Roadmap to Resilient, Ultra-Low Energy Buildings

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Centre d'études sur le bâtiment
à consommation nulle d'énergie

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Agenda for Today's Presentation

1. Introduction
2. Proposed Policy Principles
3. Draft Roadmap for Engineers – call to action

Roadmap Introduction

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What is the Roadmap?

- Guidance for the engineering profession and policy makers
- A compelling and achievable Vision for the Canadian building stock
- Goals and metrics aligned with the vision
- Case studies of buildings that align with the vision
- Proposed Policy Principles to support government activities
- A call to action for the engineering profession and Roadmap to catalyze transformation
- Project website: https://www.cae-acg.ca/resilient-building/

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Sponsors

- Pacific Northwest Economic Region (PNWER)
  - Matt Morrison, Brandon Hardenbrook, Nate Weigel
- Canadian Academy of Engineering
  - Dr. Robert Crawhall | P.Eng, FCAE, ICD.D

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Pacific NorthWest Economic Region

Roadmap History

- 2014 PNWER Summit (Whistler) – Roadmap Established
- 2019 Workshop (Montréal) and Communiqué
- 2020 Symposium (Montréal) and Communiqué
  - Example paper: *Jurisdictional Responsibility for Improving the Resilience of Buildings to Climate-related Power Outages*
- 2021 online Workshop – Low-carbon, Positive Energy Resilient Communities
- 2022 PNWER Summit (Calgary) – Bridging Silos to Catalyze Decarbonization and Resilience of Buildings
- 2023 Webinar
- 2023 Draft Roadmap for comment by Advisory Committee and CAE Fellowship inductees

Vision

Climate change mitigation and energy affordability necessitates a transformation of Canadian buildings

The design of buildings, transportation systems and industry must change, with an additional emphasis on:

- Increasing energy efficiency
- Exclusive use of zero- and net-zero carbon fuels
- Bolstering resilience

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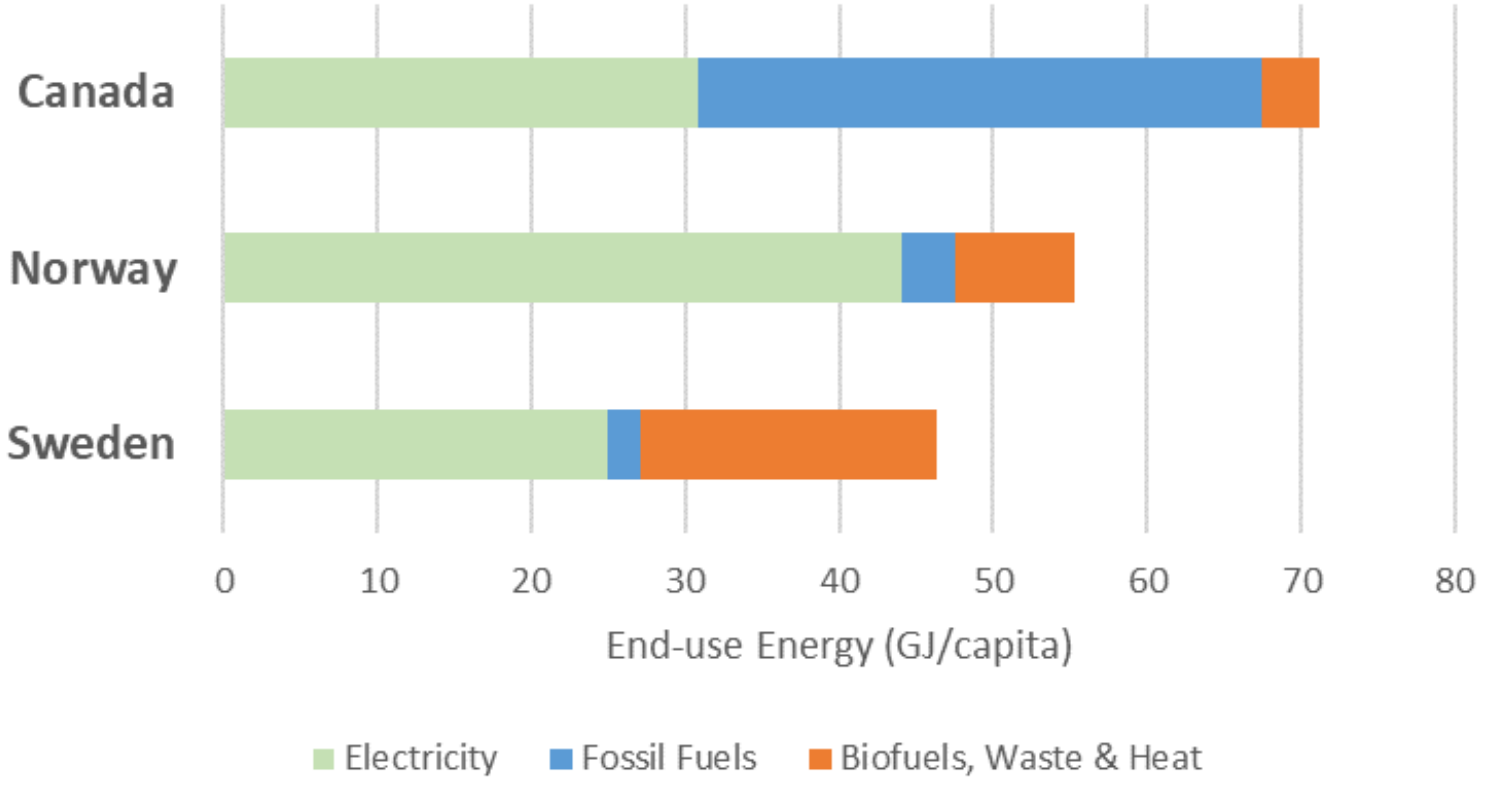
Supply- and Demand-side Decarbonization



Comparison of per capita building energy use by source (2019)

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The Resilience Imperative

Requirement: efficient and responsive use; diversity of carbon-free energy sources; including building & community-scale generation, storage, control

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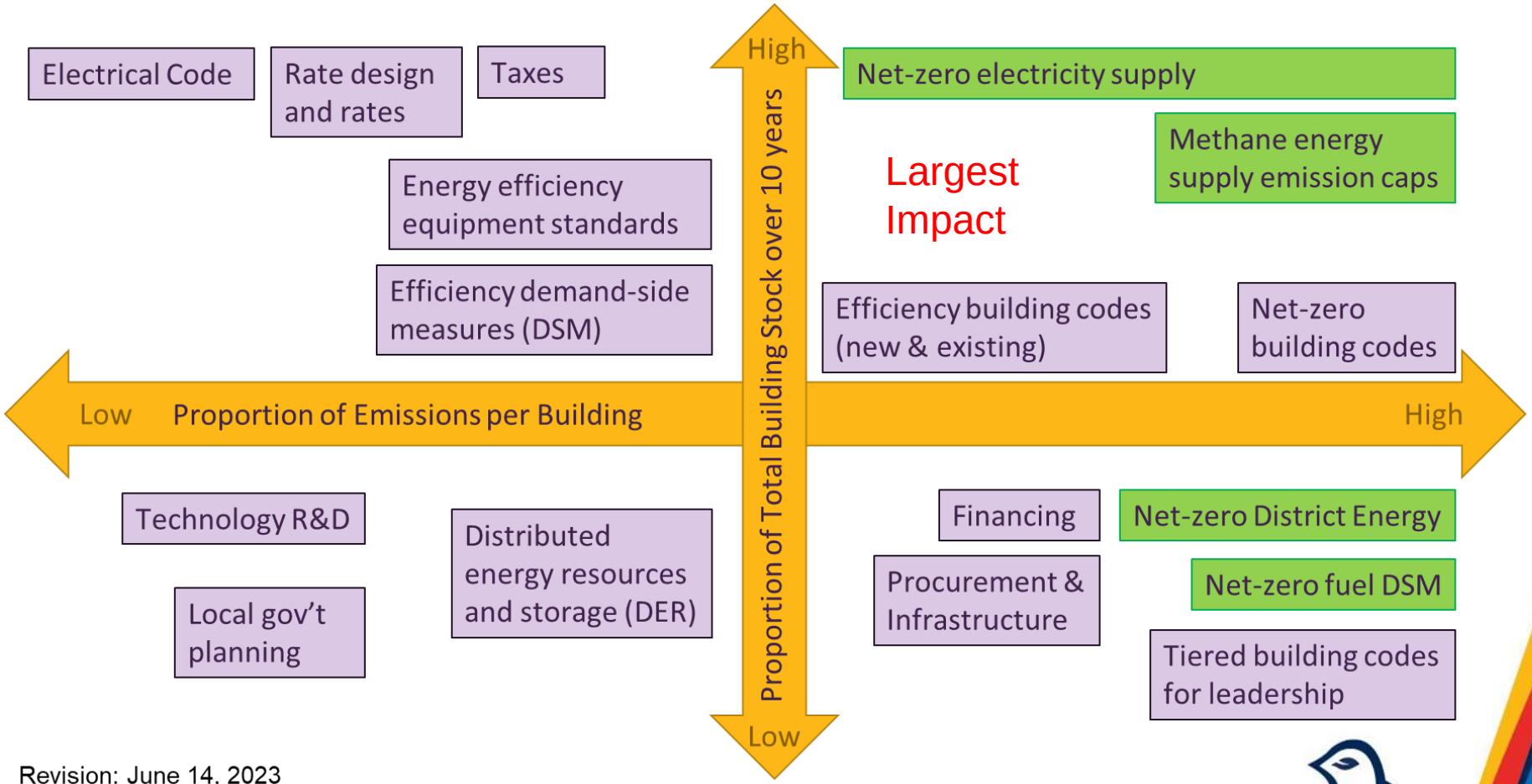
Proposed Policy Principles

Measures to Decarbonize Buildings

Demand-side Measures (purple)
Supply-side Measures (green)



Revision: June 14, 2023

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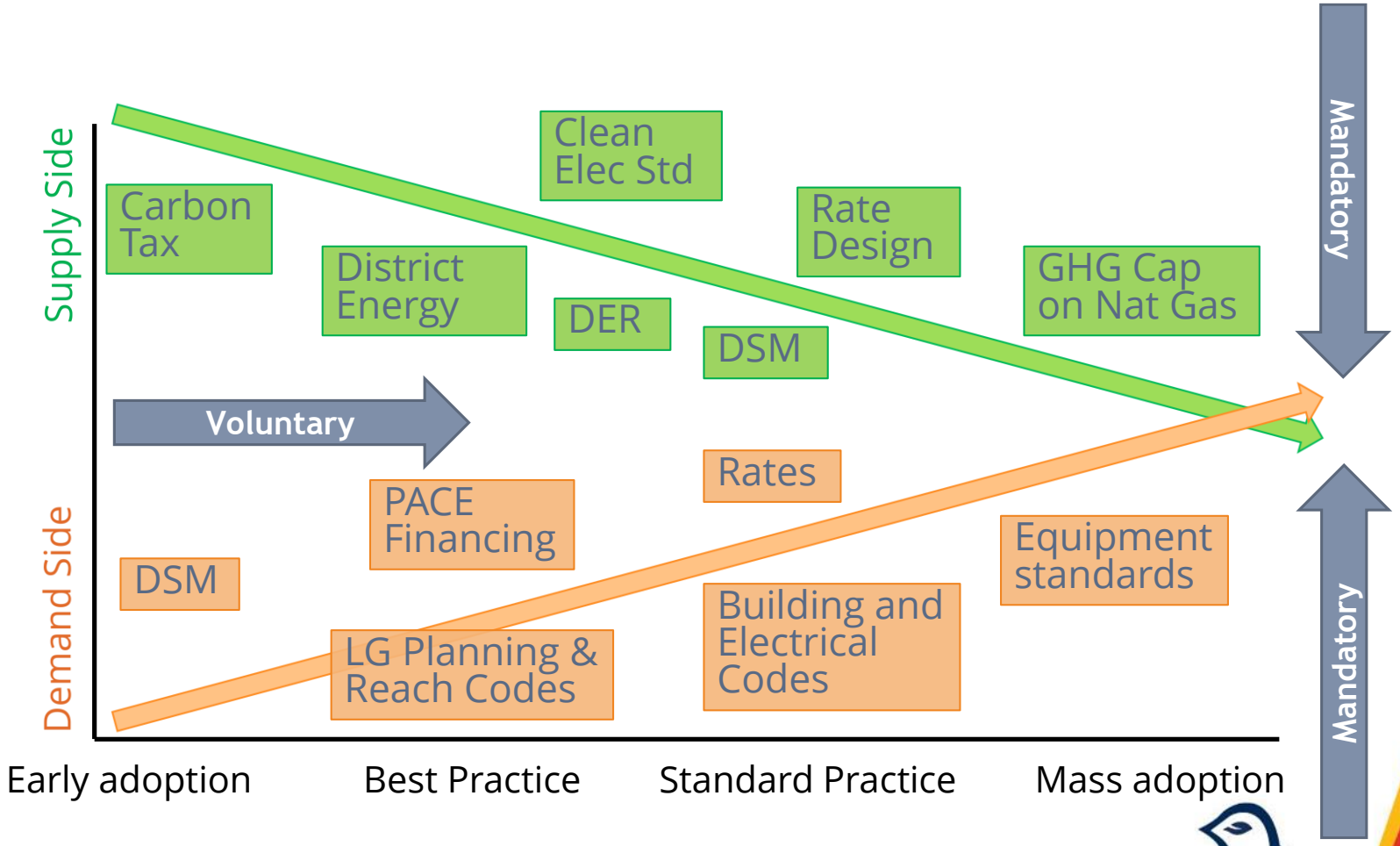
Proposed Principles for Policy Makers

1. Facilitate Integrated Demand- and Supply-side Resource Planning
2. Focus on Performance Outcomes that Foster Competition and Enable Innovation
3. Allocate Jurisdictional and Institutional Responsibility
4. Leverage Building Lifecycle Investment Triggers
5. Facilitate Data-driven, Outcome-based Policymaking

1. Facilitate Integrated Demand/Supply Planning



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2. Focus on Performance Outcomes that Foster Competition and Enable Innovation

- Establish common performance metrics and standards across markets
- Empower professionals to co-optimize design across goals
- Maximize flexibility to achieve goals, enhancing innovation, competition and cost reduction
- Develop adaptative design solutions to avoid dead ends
- Focus on risk identification, vulnerability assessment and mitigation versus exposure to recovery and damage costs
- Communicate extensively with governments on policy adjustments to enhance performance, innovation and resilience, as opposed to a “compliance mindset”
- We are calling on establishing an “innovation ecosystem” for buildings

3. Optimize Allocation of Responsibility

Current Institutional Planning Frameworks

Stages of Building Life-Cycle

Energy Supply

Proposed Planning Framework – across institutions for entire building sub-sectors

Regulatory Frameworks for Buildings	Residential	Commercial	Institutional	Rental & Social Housing
Land Use Planning	Local / Regional / Indigenous Government Planning			[P/T Emerging]
New Construction	Building Codes, Advanced Energy Efficiency Standards, Energy Efficiency Programs			
Equipment	Federal and Provincial Energy Efficiency Act, Energy Efficiency Programs			
Asset Management	Mandatory Depreciation Report	N/A	Capital Asset Management Framework	
Building Renewal	Building Codes, Energy Efficiency, Tax credits			+ Design guidelines, Rent control, Government funds
Real Estate	Real estate labelling	Benchmarking	Greening government buildings	Tenant protection
Electricity Supply	Public Utility Commission (planning, projects, supply, rates), clean electricity standard			
Fossil fuel and other methane and H2	Public Utility Commission (planning, projects, supply, rates), emerging carbon cap			
Distributed and District Energy	Public Utility Commission (planning, projects, supply, rates), net metering, government ownership, connection bylaws.			

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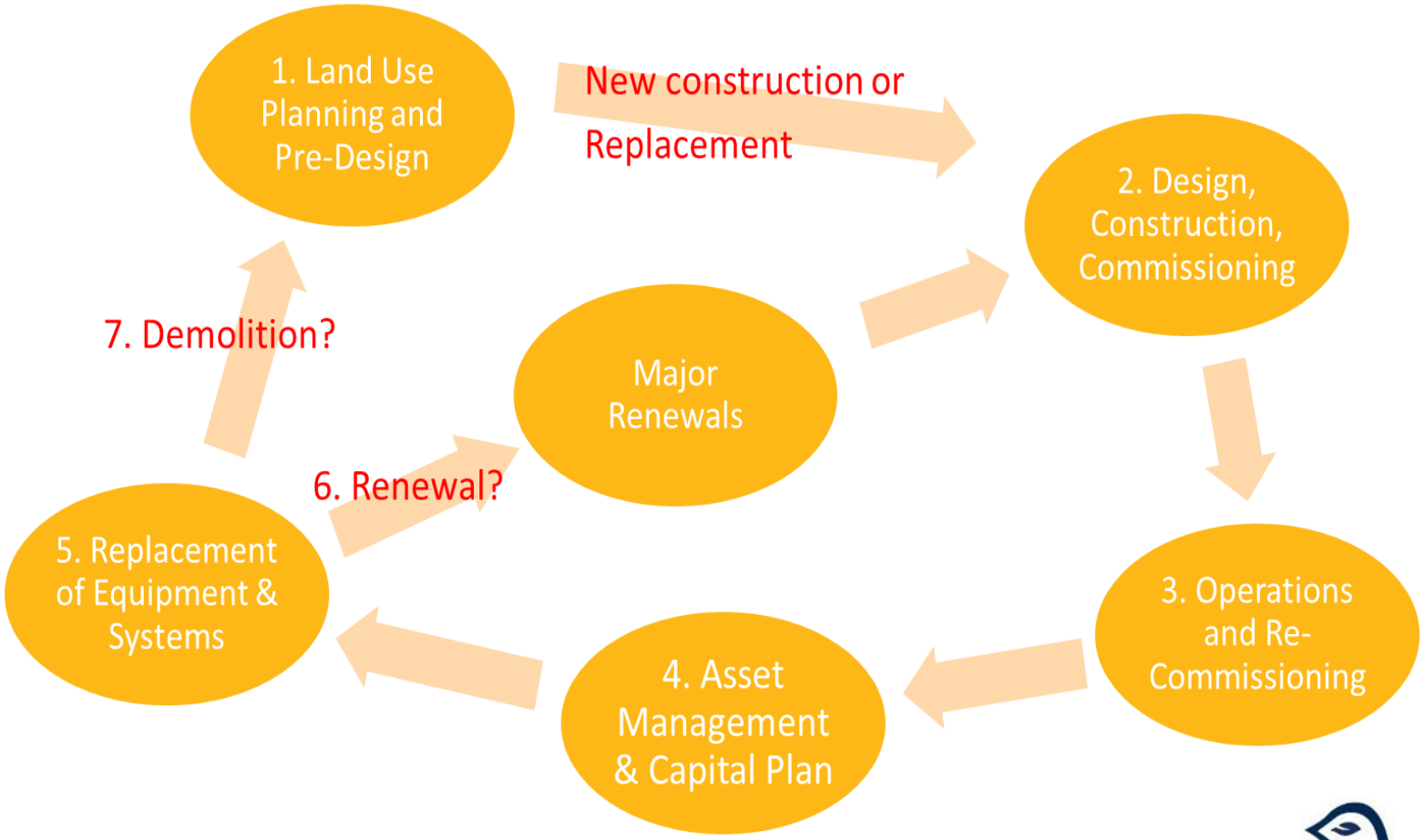
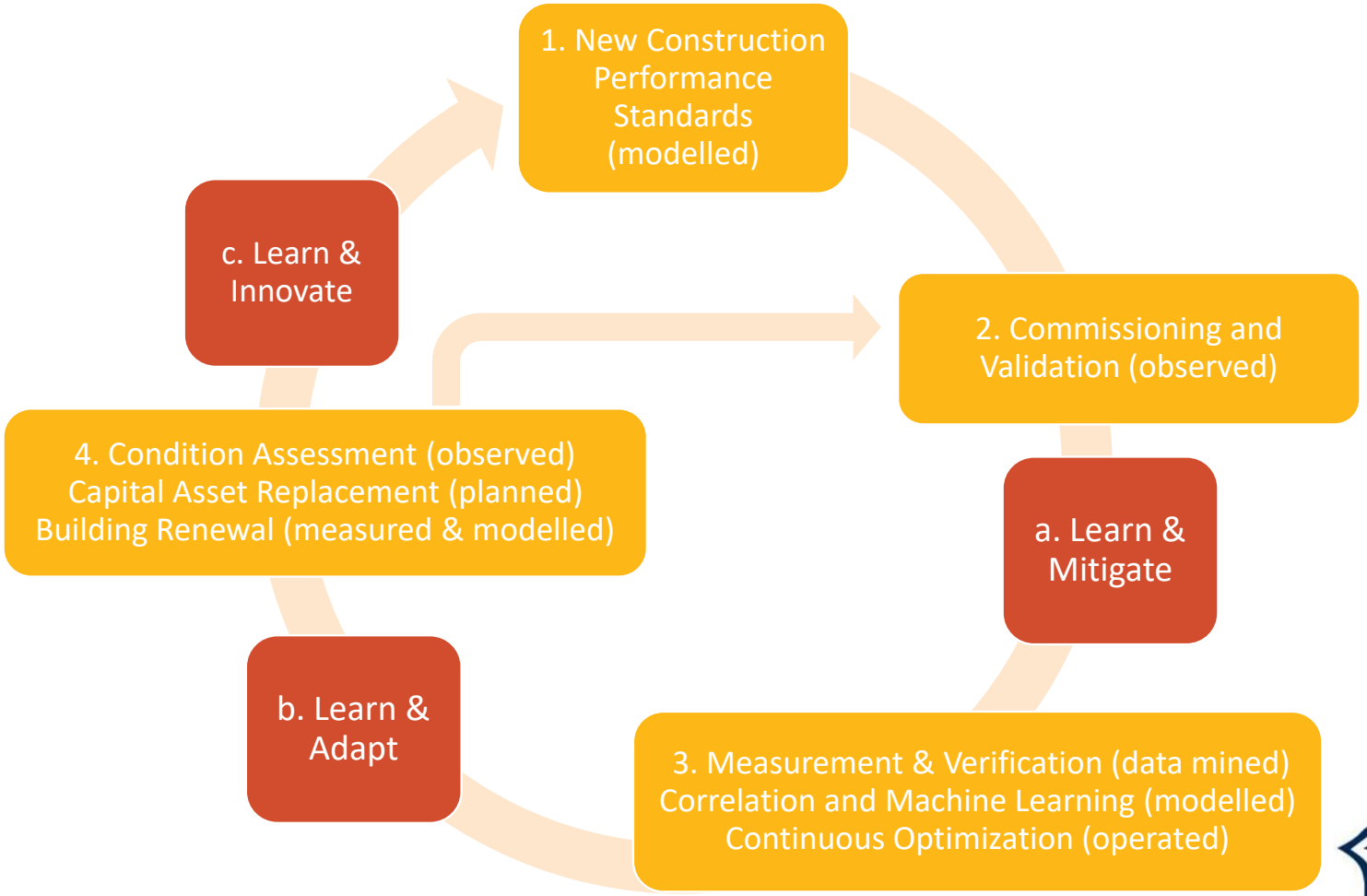
4. Leverage Lifecycle Investment Triggers



5. Facilitate Data-driven Policymaking



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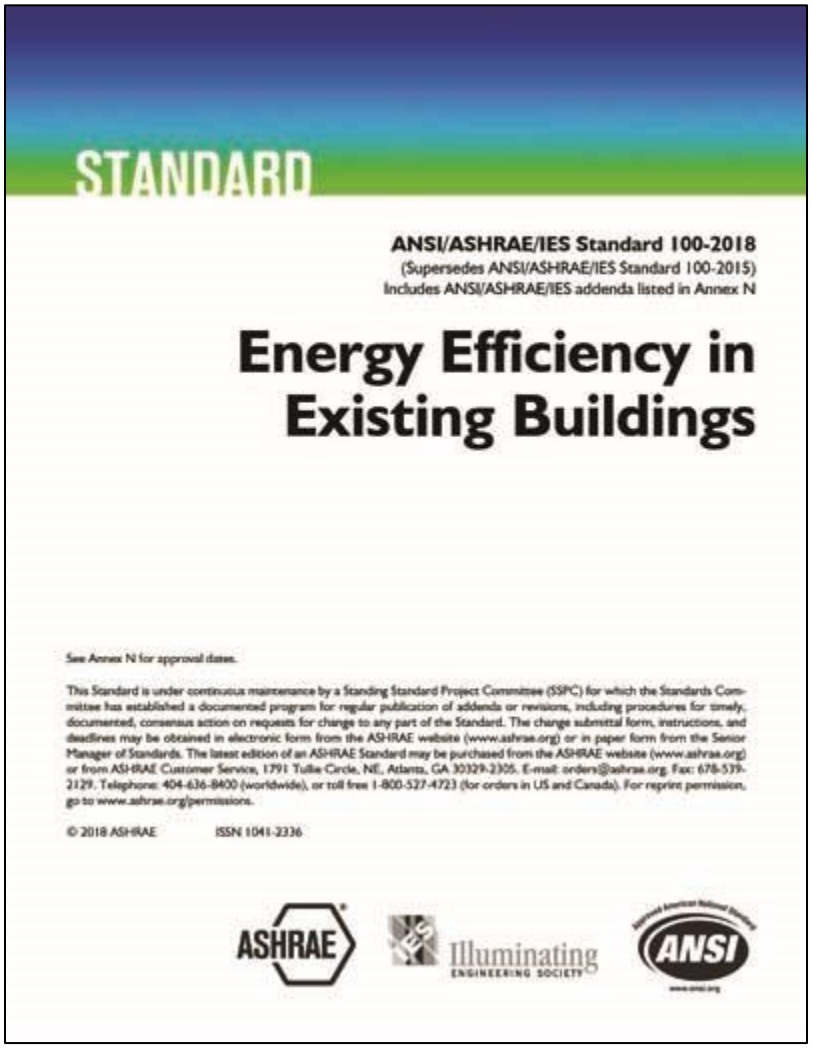
Example



STANDARD

ANSI/ASHRAE/IES Standard 100-2018
(Supersedes ANSI/ASHRAE/IES Standard 100-2015)
Includes ANSI/ASHRAE/IES addenda listed in Annex N

Energy Efficiency in Existing Buildings

See Annex N for approval dates.

This Standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the Standard. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE website (www.ashrae.org) or in paper form from the Senior Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

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Call to Action for Engineers and Roadmap

Empowering Engineers

Expanded role needed for engineers because the profession:

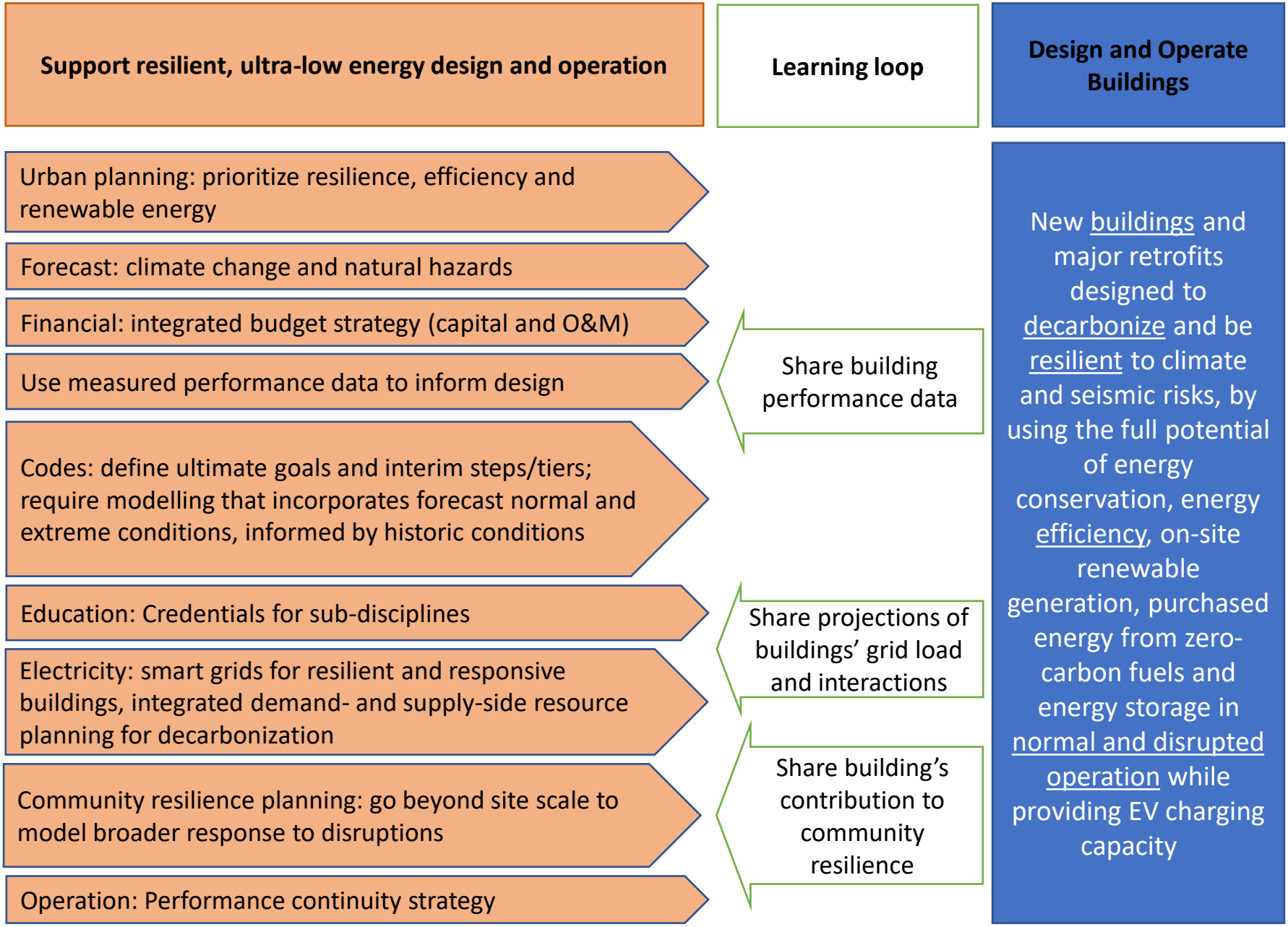
- Serves multiple Buildings sector stakeholders
- Bridges across government, institutional and sectoral silos
- Aligns with codes of ethics including “ hold paramount the safety, health, and welfare of the public, including the protection of the environment…

Engineers are in a unique position to catalyze meaningful action on policy goals while highlighting limitations of design solutions in the context of management practices, local context and a changing climate.

Call to action for Engineers

- Establish a vision for future-proofing buildings
- Individually evaluate risk factors and mitigation measures
- If involved in building operation: measure building performance and use data to optimize operation
- Contribute to policy development including codes
- Collaborate with academe on demonstration projects
- Collaborate with CAE on innovation ecosystem

Roadmap for Engineers, Professional Reliance and Practice



Closing Remarks

Roadmap Next Steps

- First draft of Roadmap: Completed November 2022
- Advisory Committee input: December-March
- Draft Roadmap for CAE Members: June 2023
  - Adding existing buildings case studies
- Final Roadmap Options
  - Current format – integrated with vision and case studies
  - Separate “Roadmaps” for engineers and governments
- Dissemination to F/P/T Ministers of Buildings and Energy: Fall 2023

Summary

- Guidance offered from CAE to engineering profession and policy makers at all levels
- Proposed Policy Principles to support government activities
  - Integrated planning for each buildings sub-sector, crossing legislative and institutional boundaries
  - Focus on data, innovation, performance
  - Clear allocation of responsibility to governments
  - Engineers co-optimizing multiple goals, maximizing affordability
- A call to action for the engineering profession to facilitate resilient, ultra-low energy buildings