



Giving Credit Where Credit is Due: Assessing Attribution and Savings from a Building Energy Code Compliance Enhancement Program

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Background



Application of Results



Methodology



Results

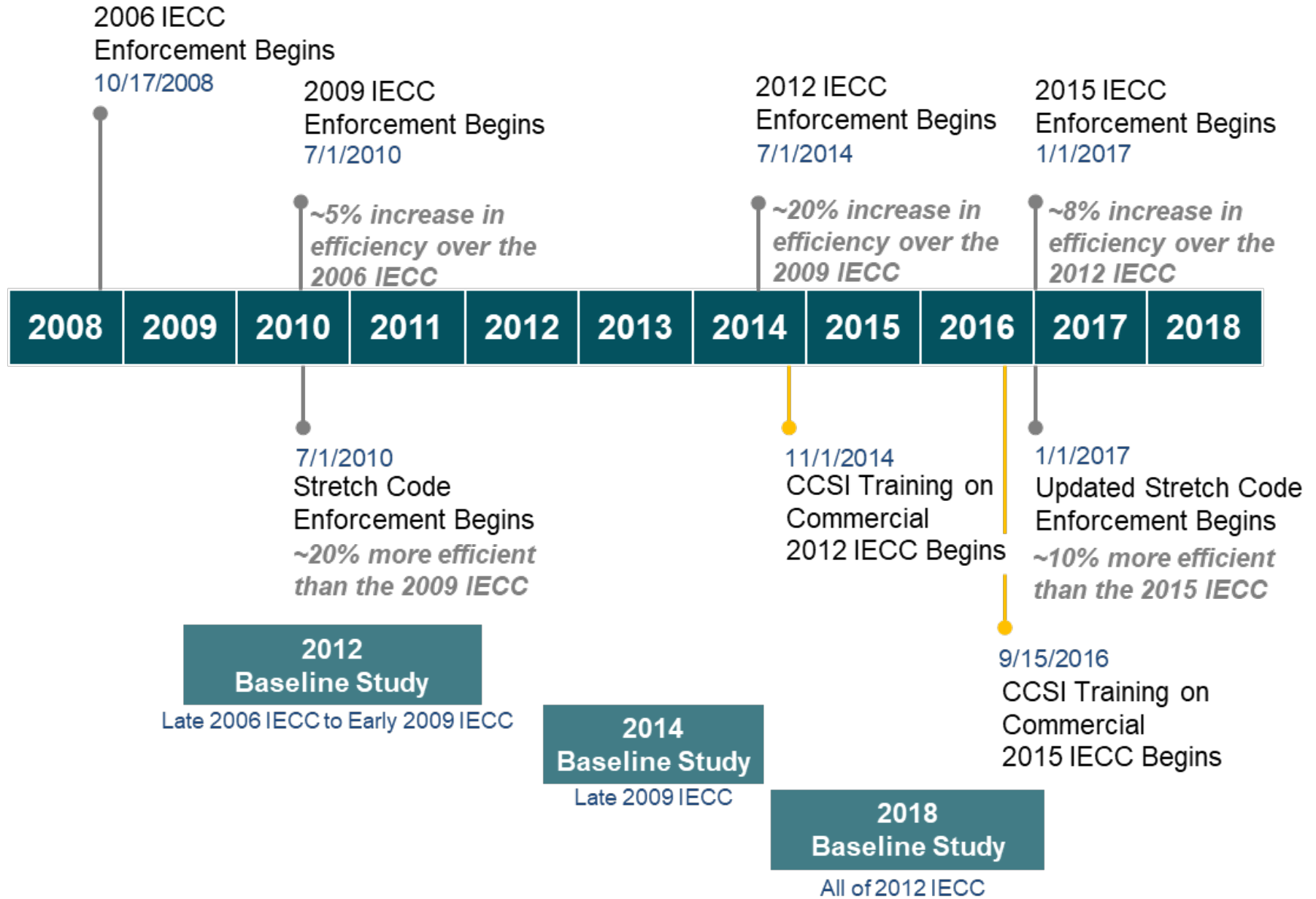


Conclusions

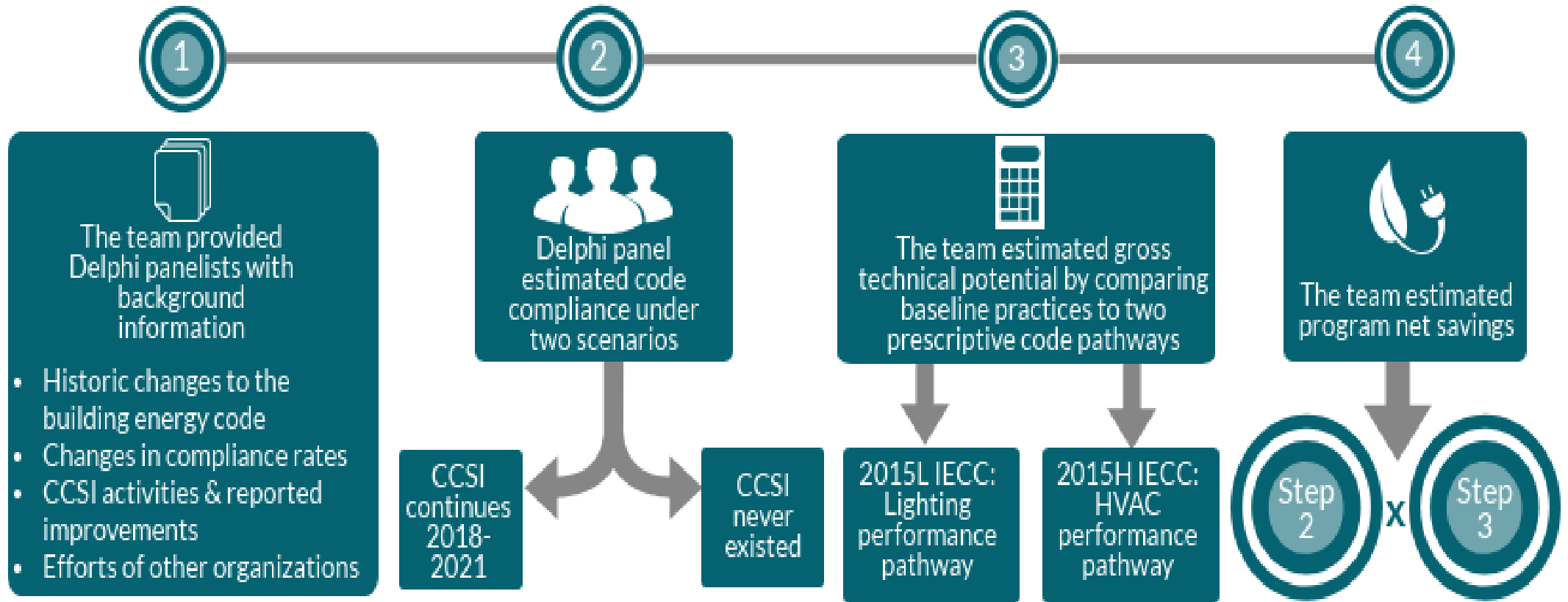
- Since 2014, PAs have funded CCSI to increase compliance rates
 - CCSI offers training to building professionals and code officials
- MA on three-year code update schedule
 - Market is always *catching-up*
 - CCSI is a way to fill the gap generated by lower NC program savings
- Evaluation measured impact of trainings on compliance enhancement and associated savings
 - *Goal was to estimate attributable savings for the 2019-2021 program period*

- Regular code updates are prevalent in many jurisdictions outside of Massachusetts
- Potential to leverage this research
 - ✓ Indicators required to measure impacts
 - ✓ Data sources that can be used to inform new construction trends
 - ✓ Lessons learned to anticipate building code cycles, impacts, and training needs
 - ✓ Applicability of methodology to other jurisdictions

Timeline

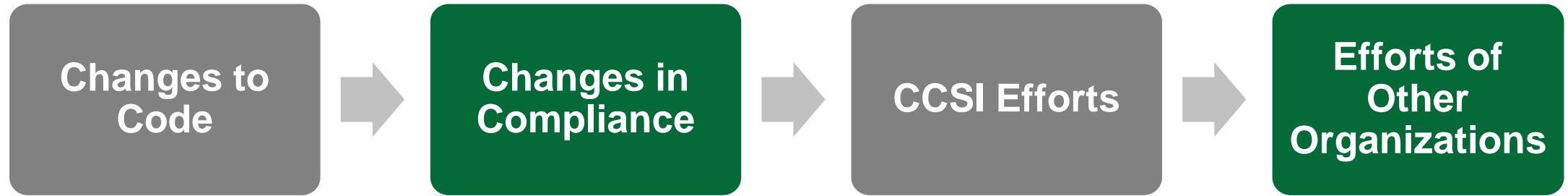


Methodology



- Statewide commercial code compliance baseline studies
 - 2012, 2014, and 2018
- Gross technical potential modeling results
 - Estimated measure-level GTP associated with non-compliance
- CCSI training materials and survey results
- Dodge data on commercial new construction activity
- Data summarized in a “situation memo” for Delphi panelists

Identifying Factors Affecting Code Compliance



- ▶ '06-'09 IECC ~5%
- ▶ '09-'12 IECC ~20%
- ▶ '12-'15 IECC ~8%

- ▶ Late '06 (82%)
Early '09 (76%)
- ▶ Late '09 (85%)
All '12 (88%)

- ▶ 52 classroom trainings between '14 and '17
- ▶ 1,089 unique attendees
- ▶ 75% of attendees said they would use information within three months

- ▶ Other organizations and secondary research suggested that the CCSI was the primary code training mechanism

- Recruited 11 of 31 experts to participate in panel
 - Local code officials, architects, and engineers
 - Building efficiency consultants and evaluators working nationally
- Panelists were selected based on their familiarity with local code issues or with similar programs in other jurisdictions

- Panel was provided with a *situation memo*, summarizing the key factors affecting code compliance
- Two rounds
- Estimated compliance for commercial buildings from 2018-2021
 - Assuming the CCSI continues training and outreach
 - Assuming the CCSI was never implemented

First Round

vs

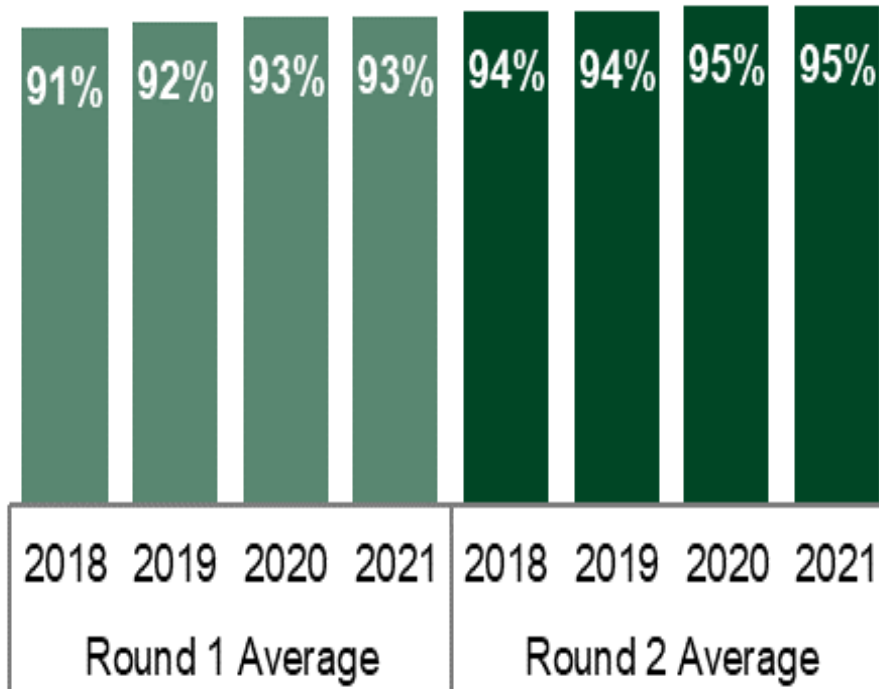
Second Round

- Panelists estimated compliance with and without the CCSI for 2018-2021
- Each panelists provided rationale for their responses

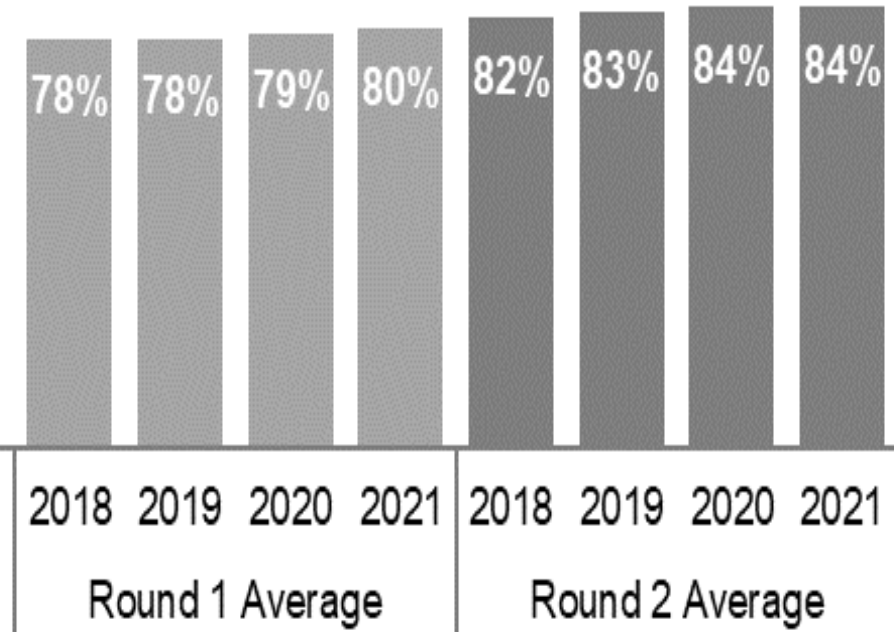
- Panelists were provided anonymous responses of other panelists and their rationale
- Panelists were asked to revisit their original estimate in light of other responses

Delphi Panel Results

Estimated Compliance with the CCSI



Estimated Compliance without the CCSI



- Round two results exclude two statistical outliers (both code officials)
- Outlier responses were presented for peers to review as part of the second round
- Outliers were only removed after completion of the second round

Attribution Calculations (2019 Example)

- Compliance with the CCSI (A): **94%**
- Compliance without the CCSI (B): **83%**
- Compliance if CCSI ceased implementation (C)
 - **$(A+B)/2$: 89%**
- Compliance increase attributable to the CCSI (D)
 - **$(A-C)$: 6%**
- Proportion of GTP savings attributable to CCSI (E)
 - **$D/(1-C_{2017})$: 45%**

- Baseline technical potential calculated by modeling baseline results compared to 2015 IECC code requirements
 - Only below-code measures included
 - Considered lighting and HVAC compliance pathways
 - Developed EUI savings for each compliance pathway
 - Averaged pathway savings to come up with an overall GTP estimate
- Dodge data used to project the growth in the commercial new construction sector

Estimated Net Savings

$$\text{Program Net Savings}_{\text{year}} = \text{Program Attribution}_{\text{year}} \times \text{Gross Technical Potential}_{\text{year}}$$

Year	Method 2: Average Savings from Lighting and HVAC Compliance Pathways	
	Electric (MWh)	Gas (therms)
2019	5,298	(6,129)
2020	7,507	(8,685)
2021	7,621	(8,816)
3-year Total	20,426	(23,630)
Savings in MMBTU		
2019	18,027	(613)
2020	25,543	(868)
2021	25,930	(882)
3-year Total	69,501	(2,363)



Recognize the need to capture a **variety of data types** when designing compliance enhancement programs



Leverage **multiple sources of data** to develop reasonable assumptions regarding commercial new construction building trends



Account for the **timing of building energy code cycles**, related impacts, and training needs



Thoughtfully examine the **feasibility and value** of a comparable assessment

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