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| **Description:** | The ABC Collaborative team, lead by RMI and the Association for Energy Affordability, submits these comments based on our experience working with Advanced Building Construction suppliers and R&D projects as well as our ongoing work on the CEC-funded REALIZE-CA retrofit projects. |
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ADVANCED BUILDING CONSTRUCTION
Collaborative

**Comments submitted on behalf of the Advanced Building Construction (ABC) Collaborative**

**23-ERDD-01 Retrofitting With Innovative Building Envelope Solutions**

Overall Solicitation Feedback and Recommendations

1. It is recommended that the CEC not subdivide the solicitation into 4 different groups. This parsing may prevent the CEC from adequately funding multiple extremely compelling solutions that may all fall into one or two major categories while funding less transformational technologies that fall into a less competitive category.
2. The CEC is highly encouraged to reevaluate certain components of its terms and conditions that complicate measure ownership during the award period, as most demonstration site owners are not the prime of the award. The requirement for the prime to maintain ownership of installed measures until the end of the award period can create unnecessarily complex contractual structures that are especially cumbersome for affordable housing owners and primes not equipped to be owners of elements of built assets. This can be further complicated by the fact that envelope improvements are not defined as FF&E, making a UCC-1 filing with a lender more complicated. Envelope measures will likely require additional financing beyond the award amounts, which may require owners to take on additional debt financing to support the project improvements, in turn drawing additional scrutiny and resistance to complicated equipment ownership structures. Any Group category that requires projects to be in low-income, DAC, or tribal communities will likely face these issues.
3. Roofing solutions appear to be a priority for the CEC which is wise. If the CEC maintains group categories, our recommendation would be to make this a unique category as opposed to lumping it into Group 1. While insulating materials can be used for both wall and roof purposes, integrated opaque systems that reduce installation times for different roof types have unique considerations from wall systems. Things to push applicants on would be how they plan to enable more mass-customizable venting and roof to wall connections which can be a critical point of failure.

   In addition, we want to flag that requiring projects in this group to be less costly, easier, quicker to install, and less invasive may incentivize less innovative solutions. We encourage you to consider other benefits beyond cost and speed of installation. We also are concerned that requiring R8 for insulation criteria may be too prescriptive and could limit solutions, including the usage of low embodied carbon materials. Furthermore, requiring that the product work with stucco, wood, and vinyl siding practices and be suitable for installation for exterior and interior of the stud bay may be a limiting requirement. Different insulation retrofit solutions may only be appropriate for stucco, or wood, at interior/exterior but shouldn't be expected to solve for all of these needs.

   If solutions are desired that are more of a “whole building system” i.e. opaque roof and wall solutions this may be more appropriate for Group 3 rendering the requirements for Group 1 very limiting and driving applicants towards Group 3 and potentially eliminating

promising applicants if Group 3 were to become more competitive due to the integrated nature of solutions it supports versus other group categories.

4. Has CEC considered issuing this solicitation in partnership with the DOE? DOE has funded a substantial amount of R&D on high-R materials and envelope systems. The two agencies would benefit from combining resources and leveraging the collective knowledge of both agencies.

**QUESTIONS FOR STAKEHOLDERS**

**1. Are the requirements for all groups in Section IV.A feasible and reasonable for improving the value proposition of existing building envelope retrofits? If not, what modifications are recommended for CEC staff to consider and why?**

*For Group 1:* As Group 1 is currently written, it seems mainly focused on high-R insulation. This Group could include technologies that are much more integrated than just being an insulation material. Again, the CEC is advised not to subdivide the solicitation into so many categories.

*For Group 1:* CEC could consider extending the TRL floor to a TRL of 6, as some solutions may be able to move quickly from engineering/pilot-scale work (i.e., TRL 6) through full-scale demonstration (i.e., TRL 7), and this will provide greater opportunity for more innovative emergent approaches. (Applications proposing a solution with a TRL of 6 that do not have a clear and realistic pathway to TRL 9 can be screened out.)

*For Group 1:* Technologies and Strategies Capabilities Requirement a: We recommend that product performance availability be for 0.5-inch increments instead of 0.25-inch increments to decrease testing burden and because products may only be manufactured/available in 0.5-inch increments.

*For Group 1:* Technologies and Strategies Capabilities Requirement c: We suggest that the language “and as interior insulation behind the drywall” be revised to “or as interior insulation behind the drywall.” This is consistent with the “or” language later in the sentence (“or other suitable practices”) and allows for technologies that, for example, are best suited for continuous exterior applications but less appropriate as an intermediate layer due to permeability properties (i.e., not suitable for both one and the other application).

*For Group 1:* Technologies and Strategies Capabilities Requirement d: We recommend that the CEC not specify this requirement. Pop-up manufacturing or the ability to incorporate digital workflows is not necessarily a mainstream “existing manufacturing process.” Respondents may also be able to propose other cost-effective and scalable processes that differ from “existing manufacturing processes.” This is a design constraint that will benefit incumbents, who may be less likely to develop disruptive technologies/solutions.

*For Group 1:* Technologies and Strategies Capabilities Requirement e: Similar to the comment on requirement c, we suggest that the CEC consider changing the “and” to “or” to allow for

solutions that are more optimized for one application over another. This reflective of current/incumbent practices (e.g., polyiso would be much more likely to be applied as continuous above-deck insulation whereas batt or fill products would be much more likely to be applied between rafters.

*For Group 1:* Technologies and Strategies Capabilities Requirement f: We note that this requirement would seem to essentially preclude typical vacuum insulated panel (VIP) products. Because other parts of the document specifically reference VIPs as examples, we are not sure if this is intended.

*For Group 1:* Site and building requirements: We recommend the minimum CFA for single family homes be reduced to approximately 1,000 square feet. Many more attainable and "starter" single family homes are smaller than 1,200 square feet, making this a reasonable and relevant building characteristic for demonstrations.

*For Group 1:* Demonstration and Proof of Concept Plans: The statement "Buildings must utilize roof deck and wall insulation installations" seems overly specific as regards the location of roof interventions when the footnote defining "opaque envelope" (footnote 4 on page 5 of 15) includes "attics." CEC might consider revising this language to be more inclusive of a range of potential roof/attic interventions that can achieve the required performance.

*For Group 2:* Barrier 5: this requirement (on optimum pillar spacing) seems somewhat academic, given that other constraints and considerations will likely prevail in retrofit applications.

*For Group 3:* We recommend that applicants who have received relevant prior DOE funding be given *preference* in this application, but that the CEC not restrict their applicants only to those that have previously received such DOE funding as this may be too limiting.

*For Group 3:* Although the document does reference a specific set of TRL definitions earlier (as a footnote in Group 1), TRLs can be harder to ascertain when dealing with a solution combining multiple/integrated measures. Given this, the currently stated range of TRL 4–6 for this Group may be too limiting and/or ambiguous, and we would suggest replacing this range with a descriptive explanation of the desired technological maturity of the solution and characterizing this as directional guidance for applicants. If the CEC decides to retain a specific TRL range, we suggest expanding it to TRL 4–7.

*For Group 3:* Table 3: Performance and Cost Metrics Summary: We suggest clarifying certain elements in this table. Specifically, for the data points for Target Cost, it is not clear what baseline assumption the target costs are incremental against nor what assumptions are being made on inflation/future dollar values. The heading for this Target Cost column may also be clearer if revised to "Target Incremental Cost" or "Target Cost Premium." (As a minor note, the two instances of the phrase "price premium" in the cells of this column, if retained, could be revised to "cost premium" for consistency.) We also suggest the CEC accept a somewhat lower target performance value for insulation materials that represent substantially lower embodied carbon potential (or high carbon storing potential).

ADVANCED BUILDING CONSTRUCTION
Collaborative

**2. Are there other envelope retrofit technologies not addressed in this concept that should be considered that could improve the value proposition for building retrofits?**

See prior comments on Section IV.A Group 1 and Group 3 requirements that may allow for a greater range of innovative solutions to be responsive to this eventual solicitation.

**3. The technologies in Groups 1 and 2 have a current payback expectation of less than seven years. Is having a seven-year payback reasonable to increase market adoption of the technology? If not, what would be a necessary payback period to increase adoption of the novel technology?**

We recommend that the CEC provide additional clarification on cost data to allow for a clearer understanding of the requirements of this stipulation. Applicants would benefit from a clearer understanding of if the requirements allude to demonstration site installed costs or estimated projected costs from manufacturers and contractors once technology has reached its peak learning curve.

**4. Should the groups include other existing building sectors, such as commercial, in addition to the residential sector, to address challenges and drive market adoption for building retrofits? If so, which sector(s) should be targeted first to lower cost and accelerate market adoption of technologies and why?**

The CEC could consider asking respondents to note if there could be ready applications for the proposed solutions beyond single family and multifamily residential and manufactured homes. (For example, hospitality could be a relevant building segment, given its similarities to multifamily residential and high energy use.) However, residential segments represent the largest share of buildings and building-related energy use and therefore represent a highly worthwhile market on their own. They also tend to be more envelope driven than commercial building types, and therefore stand to benefit the most from these types of envelope solutions.

**5. What are the biggest gaps/barriers/challenges to bringing costs down and improving market adoption of higher-performing products that are not sufficiently addressed in these proposed groups? What is needed to address these barriers and how could those potential solutions be better covered in this draft solicitation concept?**

An important approach to bringing costs down and improving market adoption will be to focus on systematic delivery or process improvements that promote easy installation. Streamlining common challenges in envelope retrofits, including coordination across trades, solutions that provide minimal tenant disruption, contractor education, and competitive bidding through innovative business models will be an important focus for successful retrofit approaches.

**6. Does a sufficient manufacturer ecosystem exist that is willing and/or able to manufacture these high-performing novel technologies following a successful demonstration project? If not, what additional resources are needed or additional concerns need to be addressed in order to increase manufacturing capacity following a successful demonstration?**

ADVANCED BUILDING CONSTRUCTION
Collaborative

More readily available growth capital would be highly welcome to bolster the manufacturing ecosystem and capacity needed to produce high-performing novel technologies at scale. Ideally some capital could be made available at favorable/concessional terms when used specifically for expanding capacity for the production of high-performing technologies that support decarbonization.

**7. What would be the appropriate level of project funding for the work proposed in this draft concept, and why? Based on the level of funding, what would be the recommended number of demonstration sites for SF, MF, and manufactured homes?**

With the currently allocated levels of funding, we would recommend that the CEC remain flexible in the required number of demonstration sites. We suggest focusing on fewer demonstrations executed with greater focus rather than pushing for higher demonstration numbers as these projects can drain team capacity. We would suggest one demonstration building per team with the option for the team to commit to doing more.

**9. Please provide any other relevant comments regarding this solicitation concept draft.**

The requirement to use the California-specific 16 climate zones for simulations may be a barrier and somewhat disincentivizes designing for a larger market (which would also benefit California by encouraging economies of scale). We suggest the CEC consider allowing for modeling using the nationally recognized climate zones (IECC and/or ASHRAE) relevant to California.