Coalition for Smarter Buildings

Recommendations in Support of Infrastructure Programs By Federal, State & Local Governments

9 August 2021

INTRODUCTION

Widespread smarter building technology adoption is a vital component to achieving the Biden Administration goals of reducing the U.S. carbon climate impact by 50% by 2030, and improving the energy grid infrastructure capacity and resiliency, all while creating good, family-supporting jobs across the country.[1]

The Coalition for Smarter Buildings, a non-profit group founded by built-environment technology industry experts, aims to help promote widespread adoption of smarter building solutions by offering guidance on what technology and solutions are commercially available now, which are aligned with different outcomes, and how to better acquire these solutions at scale.

Policy action areas are presented in three groups:

1. GUIDANCE FOR SMARTER BUILDING STANDARDS & IMPLEMENTATION
2. ONE MILLION SMARTER BUILDING JOBS
3. ONE MILLION SMARTER BUILDINGS

Dollar value ranges are cost estimates to implement each program area as a combination of federal, state and private commercial funding over the indicated period.

The Appendix includes notes on related smarter infrastructure, definitions of levels of capabilities, and a list of referenced documents.

1. GUIDANCE FOR SMARTER BUILDING STANDARDS & IMPLEMENTATION

$250M - $1.0B

over 2- 3 yrs

To implement smarter buildings at scale across the U.S. to meet the Biden Administration goals for the built environment, the Coalition proposes the urgent creation of a number of guidance documents and frameworks to convert existing and proven smarter building technologies and know-how into a form that can be deployed rapidly and scalably by public and private building owners and managers, and installed and maintained by the new smarter building workforce.

a. *Drive Adoption of Analytics Everywhere*
Promote cost-effective and easy-to-adopt analytics models, tools, and practices that benefit buildings from large to small. Require analytics for all federally managed building operations and at all federally funded buildings.

[1] *See,* for example, https://www.whitehouse.gov/briefing-room/statements-releases/2021/05/17/fact-sheet-biden-administration-accelerates-efforts-to-create-jobs-making-american-buildings-more-affordable-cleaner-and-resilient/

b. *Promote Information Interoperability*
Assign NIST to create a System Interoperability Framework to facilitate trustworthy, secure system interoperability for large and small buildings, at scale.

c. *Standardize Public Disclosure*
Create guidance and requirements of a public reporting mechanism for building carbon impact, energy use, healthy indoor environments, and other key performance indicators.

d. I*mprove Financial and Accounting Rules*
Improved accounting rules that would help incentivize a shift of smart building investments to CapEx, while driving measurable performance during OpEx, enabling operational savings be converted into continued investment in maintenance and other actions as determined by the analytics systems.

e. *Roll Out/Deployment Guidance*
Streamline federal funding mechanisms to speed up the flow of dollars and reach higher adoption sooner, consistent with goals of… "data everywhere", "grid-connected everywhere" and "analytics everywhere." Mandate in procurement rules and solicitations that Federal funds be used for new buildings, major renovations, and operating support, only if guidance is adhered to.

2. ONE MILLION SMARTER BUILDING JOBS **$500M - $3.5B**

over 3-5 years

The deployment of smarter building technologies requires a workforce capable of designing, implementing, and maintaining information systems able to monitor and manage energy efficiency, occupant health, and performance. These are specific sets of skills that currently do not exist at any large scale. The Coalition proposes the focus on the following:

a. *Increase the # of qualified workers: 1 million smarter building jobs*
Create the Smart Building Corps (as part of the Climate Corps), offer training scholarships, subsidize apprenticeships, and work alongside labor and industry to promote smart building jobs.

b. *Invest in training infrastructure: Target 250k training slots/year*.
Invest in identifying, setting up and expanding, and developing broader curricula for smart building training programs across the country, based at community colleges, higher ed institutions, and union and industry training centers.

c. *Increase the # of trainers and mentors: Target 5k trainers and 100k mentors.*
Develop incentives and outreach to experienced industry veterans and cross-over talent to teach at training programs and mentor in the field, from design to sales to installation to operations.

3. ONE MILLION SMARTER BUILDINGS $50B - $256B

over 3-5 years

Context: U.S. commercial building stock is 5.9M buildings (97B SF) (2018)
Estimated # without "smarter" systems:[2] 5.4M buildings (80B SF) (81% of GSF)
U.S. residential building stock is 141M housing units[3] (2020)

A successful and rapid deployment of smarter building technologies has to be guided by a thoughtful understanding of building types, benefits, and barriers to natural adoption. Incentivized adoption strategies outlined below are designed to change the *status quo* CapEx-only motivation, into a balance of CapEx investment (stimulus) measured against continued OpEx performance metrics to continue making the building smarter by the timely use of analytics recommendations and implementing necessary maintenance that results in both societal benefits as well as an increase in asset value for the building owners.

We emphasize that federal and state spending can stimulate significant adoption of smarter buildings through direct investment, incentives, mandated "smarter" performance, operations, disclosure and M&V. Additionally tax credits or deductions should be adopted to further incentivize the acquisition of smart building solutions such as grid-interactive efficient technologies.

HOW SMART? If a building with no smart components or operations is "Level 0," then buildings can be thought of as getting smarter when they add capabilities for: independent M&V (L1), continuous remote management (L2), interacting with the grid (L3), enabling multiple systems and apps to interoperate (L4), and operating autonomously (L5). See appendix for more detail on "Five Levels to Make Buildings Smarter."

a. *Target 1 Million Smarter Buildings*
20% of U.S. commercial building stock in 3 years (2025). The first big step to reaching 90% of buildings in eight years (2030). Options:
   i. Outfit 1M blgs to L1: Independent M&V: 20% of GSF = $2.2B
   ii. Outfit 1M blgs to L2: Continuous Remote Mngt: 20% of GSF = $15B
   iii. Outfit 1M blgs to L3: Grid-Interactive Blgs: 20% of GSF = $28B
   iv. Outfit 1M blgs to L4: Multi-System Interactive Blgs: 20% of GSF = $49B
   v. Outfit 1M blgs, to a mix of L1 to L4: 20% of GSF = $25B

b. *Require all commercial buildings > a certain size be Grid-Interactive*
Grid-Interactive buildings (Level 3 Smart Buildings) reduce overall loads and improve grid resiliency. Require enrollment in utility Demand Response programs. Would apply to all commercial buildings, including federal, state & local government, and private. Options:
   i. All blgs > 10K SF, Outfit to L3 = 80% of GSF: $114B
   ii. All blgs > 25K SF, Outfit to L3 = 64% of GSF: $90B
   iii. All blgs > 50K SF, Outfit to L3 = 51% of GSF: $72B
   iv. All blgs > 100K SF, Outfit to L3 = 35% of GSF: $50B

[2] In this summary, "smarter" means capable of at least owner/operator-accessible, independent monitoring and verification. See Appendix: HOW SMART? for definitions.
[3] The scope of this paper does not include residential buildings other than multi-family buildings > 3 stories and federally owned military housing.

c. *Mandate Monitoring-Based Operations for All (applicable) Federal Buildings*
Federal buildings can operate more efficiently if managed using real-time, data-connected information systems. This would save the federal government money, serve as a model for what's possible, and drive market adoption as federal suppliers raise the quality of their product and service offerings to meet contract requirements (capabilities they then can offer to other building owners). Options:
   i. Outfit to L1: Independent M&V: 75% of Federal buildings = $300M
   ii. Outfit to L2: Continuous Remote Mngt: 75% of Federal buildings = $2.0B
   iii. Outfit to L4: Multi-System Interactive Blgs: 50% of Federal buildings = $4.2B

d. *Require Analytics in all federally funded Energy Service Performance Contracts (ESPCs)*
ESPCs are commonly used to outsource facilities management in federal and other buildings. Requiring federally-funded suppliers of ESPCs to use and share analytics would drive higher performance and ensure verification. Assuming ESPCs are used at 5% of federal GSF, the options would be:
   i. Outfit to L2: Continuous Remote Mngt: 5% of Federal buildings = $125M
   ii. Outfit to L4: Multi-System Interactive Blgs: 5% of Federal buildings = $400M

e. *Fund all (qualifying) DOE FOA-2206 Connected Communities Projects*
Fund as many as possible of these (multi-building) projects, which include a mix of public and private buildings. There are 225+ projects already proposed to DOE. Fund all the ones that qualify as L3: Grid-Connected to L4: Multi-System Interactive Blgs, @ $5M each (+10% admin costs). Options:
   i. Fund 100 projects: $550M
   ii. Fund 200 projects: $1.1B

f. Fund Pilot DOE FOA: Autonomous Buildings Challenge
Fully autonomous operations for buildings is an aspirational goal still in its infancy. A funding opportunity focused on defining the requisite equipment, systems, and operations would inform the market and generate a pull towards what's possible for fully autonomous buildings. Options:
   i. Fund 5 projects: $52M
   ii. Fund 20 projects: $210M

APPENDIX:

A. SMARTER BUILDINGS SUPPORT SMARTER INFRASTRUCTURE
Making buildings smarter is a requirement to making infrastructure and the entire built environment smarter. A smarter city needs smarter buildings. A smarter grid needs smarter buildings. Smarter renewable energy resources need to be connected to smarter buildings. Further, the technology and processes that make buildings smarter can be applied to all built environments, including smart cities, roads, and bridges, water systems, the electric grid, hi-speed broadband, and others.

B. HOW SMART? FIVE CAPABILITY LEVELS THAT MAKE BUILDINGS SMARTER

If a building with no smart components or operations is "Level 0," then buildings can be thought of as getting smarter when they add "smart" components and operational practices that deliver certain capabilities. Each capability level builds on the ones before it:

Level 1: Ongoing, Independent M&V: giving owners/operators ongoing independent monitoring & verification ability based on an Internet-connected meter and/or interval data and visibility. Examples: utility Green Button data (delivered to owners), panel-level interval metering, CT-sensors for individual circuit monitoring.

Level 2: Remote & Continuous Management: giving owners/ operators/contracted vendors remote visibility and management control and the ability to do data-informed periodic retro-commissioning, based on 2-way Internet-connected systems and siloed apps. Even though deployed as independent systems at this level, best-practice data architecture would require that each system be interoperable with L3 and above. Examples: web-enabled building automation systems (with or without fault detection diagnostics), app-connected access controls or people counting, smart elevator apps.

Level 3: Energy Grid-Interactive Buildings: giving owners/operators the ability to interact with the electric grid in real-time to increase grid efficiency and grid/building resiliency, including demand response, interactive load control, and distributed energy resources such as renewable energy generation and storage. Examples: grid-connected energy management information systems, microgrids with solar PV generation + battery storage.

Level 4: Multi-System Interactive Buildings: systems integrated to each other and to the grid, enabling multi-system, machine-informed diagnostics and intelligence to apps delivering "smarter" experiences, operations, and outcomes. Examples: 'single pane of glass' whole building management systems, whole building data platforms for custom apps.

Level 5: Autonomous Buildings: Automating specialized experience and operations apps that work on top of multiple connected systems and the grid. Examples: artificial intelligence-driven, multi-system automatic building operations systems.

C. REFERENCES

a. *National Roadmap for Grid-Interactive Efficient Buildings*, U.S. Department of Energy Building Technology Council, 17 May 2021 - https://gebroadmap.lbl.gov/A%20National%20Roadmap%20for%20GEBs-20210712.pdf
b. White House Fact Sheet on Smart Buildings, May 17, 2021 - https://www.whitehouse.gov/briefing-room/statements-releases/2021/05/17/fact-sheet-biden-administration-accelerates-efforts-to-create-jobs-making-american-buildings-more-affordable-cleaner-and-resilient/
c. "Proposal to Build Back Smarter," John Petze, et. al., Coalition for Smarter Buildings, memo to White House Council on Environmental Quality, 17 June 2021. (See attached)
d. Smart Building Infrastructure Investment Cost Matrix, 9 August 2021. (See attached)
e. Detailed Cost Matrix, 9 August 2021. (See attached)