the reader to the most relevant pieces of data within the large eGRID dataset for this purpose.

Selection of the eGRID Subregion Aggregation Level Data

EPA recommends using the eGRID subregion aggregation level data to estimate either emissions reductions (from energy efficiency that reduces the use of grid supplied electricity) or emissions from electricity purchases (used in corporate GHG inventories or carbon footprints). State level data are not recommended for these purposes.

eGRID subregions are identified and defined by EPA – using the NERC regions and PCAs as a guide. The 26 eGRID subregions in eGRID are subsets of the NERC regions (or in a few cases, entire NERC regions). See Figure 1. An eGRID subregion is often, but not always, equivalent to an Integrated Planning Model (IPM) subregion. The plant's associated PCA determines the plant's associated eGRID subregion, which is defined as a subset of the NERC region and is composed of entire PCAs, with the exception of PJM Interconnection and New York Independent System Operator PCAs which are each associated with three eGRID subregions.

Although state level data may be tempting to use because state level data is easily identifiable to a particular location, electric grid boundaries rarely follow state boundary lines. For example, the plant located in the State of Florida and the eGRID subregion/NERC region FRCC are not the same; nor are the plants in the State of Texas and in the eGRID subregion ERCOT's/NERC region TRE the same, nor the State of California's and the eGRID subregion CAMX's. The Intermountain Power Project plant is a good illustration of a plant located in one state, yet electrically dispatched and connected to an eGRID subregion not obviously associated with that state. Although this plant is physically located in the State of Utah, not California, it is in the eGRID subregion CAMX because its PCA is the Los Angeles Department of Water and Power PCA, which is connected to the CAMX eGRID subregion.

Use of Power Profiler to Establish the eGRID Subregion Associated with a Particular Location

EPA's Power Profiler is an online application that allows a user to find out the eGRID subregion using zip code and selecting from a list of utilities that serve that zip code. See www.epa.gov/powerprofiler. A spreadsheet tool that allows the entry of zip codes of many buildings and returns the eGRID subregion or subregions for each entry is also downloadable from this website.

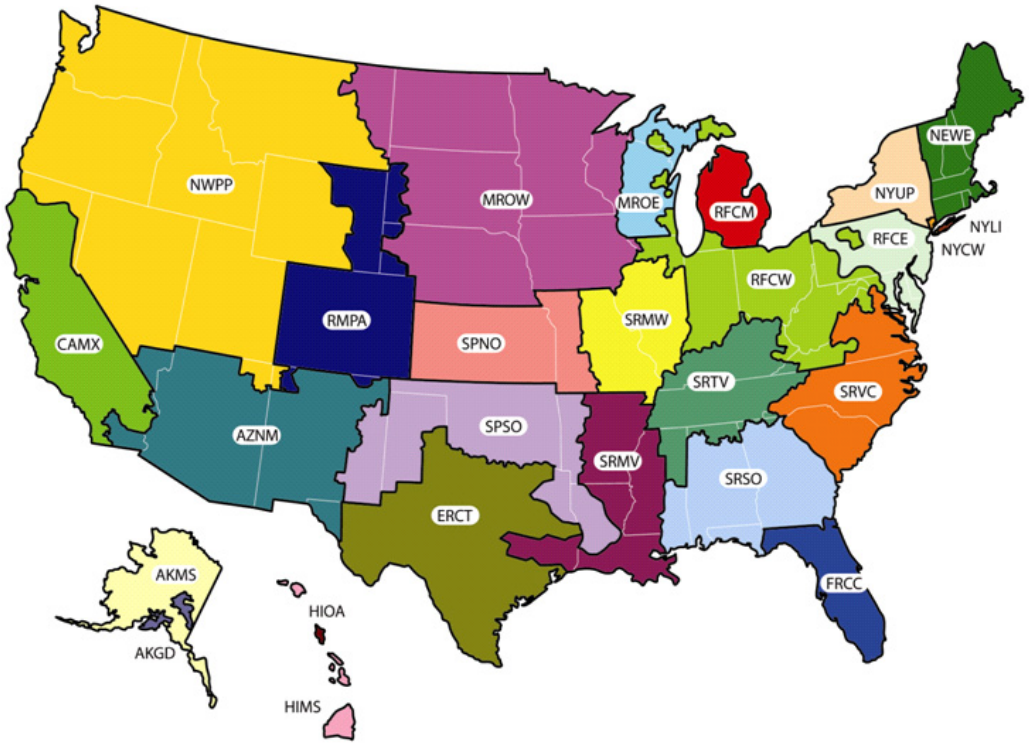

Figure 1. eGRID subregion representational map. (Note that the boundaries shown on this map are approximate because they are based on companies, not on strictly geographical boundaries).

Selection of Correct eGRID Subregion Output Emission Rates

eGRID contains several types of annual output emission rates. The eGRID output emission rate is a measure of the emissions as they relate to the net generation output of all generating units in the particular aggregation. It is calculated as the mass of emissions divided by the net electricity generation multiplied by a unit conversion factor. Units are in pounds per megawatt-hour (lb/MWh) for CO_2 and pounds per gigawatt-hour (lb/GWh) for CH_4 and N_2O.

EPA recommends using the eGRID subregion non-baseload output emission rates only for estimating emission reductions from energy efficiency and other activities that reduce the use of grid supplied electricity, while the eGRID subregion total output emission rates should be used for developing corporate GHG inventories and carbon footprints. The total output emission rates (sometimes called the system mix) include all generation and emissions from all plants, while the non-baseload output emission rates (akin to a marginal emission rate) include only combustion generation and emissions that are weighted more heavily for low capacity factor plants.

Non-baseload Output Emission Rates

Non-baseload output emission rates were developed for eGRID to provide an improvement over the fossil fuel output emission rates as an estimate of emission reduction benefits from energy efficiency and clean energy projects. Non-baseload output emission rates should not be used for assigning an emission value for electricity use in carbon footprinting or GHG emissions inventory efforts. Non-baseload output

emission rates may be less appropriate when attempting to determine the emissions benefits of some resources that have load shapes that are not at all coincident with peak loads, such as wind power, or of load reductions that occur primarily during off-peak hours.

Demand for electricity changes diurnally and seasonally. The term "base load" refers to those periods of time when demand for electricity is low. Baseloaded plants are usually called upon to provide electricity to the grid no matter what the demand for electricity is during any given period of time, and usually operate continuously except when undergoing routine or unscheduled maintenance. Therefore, use of fossil fuel average emission rates contain a considerable proportion of baseloaded generation that would presumably not be affected by any reductions in demand for grid supplied electricity. It is for this reason that the eGRID non-baseload output emission rates were created, to provide a better estimate of displaced emissions than any of the other output emission rates provided in eGRID.

The eGRID non-baseload emission rates exclude generation from non-combustion sources and exclude emissions and generation from plants that have high capacity factors, which are assumed to be unaffected by demand reductions that affect marginal generation. Plants having high capacity factors are baseloaded and are removed from the non-baseload output emission rate, the premise being that any reduction in the demand for grid-supplied power will not affect the dispatch of baseloaded units. The capacity factor of each plant is used as a surrogate for determining how much of each plant's generation is considered to be displaceable or non-baseloaded.

Specifically, the eGRID non-baseload emission rates are calculated as follows. The emission rates are determined starting with plant level data. First, all generation from resources that do not combust fuel is removed from each plant. Plants with 100% hydro, nuclear, wind, solar, and/or geothermal generation are removed from the non-baseload calculation. For any plants that have partial generation from the combustion of fuel, the emissions from the plant are retained and the generation from resources that do not combust fuel is subtracted out for this calculation, and the plant's output emission rate is recalculated. Next, a capacity factor relationship is used to determine the percent of the plant's generation and emissions to be considered non-baseload generation. All generation at plants with low capacity factors (greater than 0.0 and less than 0.2) would be considered non-baseload. No generation at plants with high capacity factors (0.8 and greater) would be considered non-baseload generation. No generation at plants with negative generation from combustion sources would be considered non-baseload generation. A linear relationship would determine the percent generation that is non-baseload at plants with capacity factors between these 0.2 and 0.8. The non-baseload generation of each plant is multiplied by the plant's output emission rate, to determine the non-baseload emissions. Finally, the total non-baseload generation and the total non-baseload emissions are summed up at each level of aggregation (state, PCA, eGRID subregion, NERC region, and U.S. Total) and are used to calculate the non-baseload output emission rates.

The most recent eGRID subregion non-baseload output emission rates for CO_2, CH_4, and N_2O are available in the eGRID2012 year 2009 Summary Tables (EPA 2012, 3). These rates should be used for estimating emission reductions from energy efficiency projects and programs.

Application of Non-baseload Output Emission Rates. Several tools use the eGRID subregion CO_2 non-baseload output emission rates as the underlying data. Two of note are: EPA's Greenhouse Gas Equivalencies Calculator (http://epa.gov/cleanenergy/energy-resources/calculator.html), which calculates the potential amount of avoided CO_2 emissions; and EPA's Green Power Equivalency Calculator http://www.epa.gov/greenpower/pubs/calculator.htm), which helps to translate a green power kilowatt-hour (kWh) purchase into more understandable everyday terms. For example, it expresses CO_2 emissions equivalencies in terms of the number of coal fired power plants, the number of passenger vehicles, or electricity use in a number of American homes**.**

In 2010, Executive Order 13514 was issued, requiring Federal agencies to "measure, report, and reduce their greenhouse gas emissions from direct and indirect activities." The Federal GHG Accounting

and Reporting Guidance accompanied this order and recommended using eGRID non-baseload emission rates to estimate the Scope 2 (indirect) emission reductions from renewable energy.

eGRID non-baseload output emission rates can be useful when attempting to estimate the emissions benefits of reductions in grid supplied electricity use, especially those that are somewhat coincident with peak demand. For example, to estimate the CO_2 emission reductions associated with the installation of energy efficient equipment or products or the installation of building envelop technologies, the user could use the eGRID subregion CO_2 non-baseload output emission rate and the expected or actual energy savings resulting from reduced electricity consumption from the installation to estimate the CO_2 emission reductions.

Total Output Emission Rates

The eGRID total output emission rate is appropriate for inventory development and carbon footprinting because it includes all generation and emissions from all generating units in the particular aggregation. The eGRID subregion total output emission rates are the default value recommended by various protocols to assign an emissions value for scope 2 emissions from the consumption of purchased electricity.

Application of Total Output Emission Rates. The eGRID subregion total output emission rates are the underlying data for EPA's Power Profiler tool (http://epa.gov/powerprofiler), which allows the user to assess the impacts of electricity use as well as to compare the fuel mix and air emission rates of the electricity in the user's region with that of the nation. These rates are also the underlying data for EPA's Household Carbon Footprint Calculator (http://www.epa.gov/climatechange/ghgemissions/ind-calculator.html), which helps the user to estimate a personal (or family) carbon footprint, and for EPA's Office Carbon Footprint Tool (http://www.epa.gov/smm/wastewise/carboncalc.htm), which estimates office GHG emissions from a variety of sources including company-owned vehicle transportation; purchased electricity; waste disposal; and leased assets, franchises, and outsourced activities.

eGRID data are used for carbon footprinting; emission reduction calculations; calculating indirect greenhouse gas emissions for The Climate Registry, the California Climate Action Registry, California's Mandatory GHG emissions reporting program (AB 32), and other GHG protocols. Other tools such as labeling/environmental disclosure, Renewable Portfolio Standards (RPS) and Renewable Energy Credits (RECs) attributes are supported by eGRID data. States also rely on eGRID data for electricity labeling (environmental disclosure programs), emissions inventories, and for policy decisions. For example, the Maryland Department of the Environment (MDE) determined eligibility for participation in the Voluntary Renewable Set-Aside Account (VERSA) using eGRID factors (http://www.mde.state.md.us/aboutmde/AboutMDEHome/Documents/RGGI-VERSA_TSD.PDF); and in 2009, the Delaware Valley Regional Planning Commission (DVRPC)--a nine county region in Pennsylvania and New Jersey--completed a 2005 GHG Inventory in support of regional efforts to quantify and reduce emissions associated with climate change , using eGRID factors (http://www.dvrpc.org/reports/09038A.pdf).

The most recent eGRID subregion total output emission rates for CO_2, CH_4, and N_2O are reported in the eGRID2012 year 2009 Summary Tables (EPA 2012, 3). These rates should be used for carbon footprinting purchases of grid supplied electricity.

Caveat about Mixed Use of Output Emission Rates

If non-baseload output emission rates are used to calculate the avoided GHG emissions from a project that would reduce the consumption of grid supplied electricity, these estimated emission reductions may not be realized within the corporate GHG inventory after the project is complete due to the way the

corporate inventory protocols specify the use of total output emission rates for purchases of electricity. The non-baseload output emission rate values the electricity savings differently from the effective reductions within corporate GHG inventory protocols. If the goal is to estimate the emission reductions that a project will realize within the corporate inventory after the project is complete, the eGRID subregion total output emission rates rather than the eGRID subregion non-baseload output rates should be used.

Recent trends in Output Emission Rates

The resources used to generate electricity in the U.S. vary not just regionally, but also temporally. Recent trends in fuel availability and prices have been generally shifting the generation of electricity away from coal and toward natural gas. Also, wind power has been growing significantly in many parts of the U.S. The national CO_2 total output emission rate in pounds per MWh was 1,422.60 for year 1998 and was 1,216.18 for year 2009. Figure 2 below shows the resource mix for 1998 and 2009. The trend of gradual reductions in CO_2 output emission rates is expected to continue in the next few future editions of eGRID due to changes in resources used to generate electricity.

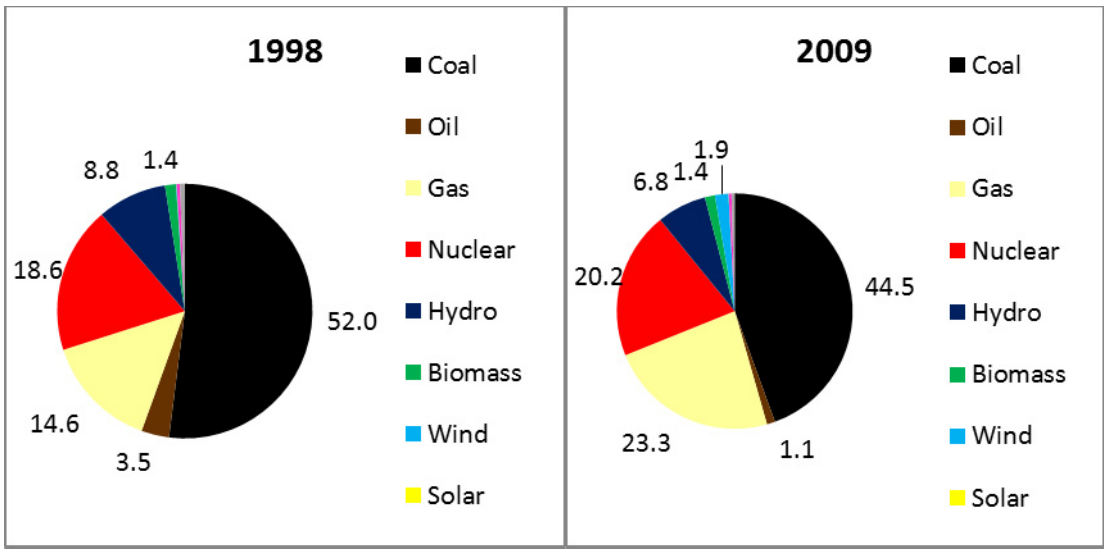

Figure 2. U.S. resource mix, years 1998 and 2009 (percent)

On an eGRID subregion basis, total output emission rates have also changed over time, each depending on the change in resource composition of the particular eGRID subregion. See Figure 3 below for selected eGRID subregions.

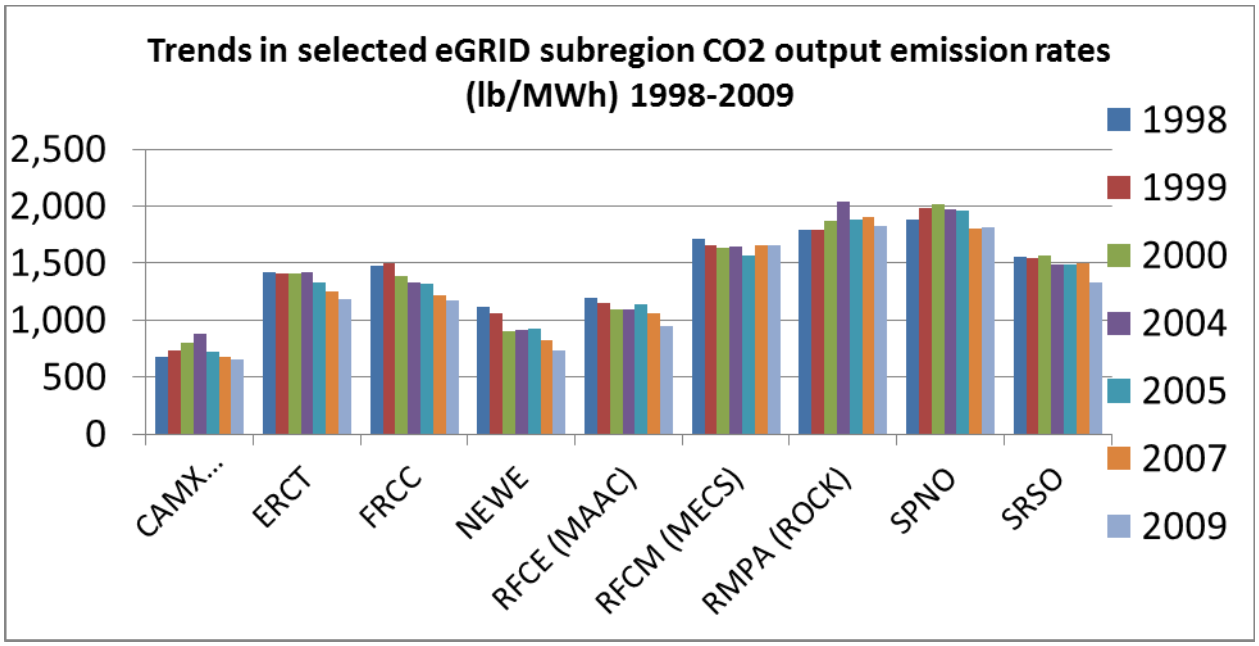

Figure 3. Total CO_2 output emission rate for selected eGRID subregions

For CO_2 non-baseload output emission rates, a similar, but generally less dramatic shift has taken place over recent years. This more gradual change in non-baseload CO_2 output emission rates is likely due to a smaller change in fuel sources used in the units that operate marginally. See Figures 4 and 5 below. Figure 4 displays the 2004, 2005, 2007, and 2009 eGRID subregion non-baseload CO_2 output emission rates. Figure 5 displays the same rates, only as a percent of 2009 values. Note that the subregion with the greatest change in figure 5 is NYCW, in which a high proportion of generators capable of burning either oil or gas that shifted from oil to gas during this time period.

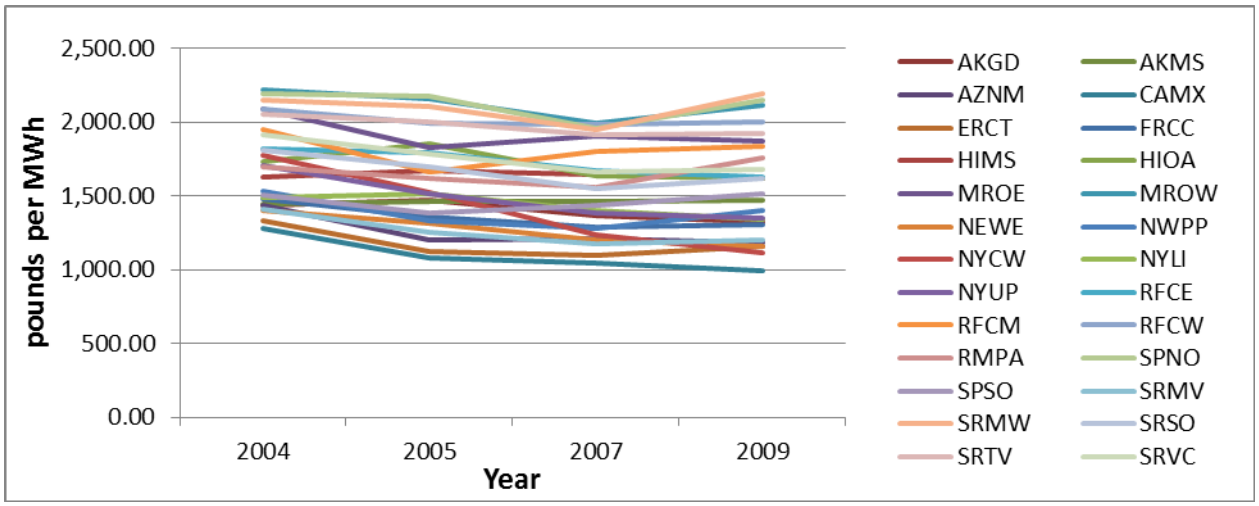

Figure 4. Trends in eGRID subregion non-baseload CO_2 output emission rates (SRNBCO2)

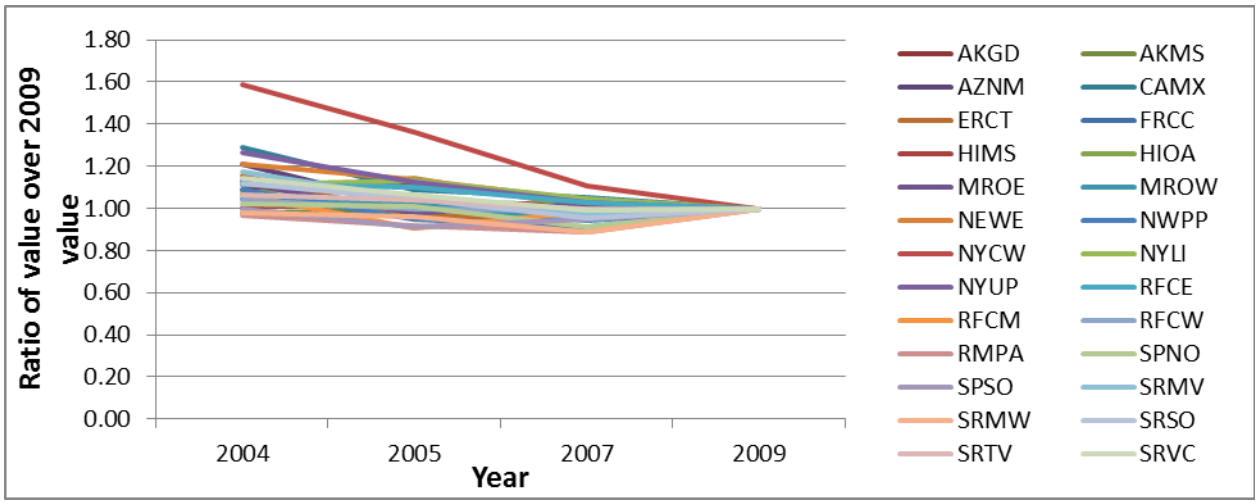

Figure 5. Trends in eGRID subregion non-baseload CO_2 output emission rates as compared to 2009 values

Use of Grid Gross Loss Factors to Include Line Losses

The eGRID emissions data are associated with the generation of electricity, not with the consumption of electricity; thus, these rates do not account for transmission and distribution losses, imports and exports among subregions (or any other geographic area), transmission constraints within any geographic area, or life cycle emissions (e.g. emissions from the extraction, processing, and transportation of fuels) at electric generating units.

eGRID grid loss data can be used to account for the transmission and distribution losses that occur between where electricity is generated and where it is used. Because there are line losses, one kilowatt hour of electricity consumption (or the reduction of such) requires a little more than one kilowatt hour of electricity generation (or the displacement of such). To convert the generation-based eGRID subregion output emission rates into those that also include transmission and distribution losses, simply divide the eGRID generation-based emission rate by (one minus the gross grid loss factor as a decimal). After applying this equation, simply multiply the energy savings consumption value by the consumption-based emission rate. See the following equation.

$$ER_c = \frac{ER_g}{(1 - Loss)}$$

where,

ER_c = *consumption based emission rate*

ER_g = *eGRID generation based emission rate*

Loss = eGRID gross grid loss factor (decimal)

The most recent grid loss factors are published in the eGRID Summary Tables (EPA 2012, 9) and Technical Support Document. Table 2 column (3) shows the gross grid loss factors that are relevant for each eGRID subregion and multiplies them by the CO_2 equivalent output emission rates as specified in the equation above, yielding the consumption based output emission rates presented in Table 2, columns (5) and (7). The carbon dioxide equivalent (CO_2e) output emission rates in Table 2 columns (4) and (6) are

calculated using the eGRID subregion output emission rates for CO_2, CH_4, and N_2O and applying the 100 year Global Warming Potentials from the International Panel on Climate Change's Second Assessment Report. The relative contributions of including the CH_4 and N_2O emissions from electric generation along with the CO_2 emissions are small; specifically, the eGRID subregion CO_2e output emission rates are 0.1% to 0.8% percent higher than the CO_2 output emission rates.

Selection of Year of eGRID Data

To either estimate emission reductions from energy efficiency that displaces consumption of grid supplied electricity or to estimate indirect emissions from the purchase of grid supplied electricity (scope 2), the data year of the eGRID subregion output emission rate should be best matched to the year of the electricity purchases. This recommendation is an update to previous papers on this topic. Table 1 below shows the recommended best fits. The rationale for the change in this recommendation is that the resource mix of the subregions changes over time and that the most recent year of eGRID data is less relevant for years that are further in the past. For most eGRID subregions, the GHG total output emission rates have been declining over the years. The eGRID year 1998 data is the first year for which eGRID subregion data is provided. For years prior to 1998, the year 1998 eGRID subregion data may be used, however, the further back in time these data re used, the less representative they would be. For years 1996 and 1997, eGRID NERC region level data exists corresponding to a few current eGRID subregions, that is, NERC region ERCOT corresponds with current eGRID subregion ERCOT All (ERCT), NERC Region FRCC corresponds with current eGRID subregion FRCC All (FRCC), and NERC Region MAAC corresponds with current eGRID subregion RFC East (RFCE). For years that are in between two eGRID data years (that is, 2001, 2002, 2003, 2006, and 2008), the prior released year of eGRID data is selected in Table 1 because it would have been most recent available eGRID data, had the inventory been prepared soon after the year being examined.

Table 1. Recommended matching of eGRID data years with emission inventory years.

Inventory Year	eGRID data year	eGRID edition to find data
1998	1998	eGRID2002
1999	1999	eGRID2002
2000	2000	eGRID2002
2001	2000	eGRID2002
2002	2000	eGRID2002
2003	2000	eGRID2002
2004	2004	eGRID2012
2005	2005	eGRID2012
2006	2005	eGRID2012
2007	2007	eGRID2012
2008	2007	eGRID2012
2009	2009	eGRID2012
2010	2009 *	eGRID2012
2011	2009 *	eGRID2012
2012	2009 *	eGRID2012
* unless more recent edition exists at time of preparation		

Example Calculation

To better illustrate how to use the information provided in the paper following the recommendations, a hypothetical example is provided. Suppose you are interested in estimating the displaced GHG emissions from installed energy efficiency in Atlanta Georgia. Suppose the annual reduction of grid supplied electricity use is 1,423,200 kWh. This electricity reduction amount happens to be equivalent to the electricity use of 100 households in Georgia in 2011[1]. First, you would determine the relevant eGRID subregion of the location. One can use Power Profiler to make this association. Atlanta Georgia is located in the SERC South (SRSO) eGRID subregion. Look up the most recent non-baseload output emission rates in Table 2, column (5), which include gross grid loss factor of 5.82% for line losses. The value is 1,730.58 pounds of CO_2e per MWh of electricity (consumption based). Convert the electricity savings from kWh to MWh (1,423,200 kWh x 1 MWh/1,000 kWh = 1,423.2 MWh) and multiply by the emission rate, yielding 2,462,961.456 pounds of CO_2e or about 1,231.5 tons or about 1,117.2 metric tonnes of CO_2e.

In the above example, the value of the emissions reductions was the non-baseload output emission rate. However, the resulting carbon footprint of the entity's remaining electricity purchases are still being valued at the total output emission rate. If the remaining scope 2 and scope 3 emissions are being estimated from the eGRID subregion total output emission rate, then even though the estimate of emission reductions provided above is 1,231.5 tons of CO_2e, the carbon footprint of the remaining purchases of grid supplied electricity (scope 2 and scope 3 combined) would go down by 1,001.7 tons.

Recommendations

In most cases, using eGRID subregion emission rates is highly preferable. An EGC may purchase power and/or export its power to other EGCs; state electricity generation may not serve all of the consumption within the state. eGRID subregion emissions and resource mix (based on generation, not consumption) uniformly attribute electric generation in a specific region of the country and minimize this issue. Power Profiler is a good resource to use to determine eGRID subregion of a particular building (based on zip code and utility).

For the task of estimating emission reductions from programs or projects that reduce electricity consumption, the non-baseload output emission rates, which are similar to marginal emission rates, are recommended. The non-baseload output emission rate is generic and does not account for the specific load shape of your particular energy savings. Note that the output emission rates included in the Power Profiler spreadsheet tool are total output emission rates, not non-baseload output emission rates.

For the task of estimating indirect emissions from purchases of electricity total output emission rates, which are sometimes referred to as "system mix" rates, are recommended. See the paper "How to use eGRID for Carbon Footprinting Electricity Purchases in Greenhouse Gas Emission Inventories" for more details and recommendations for this task.

Regarding which year of eGRID data to use, it is recommended to best match the year of eGRID data with the year being examined.

[1] http://www.eia.gov/electricity/sales_revenue_price/xls/table5_a.xls

Table 2. eGRID subregion non-baseload output emission rates CO_2e, grid loss factor, and resulting consumption based non-baseload output emission

eGRID subregion acronym	eGRID subregion name	eGRID Grid Gross Loss Factor (decimal)	Non-baseload Carbon Dioxide equivalent (CO_2e) output emission rate- for estimating displaced emissions from reduced consumption of grid supplied electricity		Total Carbon Dioxide equivalent (CO_2e) output emission rate - for carbon footprinting grid supplied electricity purchases	
			(lb/MWh generation)	(lb/MWh consumption)	(lb/MWh generation)	(lb/MWh consumption)
(1) SUBRGN	(2) SRNAME	(3) GGRSLOSS	(4) SRNBC2ER	(5) Calculated per Eq. 1 above	(6) SRC2ERTA	(7) Calculated per Eq. 1 above
AKGD	ASCC Alaska Grid	0.0584	1,323.41	1,405.49	1,283.82	1,363.45
AKMS	ASCC Miscellaneous	0.0584	1,474.49	1,565.94	523.05	555.49
ERCT	ERCOT All	0.0799	1,158.20	1,258.78	1,186.14	1,289.14
FRCC	FRCC All	0.0582	1,305.85	1,386.55	1,181.63	1,254.65
HIMS	HICC Miscellaneous	0.0781	1,623.22	1,760.73	1,357.46	1,472.46
HIOA	HICC Oahu	0.0781	1,629.49	1,767.53	1,602.30	1,738.04
MORE	MRO East	0.0582	1,878.27	1,994.34	1,600.54	1,699.45
MROW	MRO West	0.0582	2,127.82	2,259.31	1,637.82	1,739.03
NYLI	NPCC Long Island	0.0582	1,338.32	1,421.02	1,353.86	1,437.52
NEWE	NPCC New England	0.0582	1,163.21	1,235.09	734.29	779.67
NYCW	NPCC NYC/Westchester	0.0582	1,119.25	1,188.42	612.04	649.86
NYUP	NPCC Upstate NY	0.0582	1,353.21	1,436.83	500.35	531.27
RFCE	RFC East	0.0582	1,636.62	1,737.76	952.63	1,011.50
RFCM	RFC Michigan	0.0582	1,844.44	1,958.42	1,668.76	1,771.88
RFCW	RFC West	0.0582	2,012.22	2,136.57	1,528.76	1,623.23
SRMW	SERC Midwest	0.0582	2,204.50	2,340.73	1,759.15	1,867.86
SRMV	SERC Mississippi Valley	0.0582	1,204.40	1,278.83	1,006.12	1,068.29
SRSO	SERC South	0.0582	1,629.86	1,730.58	1,332.59	1,414.94
SRTV	SERC Tennessee Valley	0.0582	1,931.14	2,050.48	1,364.92	1,449.27
SRVC	SERC Virginia/Carolina	0.0582	1,686.09	1,790.28	1,041.73	1,106.11
SPNO	SPP North	0.0582	2,157.95	2,291.30	1,825.15	1,937.94
SPSO	SPP South	0.0582	1,518.94	1,612.81	1,606.26	1,705.52
CAMX	WECC California	0.0821	995.85	1,084.92	661.20	720.34
NWPP	WECC Northwest	0.0821	1,411.18	1,537.40	823.40	897.05
RMPA	WECC Rockies	0.0821	1,764.09	1,921.88	1,833.41	1,997.40
AZNM	WECC Southwest	0.0821	1,190.97	1,297.49	1,196.58	1,303.61

References

Diem A., and Quiroz C. 2013. "Using eGRID Data For Carbon Footprinting Electricity Purchases" presented at the 2013 EUEC Conference, Phoenix AZ, January.

Diem A., and Quiroz C. 2012. "How to use eGRID for Carbon Footprinting Electricity Purchases in Greenhouse Gas Emission Inventories" presented at the U.S. Environmental Protection Agency Emission Inventory Conference, Tampa, FL, August.
http://www.epa.gov/ttn/chief/conference/ei20/session3/adiem.pdf
http://www.epa.gov/ttn/chief/conference/ei20/session3/adiem_pres.pdf

[EPA 2012] United States Environmental Protection Agency (EPA). 2012. "eGRID2012 Version 1.0 Year 2009 Summary Tables." Washington, DC, April.
http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2012V1_0_year09_SummaryTables.pdf

TranSystems|E.H. Pechan. 2012. "The Emissions & Generation Resource Integrated Database for 2012 (eGRID2012) Technical Support Document," prepared for the U.S. Environmental Protection Agency, Washington, DC, April.
http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2012_year09_TechnicalSupportDocument.pdf