PACE- Program Guidance Memo

Review of Methods for Calculating Societal Benefits from Embodied Carbon

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Current PACE guidance indicates that credit can be taken for societal benefits of financed work, in addition to pure monetary energy cost savings. Traditionally, this has been limited to accounting for avoided carbon emissions from reduced energy consumption or alternate fuel use. NYSERDA provides a schedule of emissions factors to use for each fuel, and an escalating monetary value associated with each metric ton of avoided carbon (or more precisely, carbon equivalent) of emissions.

It was brought to our attention that with the introduction of new construction and gut rehab projects, another source of avoided emissions is applicable to the program, namely, avoided emissions from re-use of existing building materials (also commonly referred to as embodied energy or embodied carbon).

Taitem was tasked with exploring this opportunity and providing suggestions as to the most suitable way for applicants for PACE financing to quantify societal savings associated with re-use of existing building materials. After reviewing existing tools, considering the general level of precision required for other calculations within the PACE program and running a brief sensitivity test, we have put together the following recommended approach:

Proposed Embodied Carbon Calculation Approach

Embodied Carbon/Embodied Energy calculations and other analysis of construction stage energy consumption can be extremely detailed and complicated. It is our opinion that for the purposes of the PACE program, the level of detail and complexity should be kept to a reasonable level, and that both a more sophisticated modeling tool and an "easy" calculation option should be offered.

Easy Path:

For those with more straightforward projects, the embodied carbon for two of the main re-usable building materials (steel and concrete) has been sourced from the ICE (Inventory of Carbon & Energy) database V3[1]. Applicants would be asked to quantify (with sufficient

[1] Available for free download: https://circularecology.com/embodied-carbon-footprint-database.html

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supporting details to validate claims) the tons of structural steel and tons of concrete (both cast in place and precast) that are being re-used by the project. With these quantities, the following embodied carbon factors could be used:

- For each metric ton of steel, 1.95 metric tons of CO_2e will be avoided[2]
- For each metric ton of Cast in Place Concrete, 0.108 metric tons of CO_2e will be avoided[3]
- For each metric ton of Precast Concrete, 0.155 metric tons of CO_2e will be avoided[4]

Advanced Tool:

For applicants who wish to perform more advanced calculations, we propose allowing the use of the free Impact Estimator for Buildings tool[5]. The analysis and results from this tool will be reviewed similar to an energy model for this program and will require the same level of supporting documentation and a summary of the key parameters used in the baseline and proposed simulations.

In either case, once a quantity of avoided emissions has been calculated, the monetary benefits can be evaluated using the NYSERDA emissions rate for the year of construction as a one-time societal benefit for inclusion in the CBR calculations.

Example Easy Path Calculation:

A new 80,000 SF hotel, being established in 2020 as a gut renovation of an existing warehouse of the same dimensions, will use the easy path to take credit for avoided use of new structural steel.

The building has calculated that it is able to re-use 320 tons of structural steel in total.

$$320\ [Tons\ (steel)] \times 1.95 \left[\frac{mTonCO2e}{mTon}\right] = 624\ [mTonCO2e]$$

$$624\ [mTonCO2e] \times \$46 \begin{bmatrix} 2020\ NYSERDA \\ emissions\ rate\ in \\ \$/mTonCO2e \end{bmatrix} = \$28{,}704$$

The building will be allowed to take a one-time societal benefit credit of $28,704, occurring in 2020 as part of their CBR calculations.

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[2] Using the 39% recycled content world average and excluding all transportation impacts for simplicity
[3] Using a 30% recycled content metric for 16/20 MPa concrete and excluding all transportation impacts for simplicity
[4] Using a 30% recycled content metric for 45/50 MPa/ RC 40/50 concrete and excluding all transportation impacts for simplicity
[5] Available for download with the creation of a free user account at: https://calculatelca.com/software/impact-estimator/

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