

# (Fuel) Switching It Up: Rethinking Net-to Gross Measurement and Attribution in Non-Residential New Construction Electrification Projects

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# Background and Objectives



# Program and Regulatory Background

- Massachusetts Program Administrators (PAs) redesigned the Non-Residential New Construction (NRNC) program in 2022 to encourage electrification.
  - Dedicated incentives for **fuel switching** on top of those for reduced energy use intensity (EUI) and energy-efficient equipment
- State required the PAs to determine program attribution for incentivized fuel switch given other market forces
  - Aggressive state and municipal energy code
  - Municipal policies encouraging electrification

# Objective and Challenge

Objective: Estimate a net-to-gross ratio (NTGR) for the fuel switch portion of NRNC projects that selected electric heat pumps as the primary heating system.

- Influence on electrification.
- Influence on heating load.

Challenge: Isolating the fuel switch decision from other choices and influences on the project.

- Traditional research acquisition self-report approaches (RA SRA) assume individual equipment decisions in retrofits.
- NRNC program seeks to reduce the building's EUI and to electrify primary heating systems.

# Methodology



# Two Study Phases

## Phase I: 2022

- Timed to provide prospective application in 2023, but few projects had been offered fuel switching incentives prior to being included in the study.
- In-depth interviews with 28 project representatives but only used 13 who would receive fuel switch incentives to estimate NTGR.

## Phase II: 2023 to 2024

- Conducted after more projects had received the fuel switching incentive.
- Incorporated methodological lessons learned from Phase I.
- In-depth interviews with 19 project or design team representatives from 15 projects.

# Modified Existing Self-Report NTG Approach

- Retained elements of the RA SRA
  - Role of incentives and technical assistance
  - Selection of design team or customer as most influential decision-maker
- Crafted contextual questions to understand the project
- Probed respondent to think about fuel switch decision separately from other project decisions
- Investigated program influence on heating loads by fuel
- Removed questions on timing and equipment efficiency

# Final Algorithm Fuel Switch NTG Process

Identify primary decision maker



Determine if project would have used heat pumps for primary heat without program



Rate influence of program intervention on heat pump decision



Assess fuel switching spillover to other projects



Check consistency to address contradictory responses

# Results



# NTG Scoring Example

Question	Response / Score
Project would have had heat pump without program	Yes (Initial Fuel Switch FR = 1)
Incentive influence	4.5 out of 10, scored as 0.45
Technical assistance influence	0 out of 10
Other program influence	0 out of 10
Load influence	None (Load FR = 1.0)
Initial FR Estimate	(Average Initial FR and Load FR) – Max influence = $1 - 0.45 = 0.55$
Final individual FR	0.55

- Calculated for all projects expected to review fuel switch incentives
- Weighted by project square footage

# Final Net-to-Gross Ratios

NTG Component	Phase I	Phase II
<i>n</i> projects	13	15
Free ridership	93%	66%
Spillover	0%	0%
Net-to-gross ratio	7%	34%

- Phase I projects started before introduction of fuel switch incentives, allowed to receive them.
- Numerous projects located in towns with electrification policies.
- High level of repeat program participation (before & after).

# Conclusions



# Difficult to Isolate Program Influence

- Codes, local policies, project costs limit attribution for program on fuel switch decisions under RA NTG approach.

However:

- Many market actors sought out program support and factored it into their decision-making.
- Strong presence of repeat participants and projects in towns that require electrification for municipal buildings.
- Respondents valued program support even if it failed to rank highly in a traditional attribution framework.

# Evolving Attribution Framework

- Assessing program attribution on fuel switching requires a different framework.
  - Sensitive to how evolving markets react to program support.
  - Reflect realities of planning large, complex projects with many considerations and influences on project design.
- Massachusetts has shifted the program to a market transformation framework to align with statewide decarbonization goals.
  - Fits within broader statewide decarbonization goals.
  - Provides supportive framework to offer incentives that work in concert with other sources of assistance to make building electrification more feasible and appealing.

# Thank You

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A photograph of a brick wall with a sign. The sign is rectangular and mounted on the wall. It features the letters 'NIMR' in large, green, 3D block letters. Below 'NIMR', the words 'Group, Inc.' are written in a smaller, grey, sans-serif font. The sign has a thin gold border. The background shows a blurred window and the texture of the red brick wall.

**NIMR**

Group, Inc.



# NTG Scoring Overview

Component	Question	Response
Project eligibility	Is NG/Propane primary heating	Yes/No
Background	When PAs / which PAs engaged	Qualitative
	When heat pump added to project	Categorical
	What motivated fuel switch	Categorical
Influential party	Who most influenced the project design and how influential they were	Categorical/ Scale
Program influence on fuel switch	Would project have opted for the heat pump as primary system without program	Yes/No
	How influential was the incentive	Scale
	How influential was the technical assistance	Scale
	Influence of other program activities on decision	Categorical Scale

# NTG Scoring Overview, cont.

Component	Question	Response
Program influence on load	If and how program changed anticipated fossil fuel / electric load	Best fit answer
	If started new project	Yes/No
Fuel switch spillover	Plan to enroll new project in program	Yes/No
	If using heat pumps	Yes/No
	If heat pumps are primary heating source	Yes/No
	Project square footage	Size of project
	Vendor influence on project? On heat pump?	Yes/No
	Program influence on project? On heat pump?	Yes/No

If project located in town with municipal fossil fuel ban, given a free ridership of 1.0.