



GSA Green Building Advisory Committee Federal Building Decarbonization Task Group

18 April 2022

Federal Building Decarbonization Task Group - Charter

The Federal Building Decarbonization Task Group will explore opportunities and challenges for reducing greenhouse gas emissions - in alignment with national climate goals and action plans - through the use of renewable energy, energy efficiency, electrification and smart building technologies at federal facilities



Federal Building Decarbonization Task Group - Scope

- Individual buildings, campuses, and supporting infrastructure, including central energy plants, distributed energy resources, and EV charging. Building decarbonization includes operational emissions, refrigerant emissions, and building life cycle emissions, including embodied carbon of materials
- Decarbonization can provide additional benefits such as health, water conservation, grid reliability and resilience. Primary focus will be on existing buildings and actions that can be taken in 3-5 years

Federal Building Decarbonization - Key Principles

1. Accelerate the rate of net-zero emissions building retrofits

- Retrofit 6% of the federal portfolio each year between 2022-2030 and reduce operational emissions by 50%

2. To optimize for cost and impact, plan comprehensively to include efficiency, electrification, demand flexibility and solar/storage

- Net-zero emissions retrofits should coincide with upgrade cycles and consider the retrofit priority, which varies with location and existing conditions

3. Maximize the use of onsite renewable generation

- Consider green power purchasing through your utility, utility scale green power programs or community solar, and finally procurement of bundled Renewable Energy Certificates (RECs)

4. Consider the impacts of embodied, refrigerant and EV charging emissions

- Create an embodied carbon in materials knowledge base, use low GWP refrigerants and reduce leakage, support managed EV charging, and minimize water use

Federal Building Decarbonization - Key Principles

5. Support resilience, health, and comfort

- Incorporate passive and active measures to increase resilience, health, and comfort

6. Support system wide optimization to avoid unintended consequences

- Create a roadmap to a net-zero emissions portfolio, considering the regional energy mix, and align building/site decarbonization roadmaps with utility plans

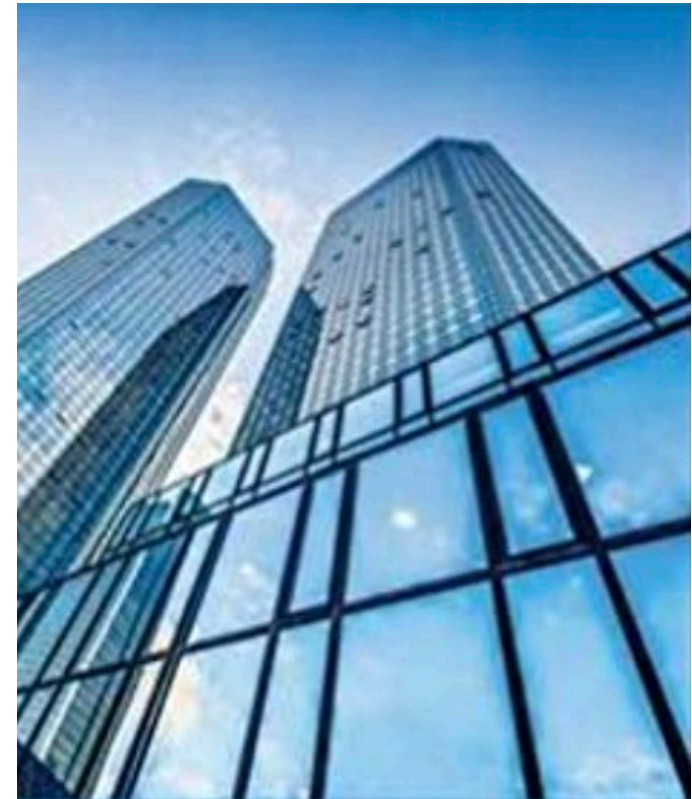
7. Support equal opportunity job creation and training underpinned by equitable procurement practices

- Locate and retrofit buildings in locations where it will bring benefits to the local community, including access to public transportation and support for diversity, equity, and inclusion



Barriers and Solutions - Capital Access & Investment Barriers

1. It may be hard to justify appropriations for low economic returns, despite a strong carbon reduction
2. Bank underwriting is not considering the economic advantages of carbon neutral assets
3. There is currently no income or value stream associated with embodied carbon; as a result, appraisers are not giving value to sustainable and low-carbon improvements
4. Lack of metrics that value and account for the social cost of carbon



Barriers and Solutions - Workforce & Building Technologies

1. A shortage of skilled industry professionals that understand how to design, build, and operate lower-carbon existing buildings
2. A shortage of non-structural materials for renovations with product specific EPDs that facilitate carbon accounting for the project
3. Federal PM staff are not yet equipped to adopt lower-carbon materials and management processes
4. Subcontractor operating emissions during construction and renovations is not easily quantified



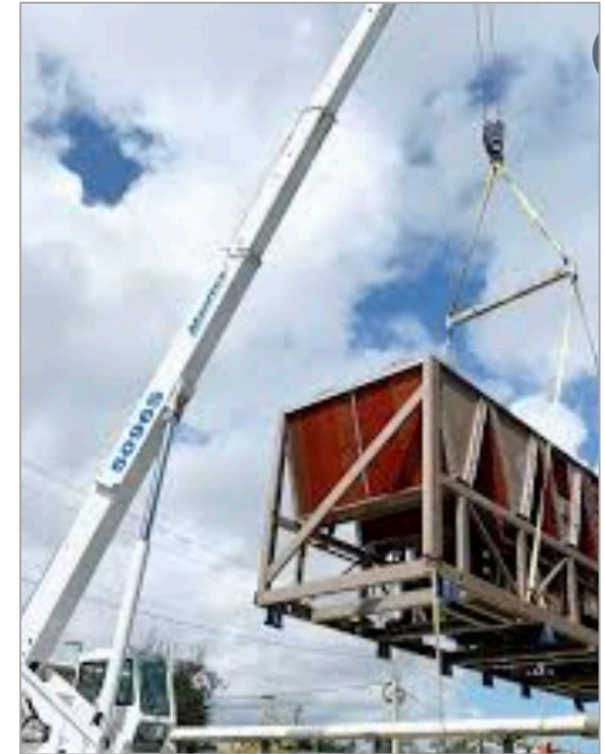
Barriers and Solutions - Climate Zones & Building Performance Design

1. Variation in a building's shape and climate zone can influence energy reduction strategies
2. Lack of local utility-scale renewables/storage and utility rate differences in many locations make carbon emissions reduction challenging
3. Current building codes often restrict FAR and heights, making on-site renewable installations difficult. They rarely require new or renovations of existing buildings to be all electric and rarely address embodied carbon
4. The significant amounts of embodied carbon emissions related to buildings is rarely considered in standards and during design



Building Decarbonization Retrofit Playbook

- Building types:
 - Small buildings with packaged HVAC (<50K ft²)
 - Large buildings with central plant (>50K ft²)
- Project scenarios:
 - Deep decarbonization retrofit
 - Major equipment replacement
 - Building envelope repair
- Project approach:
 - Cost-effective, whole building approach with a focus on continuous improvement
 - Technology solutions may vary by building type, system type, size and location
- Project scope:
 - Building Envelope
 - Energy Efficiency
 - Building Controls
 - Building Operations
 - Water Conservation
 - Electrification
 - On-site Renewables
 - Off-site Renewables
 - Demand Flexibility
 - Embodied Carbon
 - Refrigerants
 - Resilience
 - Health
 - Equity



Building Decarbonization Retrofit Playbook – Checklist Example

1. Take advantage of **planned HVAC equipment replacements** to incorporate complementary building decarbonization/resiliency measures.
2. Evaluate current equipment load trend data and compare with current equipment capacity to identify **opportunities for downsizing** during replacement.
3. Identify **low-cost, no-cost and short payback energy efficiency measures**, and especially those impacting heating and cooling loads, to further reduce building energy use.
4. Replace any packaged heating equipment using **high efficiency heat pumps** - carbon reduction costs favor clean grids and high energy prices.
5. In very cold climate zones, **consider using hybrid heating equipment** (dual fuel rooftop units) to provide efficient and resilient operation.
6. Replace packaged space cooling equipment with **high efficiency, low GWP cooling equipment** including variable refrigerant flow (VRF) or packaged rooftop units.
7. Replace **fossil fuel water heating with heat pumps** or heat recovery chillers and heat pumps
8. Reduce **water consumption** to save electricity and heating energy requirements.
9. Install **solar photo-voltaic panels** on buildings and other on-site structures and grounds, carbon mitigation economics favors dirty electrical grids and high electricity costs.
10. Install **energy storage (electric and/or thermal)** to provide demand flexibility and increase resilience.

Building Decarbonization Retrofit Playbook – Checklist Example

11. Install **EV charging stations** with the ability to provide smart charging and demand flexibility.
12. Install **automated building controls** with the ability to integrate distributed energy resources and EV charging and provide automated demand response and flexibility services.
13. Install **energy sub-metering, energy information management systems** and automated fault detection and diagnostic systems.
14. Maintain **comfortable and healthy indoor environments** through proper air filtration, ventilation and air treatment.
15. Increase **building resiliency** through a combination of passive measures (thermal insulation, day lighting, operable windows and water storage) and backup energy generation and energy storage.
16. Review facility condition indicators to identify any **deferred maintenance projects** which could be integrated into the current project.
17. Estimate energy savings and carbon reductions for all potential improvement measures to determine which deliver the **largest carbon reductions at the lowest cost**.
18. Use **lifecycle cost analysis** to determine the most cost-effective carbon reductions which meet financial targets.
19. Target projects in **underserved communities, using local contractors, diverse suppliers and workers** participating in apprentice programs.
20. Maximize the use of **low-carbon building materials**, and especially the use of reused, remanufactured, recycled and locally-sourced materials.

The GBAC Advisory Committee at its Fall 2021 meeting passed the following resolution to continue the work of the federal building decarbonization task group:

[that the] Decarbonization Task Group [is] to continue its work to produce an advice letter...[the] Task Group would like to work with GSA to integrate solutions and tools, and ...to support P100 road mapping.

The Green Building Advisory Committee offers the following recommendations to GSA for decarbonizing federal buildings based on the work of the Federal Building Decarbonization Task Group:

- Incorporate the key decarbonization principles into GSA policy and practices
- Update P100 building standards to drive building decarbonization
- Continue the work of the federal building decarbonization task group with a primary focus on accelerating net zero emissions building retrofits, initially across the GSA building portfolio, through sub-teams dedicated to building prioritization and project implementation
- Align the work of the task group sub-teams with the activities of GSA, DOE, FEMP and other teams currently supporting federal building decarbonization goals and activities

Comments and Questions