



Black text: facilitator notes

Green: comments submitted on GoToWebinar during discussion

Workshop: The Energy Within: ET Support for Embodied Energy in New Buildings

Breakout Session: Materials

Speaker: Anthony Hickling, Carbon Leadership Forum

Objective: To find actionable ways that CA IOUs' ETP programs can support construction practices, GHG accounting systems, databases, tools, etc., related to embodied carbon. We will focus on new and existing buildings (residential and nonresidential) and their carbon and energy lifecycle (not infrastructure).

Outcome: To determine the most important items for ETP to focus on.

Discussion Questions

- Should building materials be a part of decarb efforts?
- Is there a role for utilities to support a particular sourcing practice or track the embodied carbon of the material?
- Can the utilities support with the expansion of databases and tools that already exist?

Facilitator Summary

Most of the discussion centered on the need for improved databases on embedded carbon in materials as well as regulatory and utility program alignment on how to quantify and value these. Some databases exist and require further enhancements. Regulatory guidance and utility programs have lots of work ahead. Also how to examine retrofit vs new construction embedded carbon.

Discussion Notes and Comments Submitted – These are unedited draft notes.

Include redux in E use at point of manufacture in EE savings?

Anthony mentioned C&S. Do you have examples of this outside US?

- AB262 in CA is the leader. First establish system to collect data, then establish baselines, then determine what a standard for embodied impact would look like.
- London may be looking at something. A couple countries in middle east are establishing transparency criteria that would lead to thresholds and baselines to be improved over time.



- We are working on some easy guides for policy. Guidebook for incorporating embodied carbon. AB 262 is great, is first SW policy to incorporate embodied carbon, but it's lacking and should not serve as a template. We are working on what a good and great template would look like. But AB 262 is being acted and iterated on.
- LEED pilot credit that looks at how you would incorporate embodied carbon, tools like EC3. Different builders are playing with the pilot credit. Beyond material reuse and existing LEED.

Do you see embodied carbon calculators (such as EC3 or others) being incorporated into building energy codes? Or should they be incorporated into green building codes?

- Wording it as a procurement code. Not that it can't fit into energy code, would love to hear from you all on ways that we can incorporate it. We've been creating materials around how to create procurement strategies that take into embodied carbon into consideration.

Ceramic insulation coating for thermal heat load reduction—for air leakage—used in industrial to reduce embodied C? Could be—doesn't know.

Database by utilities. Electronic reference manual—relational database that provides operational savings for EEMs utilities promoting. Are expanding to convert to C savings. Also includes NEBs—are increasing these as they get more info on these. As you work on embodied C please connect w/CalTF to include in existing tool.

- Just operational, or also embodied?
- All operational bldg. e component today. Have section on NEIs—keep this discussion forward. Just as trying to include in IL. CalTF website available to see tools and connect to offer info

In 2021 it will include GHG redux measures as co-benefit to EEMs. Can track as GHG separately and get metrics on them. 3rd yr of trying to figure out embodied C and will be doing R&D to look at bldg. materials and products—to expand the knowledge.

Embodied accounting included in existing bldgs.? Could be of greater value.

- If retrofit—is this alternative to rebuild? Would need to highlight that decision—fewer materials and much lower embodied C footprint. But retrofit won't be zero embodied. Should continue to look at embodied C—one metric that looks to decrease overall impact of the building. Find ways to incentivize.



- LEED does that too—gives points for re-using materials.

LEED Rating system has mandatory and prescriptive requirements for Materials & Resources which includes recycled content, resource reuse, regional materials, etc. which appear to be addressing the embodied carbon.

To the question about building codes and steps being taken. We presented this [ACEEE paper summarizing work in progress](#)

Not sure if this got mentioned earlier, but Circular Ecology has a good material embodied carbon data for use in this kind of effort: <https://circularecology.com/embodied-carbon-footprint-database.html>

C is not valued fully today. Potential for jurisdictions/utilities to move to C metric with new programs. SCE is working w/university partners to evaluate performance on C basis—but on operational—hasn't gone to materials or building practices. Happy that Efficiency Vermont is working on that. Potential to harness another value stream to go after C – which is what we really want, while looking at EE in parallel. Could incentivize materials with certain GHG profile, with baseline and improve from there.

Is there any conversation about Ceramic Insulation Coating for thermal heat load reduction for the building envelope and seal off air duct from air leakage? For energy efficiency. This product has been used for the last 35 years in the industrial markets. To reduce embodied carbon.

1 ton of cement nearby is different from a far away cement. As well as environmental standards/practices. From current data-how much variation is there – but difference between cement to wood is so big that location or practice to make it is not important. Or are they large and need to take into consideration.

- Distance can be important, depending on material.
- On average the transportation is seldom large contributor on emissions. Usually less than 20% of emissions profile. Cement cost prohibitive to transport far. With wood some political/social/other constraints—timber in construction has usually less impact than steel and concrete—yet in some projects these make more sense- and need to spec steel with less impact. Or incorporate fly ash—in cement replacement. Carbon cure—inject sequestered C into concrete – w/o compromising structural strength of concrete. Bldg codes need to be open to these tech alternatives.



- Some areas have more renewable electricity—can reduce C footprint of materials if sourced from that area. A: increased interest in embodied C as have on-site production w/combustion of fossil fuels. R: move to green H2 for steel making due to C embodied in its production.

Replacing natural gas equipment (furnaces, cooking, water heaters) w/electric—what’s the difference in embodied C of getting rid of existing w/remaining life—vs new, electric equipment? What’s the overall C balance?

- We haven’t done that research at the CFL, but likely there are analyses elsewhere that look at total cradle-to-grave LCA to see if it makes sense to do such replacements.
- academia/LBNL perhaps?

I'd be curious to know if the speakers think embodied carbon accounting should be included in retrofit and existing building programs. For instance, we often pay incentives on energy cost and present payback based on upfront capital cost. I believe carbon emissions payback that includes the upfront embodied carbon cost would be of additional and perhaps greater value.

Baselines to compare good/bad products?

- We have a baseline but it’s not comprehensive—[CLF website](#) has a PDF of embodied C for various materials—ranges are large. We’re working on getting resources to research and create a holistic database where anybody can send the data and provide a more thorough baseline. All current studies are limited—and so still need to work on this.

Who would someone talk to for sealing in embodied C?

- Techs that hold C in them? Eg “Carbon Cure”, or mass timber – all sequester C and when put in bldg. it is stored in the bldg. Lots of biogenic and synthetic strategies to do C sealing.



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Breakout Session: Construction Practices

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Discussion Questions

- How does this fit into CA's GHG goals and/or Green Building Code?
- Are current rating systems adequate to capture embedded carbon?
- What are the key blocks to getting traction at the building code level?
- How can the utilities engage with the developers to support better practices (e.g., using existing concrete)?

Facilitator Summary

The breakout session identified actionable ways the CA IOU's ETP could support construction practices related to embodied carbon. The support topics identified mainly focused on helping frame a regulatory path for the CPUC to help guide the IOUs. The participants discussed the following ideas:

- 1) Benchmark best practices for accounting carbon – one best practice to reference is Vancouver's action report on embodied carbon goals;
- 2) look at other IOU program best practices to incorporate new metrics – one idea was to look at CA's Water Energy Nexus efforts;
- 3) review carbon import taxes and how to develop a level playing field;
- 4) review current policies and identify any potential ways of reducing free ridership;
- 5) review the TRC calculations and if/how carbon accounting can be included;
- 6) review how larger firms are tracking/collecting carbon data – use this information to propose baseline methodologies. To support these items the participants identified the following actors who should be involved – CALTF, CPUC, IOUs, CEC, NBI, and CLF.



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There is a sense of urgency to get this moving. We need to ensure we can incentivize and help reduce the carbon impacts and ensure the reductions in the future. Embodied carbon should be a component of cost effectiveness for California

There are existing policies: City of Vancouver released an Climate Emergency Action Report with embodied carbon goals. Goal is a 40% reduction by 2030 vs 2018 baseline.

How is the commission engaging with EC and how could the commission best support these types of efforts?

The first key is a regulatory path to a GHG policy. The IOUs are on a GHG metric. Benchmark on how carbon could work. Look at the water NEXUS – this framework could help the PUC design a proper way of accounting for carbon, and offer Ideas on what info is needed to build a cost-effectiveness calculator to help ET promote and drive towards us cost-effectiveness and program design.

The way i see it somehow working would be if the utilities could instead of purchasing carbon offsets that it offers rebates in construction, Different factions within the state may or may not be in support, ie those looking at the funds vs those looking at the actual impact

We need different and better policies: More mixed concrete with additives (which is manufactured elsewhere, outside of CA – how to deal with that E?) to reduce friction and to allow processing at lower temp would reduce energy. There are some rules that are clear on what energy we should and should not use. Thoughts and processes are out of the current discussion in PUC policy but should be considered.

Push them thru custom process, which increases cost and then they're not consistently treated by CPUC.

A possible different [chemistry for cement](#) which might not give off CO2 emissions. It's long off patent and was developed by Stauffer Chemical Company, no longer existing. It was called "fast setting cement" and I think it performed well but never got beyond the pilot stage.



Energy metric – EE energy used for materials. But the carbon profile could be different. Current policy is focused on energy and is not considering the carbon aspect. Fragmented framework in CA with various regulators. ET could support/inform the gaps and data to help develop policy and programs and piloting.

Looking at a carbon import tax (France is using one) – one way to create a fair playing field.

The Commission is engaging in the early stages of studying lifecycle carbon emissions – could inform policy changes in the future.

Embodied carbon should be a component of cost effectiveness to see the whole picture, just as we look at energy savings and costs. A database similar to how RS Means is used for costs would be extremely beneficial.

Are there any moves to enable or incent factory-built buildings?

- Not aware of this practice

Tech & policy related to carbon measures: Keep in mind that the same policies in the past have been tied to free ridership. Look at the policy (directed to utilities and PUC) and how it will impact technologies and approaches.

Are there any best practices from the past that we can use as strategies to inform future carbon influenced programs?

- The parallel would be the need for the baselines and standard practices from industry. Incentivize carbon performance – SCE has a pilot with universities that looks at carbon performance – this is an aspect
- CALTF develops models and could support the CPUC on how baselines will be established.

Carbon is considered in TRC calculations to an extent. Is this gap here that only embodied carbon is not included in the calculation? Once the baselines are established, could we include this input into the calculator?

- A working group would have to work it out and understand if this would be the right fit. CalTF is a good forum to develop consensus on this.



A lot of larger firms and municipalities are tracking carbon data. Collecting this data is becoming a standard. Issue is what do we do with this data and how do we establish a baseline? A database for this data does not exist yet but would help inform.

Buildingtransparency.org is a great resource to use, as well.

We will build a new NYC every month for next 40 years--and they will be there for long time--design for re-use, circular economies of building very Important. Embodied C should be component of cost-effectiveness to get full picture.