

May 8, 2023

Elaborative comments to the EPA Low-Embodied Carbon Initiatives submissions by Bill Caplan, author of *Thwart Climate Change Now: Reducing Embodied Carbon Brick by Brick* (Environmental Law Institute ELI Press, 2021).

Responses to the Environmental Protection Agency’s RFI EPA-HQ-OPPT-2022-0924 are critical to programs that will impact greenhouse gas (GHG) emissions during the 6 years remaining in the 2020s. The Inflation Reduction Act (IRA) appropriated more than \$2 billion each to the General Service Administration (GSA) and the Federal Highway Administration to procure or incentivize the use of low-carbon materials. As defined by the IRA, low-carbon materials “have substantially lower levels of embodied greenhouse gas emissions . . . as determined by the Administrator of the Environmental Protection Agency”.¹ The funds must be allocated by September 30, 2026.

To allow quick access to the IRA resources, the EPA issued an interim interpretation of “low-embodied, greenhouse-gas emissions” on December 22, 2022 to provide actionable standards that may be shared with other agencies. The determination, based on an initial review of how states and other entities approached addressing embodied carbon, reviewed Global Warming Potentials (GWPs) available from Environmental Product Declarations (EPDs) for asphalt, concrete, glass and steel.² Presumably, this included EPD datasets from Building Transparency’s EC3 database, a data source for GSA’s *IRA Limits for Low Embodied Carbon Concrete*.³ EPA’s RFI questions 5, 6, 8, 13, 14, 16, 18 and 26 concern the veracity of the ‘background datasets’, their need for ‘standardization’, ‘maintenance’, ‘quality assurance’ and ‘independent verification’—especially for use in benchmarking and setting embodied greenhouse gas emission thresholds.

The preponderance of underlying data that formulates GSA’s Limits was mined from the Embodied Carbon in Construction Calculator (EC3) Tool operated by Building Transparency. EC3 is a Public Beta software program yet to be fully debugged. Though significant questions have arisen regarding its use, there are no indications that the EC3’s functions, factors and data-entry procedures have been verified in large scale, or independently audited. Establishing federal regulations sourced primarily from a single independent operation without proper due diligence would be a grave mistake. The impact of GSA’s “Limits” will span industrial activity across the United States, as well as the government’s ability to implement an important part of the IRA. EC3 is valuable and viable, but the tool and others like it, as well as their management, must be properly vetted and corrected if necessary.

Considering the need to obligate IRA funding by the end of 2026, the haste expressed in the GSA Inflation Reduction Act Industry Exchange event “to have actionable standards finalized” is understandable. Nonetheless, once finalized, GSA’s standards will essentially be set in stone⁴, most likely though 2029. State and municipal Buy Clean initiatives across the nation are likely to use them as well. Unfortunately, as constituted, the impact of the Limits is unclear. Are they too restrictive to be met, or might they fail to produce the “substantial” reductions necessary to qualify for IRA funding? Allocation by September 30, 2026 can still be achieved if proper vetting is initiated now. The questions raised can be investigated, acted on where necessary, verified, and independently audited in 2023. Actionable standards could be finalized by early 2024, with sufficient time to obligate funding by the end of 2026.

¹ Inflation Reduction Act Sections 60503 and 60506

² Letter from Janet G. McCabe, Deputy Administrator EPA, to Mr. Wishnia, Deputy Assistant Secretary for Climate Policy, DOT and Mr. Kampschroer, Chief Sustainability Officer and Director of the Office of Federal High-Performance Green Buildings, GSA, December 22, 2022.

³ GSA’s *IRA Limits for Low Embodied Carbon Concrete*, Pre-decisional discussion DRAFT— January 25, 2023

⁴ GSA Inflation Reduction Act Industry Exchange event transcript, BIS-GSA-AT, G23-958, February 2, 2023

As noted in the February 9, 2023 letter to Kevin Kampschroer at the GSA, from the President and CEO of the American Iron and Steel Institute, “there are serious concerns with the EC3 database and resulting methodology that could significantly impair the effectiveness of the GSA’s program if not adequately addressed.”⁵ Having studied Building Transparency’s EC3 database for Ready-Mixed concrete over the last 4 months, I concur.

Seven categories of concern regarding the veracity of the EC3 datasets provide insight for the EPA RFI’s questions concerning their need for ‘standardization’, ‘maintenance’, ‘quality assurance’ and ‘independent verification’:

- Duplicate EC3 entries for the same EPD.
- Inclusion of EPDs computed from Industry Average ‘cement’ values.
- Questionable traceability for EPD-data ‘Updates’ in EC3.
- Questionable EC3 ‘Uncertainty Factor’ determinations.
- Questionable Industry Average ‘concrete’ Global Warming Potential (GWP) estimations.
- Limited geographic data balance.
- Lack of Portland cement ‘content’ disclosure.

CATEGORIES of CONCERN for READY MIX CONCRETE GWP DATA

1. Duplicate EC3 entries for the same EPD:

As others have reported, there were numerous double entries for specific product EPDs in the EC3 database. Data searches indicate that double entries were included in the January 25, 2023 pre-decisional draft’s underlying surveys. Lax EC3 EPD name-designation procedures at Building Transparency appear to be the cause.

A Typical Example

An EC3 data search on April 7, 2023 for EPDs from the National Ready Mix Concrete Company, Encino, CA for products named “S70524” revealed two individual entries for the Sun Valley Plant:

National Ready Mix — Sun Valley — S70524
National Ready Mix — Sun Valley — Mix S70524

The “Declared Product” name on both of the published EPDs was “Mix S70524 • Sun Valley Plant”.

Although many such double entries appear to have been “expired” from active data calculations or purged from the database as of mid-March 2023, others such as this pair remained. **Duplicate entries of the same product EPD act to skew the result of data compilations.**

⁵ Letter of February 9, 2023 from Kevin Dempsey President and CEO American Iron and Steel Institute to Mr. Kevin Kampschroer, Chief Sustainability Officer and Director of the Office of Federal High-Performance Green Buildings, U.S. General Services Administration, Re: *GSA Inflation Reduction Act Low Embodied Carbon Material Standards, Pre-decisional Discussion Draft (January 25, 2023)*; <https://www.steel.org/wp-content/uploads/2023/02/AISI-Comments-to-GSA-Low-Embodied-Carbon-Material-Standards-Feb-9-2023.pdf>

2. Inclusion of EPDs computed from Industry Average ‘cement’ values:

The EPA requires that “Concrete EPDs must, where available, rely on facility specific data for the upstream cement plant”.⁶ It should be noted that the EPA requires Portland cement plants to document their CO₂ emissions.⁷ **Facility-specific product-specific EPDs are readily available from the cement suppliers.**

EPDs with GWP values calculated from Industry Average cement data should be excluded from GSA Limits surveys. They do not meet the requirements of a facility specific EPD and their GWP declarations are unreliable.

In the double-entry example above, one EPD entry was calculated from Industry Average cement data, the other from “manufacturer specific” cement.

The entry Mix S70534—using Industry Average data—declared GWP at **397 kgCO₂e**. Entry S70534—using “manufacturer specific” data—declared **342 kgCO₂e**. The difference is 16 percent.

Both EPDs were classified in EC3 as “Manufacturer Specific”, “Plant Specific” and “Product Specific”.

3. Questionable traceability for EPD-data ‘Updates’ in EC3:

According to the EC3 User Guide⁸, when an update is made to an existing EPD’s datafile that is superseded by a new entry, the EPD’s original “expiration date” is changed to the ‘publication’ date of the new EPD entry. The older file is classified ‘Expired’ and excluded from future GWP data compilations. Although an EC3 search indicates the date an EPD was “Last Updated”, it is not clear from its datafile when a prematurely expired EPD was actually excluded from GWP data compilations.

Example:

An April 13, 2023 database search for Central Concrete, Plant Bode B, Product Name “1471C5E1”, revealed three EPDs:

Active—Product Name “1471C5E1” Last Updated March 30, 2023

Expired—Product Name “1471C5E1” Last Updated March 30, 2023

Expired—Product Name “Mix 1471C5E1” Last Updated March 3, 2023

Presumably, on **March 30, 2023**, a Central Concrete-Plant ‘Bode B’ EPD “1471C5E1” issued on October 4, 2021 and still valid, was input to EC3’s database. This caused the pre-existing EPD of the same name—issued on September 16, 2018 and valid to September 16, 2023—to be expired. The expiration date in EC3’s data file was changed from September 16, 2023 to October 3, 2021. This update changed the product’s GWP value from **287kgCO₂e** to **261kgCO₂e**. **Did that impact EC3’s GWP data compilations commencing March 30, 2023?** Might an auditor viewing the expired

⁶ Letter from Janet G. McCabe, Deputy Administrator, United States Environmental Protection Agency, to Mr. Andrew Wishnia Deputy Assistant Secretary for Climate Policy U.S. Department of Transportation, and Mr. Kevin Kampschroer, Chief Sustainability Officer and Director of the Office of Federal High-Performance Green Buildings, U.S. General Services Administration; December 22, 2022.

⁷ 40 CFR Part 98 Subpart H – Cement Production

⁸ EC3 User Guide of April 7, 2022

datafile, assume it was deactivated from compilations on October 3, 2021 rather than March 30, 2023?

The identical product mix, named “Mix 1471C5E1”, was “expired” on March 3, 2023. The EC3 file expiration date was changed from October 27, 2021 to September 15, 2018. **Was its GWP value of 340kgCO₂e actively compiled until September 15, 2018, or through March 3, 2023?** There is no corresponding ‘active’ entry on March 3rd, presumably it was manually expired.

As the date an EPD is excluded from GWP compilations might not be discernable from its datafile—transparency and traceability seem comprised. The “Expired on” date in the EC3 datafile might vary significantly from the actual date of deactivation.

4. Questionable EC3 ‘Uncertainty Factor’ determinations:

EC3’s standard Uncertainty Factors seem arbitrary. They often fail to relate to certainty disclaimers disclosed on EPD declarations. Some EPDs calculated from industry average cement data note that “LCA impacts can vary depending upon manufacturing process, efficiency and fuel source by as much as 50% for some environmental impact categories.” In such cases, they note a caveat that cement accounts for a large portion of the impact which could result in high variations. For example, the EPD for the National Ready Mix, Sun Valley Plant “Mix S70524” mentioned above—‘Last Updated in EC3’ on March 3, 2023— contained the following EPD disclaimer:

“Cement accounts for as much as 92% of the impacts of the concrete mixes included in this EPD and thus manufacturer specific **cement impacts could result in variation of as much as 46%.**”

Yet this EPD and others like it in the EC3 database through April 6, 2023, were classified as “Manufacturer Specific”, “Plant Specific” and “Product Specific” with an EC3 Uncertainty Factor of **1.095**—nominally 10 percent.

EC3 applied the identical Uncertainty Factor of **1.095** to the other National Ready Mix, Sun Valley Plant “S70534” EPD above, which was calculated using “**manufacture specific cement data that represents 100% of the total cement used**” as stated on the EPD.

GSA “Limits” are based on EC3 “Uncertainty-Adjusted” GWP data. Clearly, the “Uncertainty-Adjusted” GWP-data provided by EC3 requires further scrutiny.

5. Questionable Industry Average ‘concrete’ GWP estimations:

According to the EPA’s letter of “interim determination” of December 22, 2022⁹ concerning *Low Carbon Materials*, if neither the “Top 20 percent” nor “Top 40 percent” materials/products are available in a project’s location, “then a material/product qualifies per this determination if its GWP is better than the estimated industry average.” **How were GSA Industry Average Limits estimated?** The only source of data referenced in GSA’s January 25th draft is the “Uncertainty-Adjusted GWP” data reported from the EC3 database as of January 17, 2023. Does that imply that the Industry Average Limits were derived from EC3’s Compare Tool?

⁹ Letter from Janet G. McCabe, Deputy Administrator, United States Environmental Protection Agency, to Mr. Andrew Wishnia Deputy Assistant Secretary for Climate Policy U.S. Department of Transportation, and Mr. Kevin Kampschroer, Chief Sustainability Officer and Director of the Office of Federal High-Performance Green Buildings, U.S. General Services Administration; December 22, 2022.

An EC3 search¹⁰ of Connecticut Ready-Mixed concrete plants for “3000 psi” class concrete, yielded seven candidate EPDs with an **Average GWP of 199kgCO₂e ±22.9%** per cubic yd, all manufactured by O&G/Brewster Transit Mix.

The Seven ‘Uncertainty-Adjusted’ GWP Values

199.2, 223.4, 231.8, 235.2, 251.9, 272.0, 273.7

199kgCO₂e does not appear to be their average. The EC3 User Guide of April 7, 2022 defines ‘Average’ as “The arithmetic ‘Mean’ of Comparison Values of EPDs in a collection. Usually reported along with the standard deviation of the collection.” 199kgCO₂e does not appear to be the ‘mean’ value of this Connecticut collection either.

If GSA Industry Average Limits were not derived from EC3 local data, then what is the source of the data?

6. Limited geographic data balance:

The GSA states that its existing Limits of September 2022 reflect a 20% reduction from GWP (CO₂e) limits in the proposed code language of *Lifecycle GHG Impacts in Building Codes* from the New Buildings Institute (NBI), January 2022. The NBI’s proposed CO₂e Limits were created for each concrete-mixture strength class, so that 75 percent of the GWP-values in Building Transparency’s EC3 database could comply. Of the 23 states surveyed, 81 percent of the qualifying EPDs in the survey were provided by concrete plants in California and New Jersey—68 percent from California alone. This lopsided domination by data from just two states alone, primarily determined by their local sources of cement, overwhelmingly skew the results of EC3 database compilations. As of April 10, 2023, California and New Jersey contribute 91 percent of all active Ready-Mixed concrete EPDs used to determine GSA’s Limits. As such, the GSA’s Limits fail to reflect a realistic assessment of the concrete products available throughout the United States, from nominally 8,000¹¹ concrete plants.¹²

7. Lack of Portland cement ‘content’ disclosure:

Although the EPA directs cement plants to document CO₂ emissions, and requires concrete EPD GWP-calculations from upstream cement ‘facility specific’ data where available to qualify for IRA funding, the NSF International Product Category Rule (PCR) for EPDs for Concrete acquiesces to the concrete industry’s desire to conceal the magnitude of Portland cement in their mixes.

Section 9.2 of the PCR for Concrete Version 2.1 (August 2021) contains the following clarification to the declaration of general information required in an EPD:

“—as the percentage of material components can be considered proprietary information, the list of materials should be reported in order of greatest mass per mix.”

¹⁰ April 10, 2023

¹¹ National Ready Mix Concrete Associations (NRMCA) Member Industry-Average EPD for Ready Mixed Concrete, January 3, 2022.

¹² <https://newbuildings.org/resource/lifecycle-ghg-impacts-in-codes/>

In other words, the percentage of Portland cement in a mix need not be stated, though without it GWP values cannot be verified. Furthermore, suppliers can alter a batch's Portland content at will.

This disclosure exception is allowed by the core PCR, ISO 21930:2017:

“With appropriate justification, this requirement does not apply to confidential or proprietary information relating to materials and substances that apply due to a competitive business environment or covered by intellectual property rights or similar legal restrictions.”

Given that cement plants must report CO₂ emissions to the EPA under the *Greenhouse Gas Reporting Program*¹³, and that cement manufacturing constitutes the largest portion of concrete's GWP, there is no 'appropriate justification'. Mandatory disclosure of the Portland content by percentage is necessary—by weight would be better.

CONCLUSIONS

The underlying data that has been compiled to determine GSA's *Low Embodied Carbon Limits for Concrete* was insufficiently vetted to meet the standards for federal regulation. As currently constituted, it is unclear if the Limits provide a reasonable chance of reducing concrete CO₂e emissions under GSA's guidelines or to qualify for IRA funding as defined by the EPA. The Limits as constituted could prove to be too lenient and thereby valueless; or too restrictive for a large percentage of the regional concrete plants across the United States.

Building Transparency's EC3 tool/database has the capability to provide reliable GWP-data once vetted and independently audited. Data-entry management, compilation factors and quality assurance procedures require verification, and correction where needed. Deficient EPD datafiles must be purged from compilations.

The following steps would set the groundwork to determine realistic Limits that comply with the EPA's requirement for a 20 percent GWP reduction or the alternatives.

- Encourage or fund Building Transparency to provide or augment onsite fulltime Quality Assurance personnel to monitor data entry. Require third-party auditing to meet EPA/GSA standards.
- Remove all EPDs files that are not 'facility specific'—as defined by the EPA for upstream materials—from compilations used to determine GSA and other Buy Clean initiative Limits.
- Uncertainty Factors should not be used to increase average GWP values for the purpose of determining GWP Limits. If used at all, Uncertainty Factors should be used to increase the value of a GWP cited on a contractor's EPD when submitted for permitting approval which fails to meet disclosure requirements for its upstream materials, but might be eligible for the '40 percent' or 'Industry Average' exceptions.
- To qualify for Low Embodied Carbon Concrete programs, require contractor EPD submissions for Ready Mix concrete to disclose the percent of Portland or Portland-Lime cement in the mix, or

¹³ 40 CFR Part 98 Subpart H – Cement Production

their content by weight.

- EPD-ID numbers should be required to be ‘manufacturing plant mix specific’ and include a Version Number to reflect revisions. Many concrete manufacturers use a single mix name to represent their ID for concrete batches produced at multiple plants that have different GWP values. The current lack of a designated ‘plant-product’ specific ID# can complicate the ease of verification, and mislead a contractor to assume a specific mix number assures the same GWP from any plant.

For the reasons elaborated in the deficiencies above, the GSA should temporarily suspend the existing *Maximum Global Warming Potential Limits for GSA Low Embodied Carbon Concrete*, and delay implementation of the pre-decisional discussion draft of January 25, 2023, pending review of a cleansed and verified EC3 dataset by the end of 2023.

Materials that support the data deficiencies enumerated above—both specific and in general—are available on request.

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