Response to Energy Commission Staff Proposed Methodology for Estimating Fuel Displacement

1. Is the Energy Commission staff's approach to estimating fuel displacement reasonable? If not, please explain why.

Answer 1:

California's energy strategy is guided by the "loading order", which first calls for reducing electricity demand with energy efficiency and demand response programs, then meeting remaining generation needs first with renewable and distributed resources, and finally with clean fossil-fueled generation. With the exception of fossil-fueled generation, these resources are called preferred resources. As preferred resources have become increasingly important in California's electricity system, so has the need to evaluate the programs that support them. A primary metric used in evaluating preferred resource programs is greenhouse gas emissions reduction.

The proposed method does not make any specific assumptions about the retirement of existing resources, the addition of new resources (preferred or otherwise), the impact today's preferred resource procurement will have on future procurement, the impact the operation of these new resources will have on existing resource operation.

Evaluating opportunity of use of resources should be the first step. If a resource will cause a condition of over production, it should not be considered preferred.

Energy Commission staff's approach appears too simplistic, resource charts such as the "duck chart" show the necessity to move from annual/seasonal averages to the use of material resource planning, Just In Time production technics and the concept of takt time matching production to sales. Introducing production that will exceed sales is wasteful. Resources that produce more green house gas when they are used at small percentages of capacity, when conditions of over production exist, need to be avoided and should be considered not capable of dispatch.

In our modern world, calculation has never been easier, examples that contain "ease of calculation" and "simplified operation" should be removed from the report. The example using the refrigerator that has a 10% duty cycle that is unaffected by synchronizing events such as door openings at meal times and heat loads introduced through loading warn product (beverages, leftovers) into refrigerator is unrealistic. Better use of factual data is required.

Synchronizing events cause peaks the same way hot days cause peaks in air conditioning loads.

Real-time measurement of energy consumption with alarms warning of when peak usage occurs will help reduce fuel usage. This has been common in our automobiles for years. Is there a electric car that does not keep the driver aware of energy usage and capacity through alarms and displays? Our homes and businesses should be equipped in a similar way. Fulfilling this feature of the smart grid, should be a priority, you can't control what you can't measure.

When more people understand what a watt is, where it comes from and how it is made and used, the progress of green house gas reductions through fuel displacement will increase.

In summary, understanding opportunity of use of a resource, better use of factual data, resource planning and real-time information to the energy consumer will enable better methodology for estimating fuel displacement. Displacing heat for consumption produced from electricity from Green House Gas producing generating power plant should be the primary use of CHP/cogeneration. Replacing electrical space heating in residential applications with CHP/cogeneration will provide valuable fuel displacement through efficiency, the first item in the "loading order" for the State of California.

2. Is the Energy Commission staff's approach to the treatment of renewable energy appropriate? If not, please explain.

Answer 2:

No,

Solar PV example is more appropriate.

Solar's effect on gas-fired generation that is not capable of dispatch to zero fuel consumption when solar's production is high will cause Green House Gas to increase by running a gas-fired generation during a over production condition. Having to keep gas-fired spinning reserves to cover fluctuations in solar output reduces fuel displacement for the solar output.

If opportunity of use of resources is not taken into account, CHP/cogeneration may cause local over production in a similar way as spoke of here on page 15 see "curtail renewable" and page 31 "variability impacts on voltage" in http://www.energy.ca.gov/2013_energypolicy/documents/2013-08-19_workshop/2013-08-19_transcript.pdf

3. How could the method be applied across programs so that it creates beneficial comparison without interfering with existing program-specific displacement metrics?

Answer 3:

A formula with the Green House Gas content per one unit of power in the numerator and one unit of power in the denominator would allow the comparison of all generating resources. This method is agnostic to the approaches and methods used by those programs to estimate emission reductions. If this interferes with existing program-specific displacement metrics, maybe those metrics need adjusting.

Formula:

Product of Fuel's Green House Gas per one unit of useful power output, divided by one unit of power, times product of amount of production of power divided by amount of production of power delivered to load, times ratio of opportunity for use.

Where Fuel's Green House Gas per one unit of useful power output is Fuel's Green House Gas per one unit of power divided by conversion efficiency.

Where conversion efficiency is useful power produced divided by power input.

Ratio of opportunity for use is useful power output times number of hours in a day where production will not cause over production divided by hours in a day.

For ease of use by all, grams will be the measure for Green House Gas Carbon Dioxide Equivalent (GHGCDE) per unit of power. For power, watt hours should be the unit of measure, convert BTU's to watt hours, convert Therms to watt hours.

Example:

6 kW of electric heat vs. 6 kW of gas heat.

Electric heat produced with electricity produced with fuel with a GHGCDE of 0.53 grams per watt hour, divided conversion efficiency plus delivery losses equaling .4 (40%), equals 1.33 grams per watt hour. Multiply by 6000 watts.

Result 7,980 grams of GHGCDE per hour.

Gas heat produced with fuel with a GHGCDE of 0.53 grams per watt hour, divided conversion efficiency plus delivery losses equaling .85 (85%), equals 0.62 grams per watt hour. Multiply by 6000 watts.

Result 3,720 grams of GHGCDE per hour.

If the gas heating is augmented with electric heat that responds to conditions of over production caused by renewable generation. Further Green House Gas reductions, as well as local grid stabilization will result through dumping over production into electric heating load.

Opportunity of use will be calculated based on local conditions of over and under production caused by the load/resource.

4. Is the use of annual heat rate values (versus seasonal values) sufficient given the purpose and scope of the method? If not, please explain and propose an alternative.

Answer 4:

No,

Hourly Green House Gas Carbon Dioxide Equivalent content should be the unit, with the takt time for the smallest use being best due to risk of the waste of over production due to gas-fired generation not capable of dispatch.

5. Is the use of a single, state-wide heat rate projection appropriate? If not, please explain and propose an alternative.

Answer 5:

See Answer 4 and 3.

6. Is the use of two heat rates categories (peaking and load following) adequate? If not, please explain and propose an alternative.

Answer 6:

See Answer 3 and 4.

7. Does the approach sufficiently address the issue of imported electricity? If not, please suggest ways that it could be improved.

Answer 7:

You don't discuss imported electricity. Are you importing electricity to replace local electricity used to produce heat for consumption? CHP/cogeneration highest value is when you use the total system energy of CHP/cogeneration to reduce need for grid power and it's associated waste heat.

8. Do you agree with the line loss factor used? If not, please explain and propose an alternative.

Answer 8:

No,

Exported electrical energy would only have line loss related to "Over the Fence" values. Exported electrical energy would find sink in the local power circuit. Loss should based on empirical data.

9. Do you agree with the heat rate floor used? If not, please explain and propose an alternative.

Answer 9:

No,

See answer 4 and 3.

What about renewables that will be displaced by CHP/cogeneration when figuring Rewnewables Portfolio Standard percentage effect on Green House Gas Carbon Dioxide Equivalent content?

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