

Proposal to Build Back Smarter (BBS)

A proposal from recognized smart building innovators at the Coalition for Smarter Buildings

Tangible Steps Toward Energy Efficient, Healthy, and Productive Built Environments Through the Rapid Deployment of Information Technology

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Summary

There are 5.8 million commercial buildings in the U.S., 97.5% of which are less than 100k sq/ft in size. While most larger buildings have some level of “smart buildings” technology installed in them, overall adoption is inadequate to achieve the necessary efficiency and sustainability goals of the administration. This document proposes several areas where the administration and public policymakers at other levels can drive significant adoption of existing and well-proven technologies to make the U.S. building stock smarter.

This document proposes six areas of targeted action to address barrier issues that are well understood by practitioners at the Coalition, and offer solution sets that are well-proven within the industry. We propose a course of action that includes the following areas:

1. **Workforce Development and Job Creation:** The industry is currently experiencing a well-known shortage of skilled technicians. We propose the creation and organization of education and training resources to empower a new class of information workers to install, commission, and maintain the next generation of building technologies.
2. **Drive Analytics Adoption:** Outline and implement specific policies to increase the use of analytics to reduce GHG emissions, and improve energy efficiency, occupant health, comfort, and productivity.
3. **Information Interoperability:** Embark on a fast-track federal effort to catalog and explain those technologies necessary to ensure the availability of information for analytics, ensuring necessary security and data governance.
4. **Deployment Plan:** Outline strategies and implementation steps to scale up the deployment of technologies to make 5 million buildings smarter by leveraging small and medium-sized businesses across the U.S.
5. **Measure and Verify:** Create a program and campaign to solicit performance metrics from the implemented projects for the purpose of verifying results and motivating building owners to implement the right measures.
6. **Financial and Accounting:** Explore specific steps that the administration can implement to influence financial and accounting policies making deployment of smart technologies more impactful in the long term.

The authors and the Coalition feel passionately that this proposed course of action to the implementation of smart building technologies will dramatically improve the realization of the administration’s sustainability goals while creating a significant number of local high-paying jobs and ensuring a healthy, safe, and productive environment for our 21st-century citizens. We also believe that the goals identified will lead to a plan that is specific, measurable, attainable, realistic, and very timely.

Premise

Over the past ten years, data-centric, “Smart Building” technologies have proven to be a highly effective means of achieving energy efficiency and carbon reduction in the built environment. Pathbreaking initiatives (like the [DoE Better Buildings](#) program) have consistently confirmed the value of these technologies by generating proven, concrete results across buildings of all types.

Further, such initiatives have proven that “Smart Building” technologies have low cost-of-entry, maintain freedom of choice for building owners, and offer high commercial/investment ROI—while simultaneously creating jobs in local economies.

However, the adoption of these proven technologies faces a range of barriers in the current environment. As explained below, the Administration now has a unique opportunity to support the adoption of these technologies by addressing these barriers through targeted policy and regulation.

Proposed Areas of Action

1. Workforce Development and Job Creation

President Biden's transformative and ambitious plan can only be implemented across the country if many more existing and new workers are trained to use these technologies to achieve the high levels of quality environment we seek from our buildings. As a linchpin of this proposal, we urge the creation of a nationwide education and training program for trades and new information workers to design, install and maintain the necessary new tools and systems for smarter buildings.

- We have identified numerous independent public (colleges, universities, and community colleges) and private organizations providing training programs focused on the need for a trained workforce for the implementation and maintenance of efficient, healthy, and safe intelligent buildings.
- We can provide a summary of education organizations that we have identified. As far as suggesting ways to help we offer the following:
 - Create and deploy a program to help those training organizations with scholarship funds for students.
 - Provide funding to enable those organizations to develop/add training programs. Currently, the training organizations have to take on the upfront costs of developing training programs and then work to recoup that investment over time.
- We have been approached by unions, and have had previous discussions with community colleges, about curricula related to using Fault Detection and Diagnostic (FDD) technology in maintenance and service. We believe there are viable ways the government can advocate for and support these activities. In fact, with support, the Coalition can develop training criteria/curriculum and can liaise with local vocational and community colleges, etc.

2. Drive Adoption of Analytics

In past decades, the use of data analytics in buildings has been driven by the ups and downs of energy prices, while the general use of analytics in the world broadly has proved itself in many areas in improving our quality of life and performance of commerce. This key part of this proposal is focused on the use of data analytics to improve the quality and performance of the over 5 million commercial buildings in the United States, focusing on energy and carbon reduction in addition to other benefits related to occupant health and productivity.

- Analytics should cover not only GHG emissions and energy efficiency, but also Indoor Air Quality (IAQ), safety, comfort, reliability, and other risk factors that affect the performance and productivity of occupants.
- Monitoring Based Commissioning of building systems (MBCx) that include continuous, device-level fault detection and diagnostics and tracking of Key Performance Indicators.
- Promote information interoperability standards that enable the widespread and cost-effective use of data analytics technologies for Measurement and Verification (M&V), and continuous MBCx as well as tracking and monitoring of IAQ and related occupant safety and health factors.
- A higher level of maintenance standard, based on proven condition-based and predictive maintenance norms, is needed as is the acknowledgment of the link between maintenance and energy/GHG emissions. Current ASHRAE 180 (Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems), and Preventative Maintenance (PM) practices in general, are not what they should be and due to insufficient funding and misinformed practices, most buildings are undermaintained. Analytics-driven, proactive maintenance processes are a key enabler to address under-maintained buildings.
- Minimum technology requirements to support smart building development must be mandated to facilitate the implementation of Analytics, MBCx, and M&V. We urge the Secretary of Energy to augment the existing Energy Act

2020 Section 1007 (Smart building acceleration) to incorporate elements of ASHRAE Guideline 36 (High-Performance Sequences of Operation for HVAC System), ASHRAE 62.1 and 62.2 (Ventilation for Acceptable Indoor Air Quality), ISO 50001 (Energy Management), and the forthcoming ASHRAE Guideline 1.7 (Ongoing Commissioning Process for Buildings, Systems, And Assemblies).

- Over the past decade, DOE-funded work on the Smart Energy Analytics campaign and other initiatives have demonstrated the cost-effectiveness of analytics-driven energy and maintenance management. The perception of economic barriers should be dispelled through education, while also being bold in mandating the adoption of analytics to achieve the performance benefits of data-driven buildings.

3. Information Interoperability

An information-centric approach to improving commercial buildings is best served by providing the analytics systems with as much relevant and high-fidelity information as possible from sensors, historical data, and computation results.

A missing element is a necessity for information to be inherently usable by other systems with suitable access control, without undue commercial constraints, and ensuring that trust in the information is known. The authors and Coalition propose that NIST conduct a review of existing interoperability standards and requirements and for NIST to publish guidance to ensure that information can be used in an interoperable fashion, with the strictest security and privacy standards. Adherence to such guidance should be a condition of receiving federal funding.

- The creation of an abstract data architecture/framework to facilitate the use of information using universally acceptable standards from protocols (BACnet, Modbus, OPC UA, LonWorks, etc.), standard tagging ontologies, system interoperability mechanisms, cybersecurity standards, trustworthiness, data governance, etc.
- We feel that this is an urgent component of this proposal, which will best be achieved with help from NIST on a fast-paced process such as creating a NIST-IR or a Special Publication similar to the NIST Cybersecurity Framework that was instigated by Executive Order 13636 in February 2013 and subsequently published in February 2014.
- We are prepared to collate a list of relevant standards and other mechanisms as well as a high-level system interoperability requirements document as an input to this process. We will also propose convening a working group of the Coalition for Smarter Buildings to assist NIST with the creation of such a guide/publication.
- Note that the proposal does not anticipate the need to create any new standards as part of this process.
- The objective is to create a framework for the implementation of data-centric systems -- specifically to make the component and system parts interoperable and interchangeable so as to prevent the weaponization of data to make systems proprietary.
- While the focus is maximizing the use of data for reducing GHG emissions and improving energy efficiencies, the framework must also accommodate the use of data for other purposes such as health, resiliency with perspectives such as smart cities, infrastructure, and digital twins.

4. Deployment Plan

A key area of this initiative should be the definition of programs that focus on helping make the 5.5 million smaller (less than 100,00 sq. ft.) commercial buildings smarter since they form the nexus of the commercial life of the United States, including schools, civic facilities, and local businesses.

This area of the proposal envisions that the U.S. mobilize a large network of SMBs (small/medium businesses) operating locally, and at the intersection of mechanical services and information technology, to deliver the smarts to improve the quality of buildings in accordance with specific areas outlined in this plan. While the industry itself can provide some of the required pieces (the technology and means of acquiring it), there are unique areas where public policy can play a crucial role, including:

- A comprehensive long-term MBCx program, based on interoperable, smarter building best practices, should be mandated for ALL Federal buildings and organizations which receive Federal funding. These buildings can serve as replicable templates (based on size, location, and building type) that state, local, and private entities use to help guide them in bringing these technologies to their buildings.

- Require that all federal Energy Services Performance Contracts (ESPCs) include analytics as part of upfront auditing activities and ongoing M&V before the contract is finalized. Without analytics-based monitoring, long-term results from ESCPC's cannot be ensured.
- We also want to emphasize that we do not believe that more pilots are needed. As we have highlighted, these technologies are well proven. What is needed now are policies, incentives, mandates, and mechanisms to drive adoption on the order of 1 million buildings per year.

5. Measure and Verify

Creating a positive reinforcing loop is vitally important to undermine the race to the bottom of past energy-focused models. We propose that building owners who receive federal funding be mandated to provide a continuous and standardized set of metrics, suitably anonymized, to show the impact on occupant health and performance as well as carbon impact and sustainability metrics.

- Based on the history of adoption of these technologies, and the very real economic factors involved, we believe that there needs to be more mandate-oriented action in addition to those existing standards. Put simply, there needs to be regulation requiring meeting specific energy use metrics in buildings.
- As an analogy, the Clean Idle standards for trucks specify and require trucks to meet specific measurable standards. The CAFE standards for cars required the industry to change how they designed and built cars. Those mandated standards drove technology advancement, better products for customers, and achieved the goals of dramatically reducing fuel use of vehicles. We are suggesting that a similar approach is needed in order to actually affect the performance of the nation's building stock.
- An example that is occurring at the state level, states that have legalized and regulated the cultivation of Cannabis are imposing specific energy use limits as part of the permitting process. Companies that apply for licenses accept the requirement and are able to meet the requirements. The requirements are achievable. Technological and financial barriers have come down dramatically in the past decade. To the extent financial barriers remain, incentives should be considered such as carbon tax credits and qualifications could be put in places such as building size or vintage.
- The target for this campaign should be people and companies that make investments in buildings to improve efficiency under this program, and in alignment with the Biden Administration strategy.
- Formally support initiatives to provide standardized data availability for the whole industry. This would encompass data anonymizing and security considerations and could be performed by national labs and commercial standards certification organizations (i.e., UL).

6. Financial and Accounting

Commercial buildings inherently last for decades with many stakeholders from investors, owners, leasees, and occupants. The accounting practices that currently exist in the US have reflected the desire to encourage asset growth and stability but have created well-known disincentives to investment in performance-enhancing investments.

Unfortunately, the unintended consequences of these practices have repeatedly undermined well-intentioned energy efficiency programs. This proposal is to work with industry professionals to determine changes to policy, incentive, and accounting practices that will resolve split-incentive and budgeting issues that impede energy efficiency. The goal would be to provide a financial regime that encourages a "race to the top" versus the bottom.

- Convening federal, state, and local representatives with real-estate industry representatives to evaluate possible incentives or regulatory policies that would encourage a change in leasing practices to solve the "split-incentive" problem.
- The relationship between energy and maintenance budgets currently makes it difficult to effectively implement energy conservation measures because the maintenance budget is penalized for energy savings. We recommend that financial and accounting professionals convene to understand this issue and provide guidance to ensure that energy-saving investments work in the long term.

- From the perspective of energy managers, a dollar saved is a dollar taken away. Dollars accrued from energy savings frequently is removed from the energy budget and placed into the general budget and not into the maintenance budget where it could achieve more energy savings and other improvements to the asset including improving health, safety, and performance.
- Align tax incentives with accounting practices to raise the visibility of energy usage and potential efficiency improvements in buildings.

Next Steps

We appreciate the opportunity to continue this dialog. We would like to propose a meeting to further discuss this proposal and formally introduce the Coalition (see below). The Coalition was created to drive the adoption of smart buildings and provide relevant resources to CEQ/White House as well as other federal and state government agencies to achieve the decarbonization and smarter buildings goals of the Administration.

The authors and the Coalition have extensive reach into the industry and we feel there is strong alignment with administration goals – growth of industry, creation of good-paying jobs, increasing efficiency of the nation’s building stock, and impacting the sustainability of the environment.

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The Coalition for Smarter Buildings (C4SB)

As a means to offer the best resources the smart building industry can bring together, we would like to formally introduce the industry trade group we are part of, The Coalition for Smarter Buildings (C4SB). (Please see attached Introduction to Coalition for Smarter Buildings.)

The Coalition can make the goal of tripling energy efficiency and reducing carbon emissions from buildings by 52% by 2030, as laid out in DOE’s Roadmap to Grid-interactive Efficient Buildings (17 May 2021), a reality for the Administration and Congress and we would like an opportunity to meet to discuss the many ways we can be a resource to federal and state policymakers in ways that could drive commercial adoption.

The Coalition believes that without this last piece – a direct, coordinated link to industry – the Roadmap to GEBs will struggle to succeed.

The Coalition is composed of private sector commercial firms from across the country and the smart buildings industry, with investor and building owner/management relationships. We believe that we can turn this good national policy into private sector acceptance of GEB solutions on a broad-based national scale. An additional document is provided that includes details on the C4SB.