Garland Road Electrification Pilot

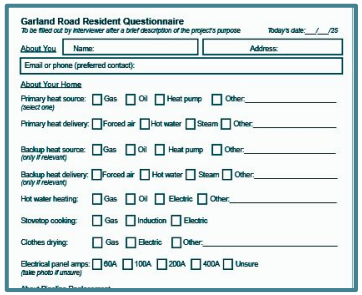
Jon Slote, 117 Garland Road, Newton, MA

Background

- The southern section of Garland Road in Newton Center has 9 single-family homes and one 3-unit multi-family building.
- In late 2024 National Grid proposed replacing 600’ of gas pipe on the street, although there were no known leaks on this section of pipe.
- Many residents felt that this was a poor use of funds, and spoke against the replacement at a public hearing.
- When the City Council approved the grant of location, residents met to see if GSEP funds could be used to instead electrify.
- Residents were surveyed to understand their sentiments about an alternative and understand the potential costs to electrify.

Sources of Information

Data was gathered from a broad set of sources


Garland Road Resident Questionnaire

To be filled out by interviewer after a brief description of the project's purpose. Today's date: __/__/25

About You | Name: | Address:

Email or phone (preferred contact):

About Your Home

Primary heat source: ☐ Gas ☐ Oil ☐ Heat pump ☐ Other: (select one)

Primary heat delivery: ☐ Forced air ☐ Hot water ☐ Steam ☐ Other:

Backup heat source: ☐ Gas ☐ Oil ☐ Heat pump ☐ Other: (only if relevant)

Backup heat delivery: ☐ Forced air ☐ Hot water ☐ Steam ☐ Other: (only if relevant)

Hot water heating: ☐ Gas ☐ Oil ☐ Electric ☐ Other:

Stovetop cooking: ☐ Gas ☐ Induction ☐ Electric

Clothes drying: ☐ Gas ☐ Electric ☐ Other:

Electrical panel amps: ☐ 60A ☐ 100A ☐ 200A ☐ 400A ☐ Unsure (take photo if unsure)

Garland resident sentiment and home electrification status was from a custom survey

nationalgrid

Pipe replacement costs were from National Grid's DPU filing 24-GSEP-03

BEST BUY

Some appliance costs were from various retailers like Best Buy

elephant

Labor costs were from various outside organizations and resident's experiences

HEATSMART NEWTON COOLSMART

Average heat pump costs were from HeatSmart Newton data

EVERSOURCE

Street transformer costs were from Eversource

ISO new england

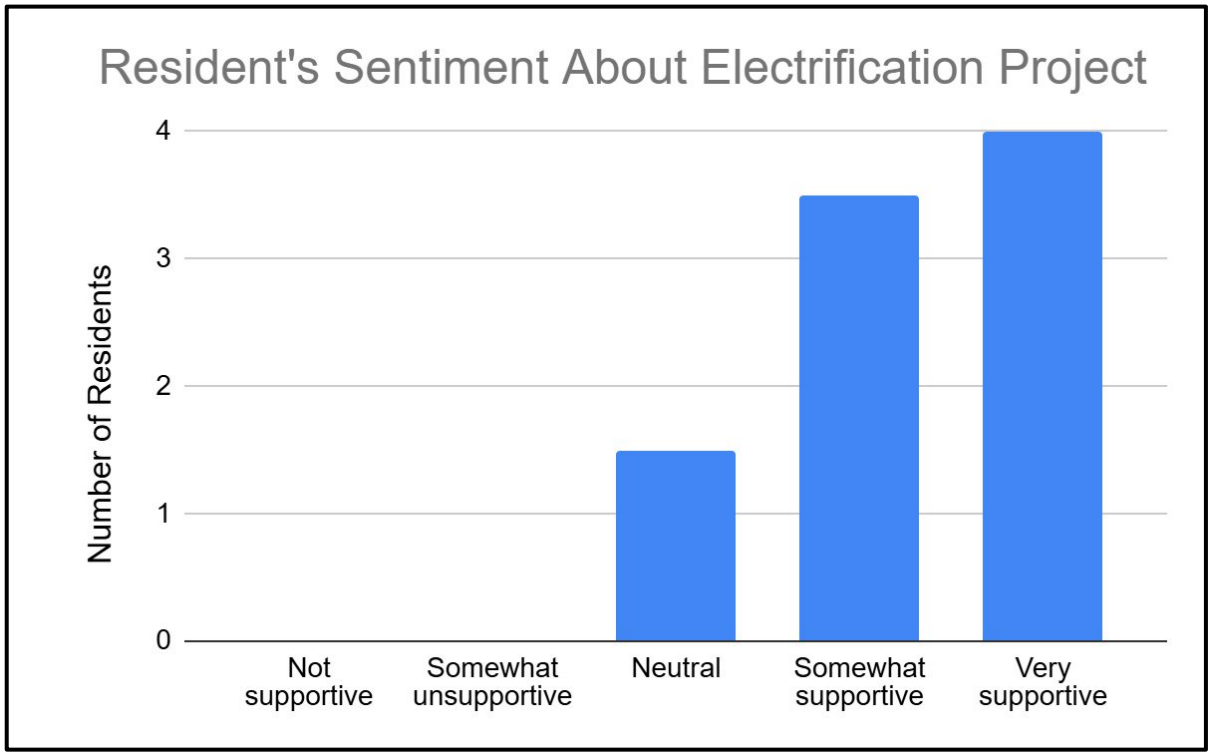
% Fossil fuel in New England's electricity was from ISO-NE

EPA

Cost of carbon calculations followed EPA 2024 guidance

Garland Road Resident Sentiment

There is widespread support among residents for electrification…



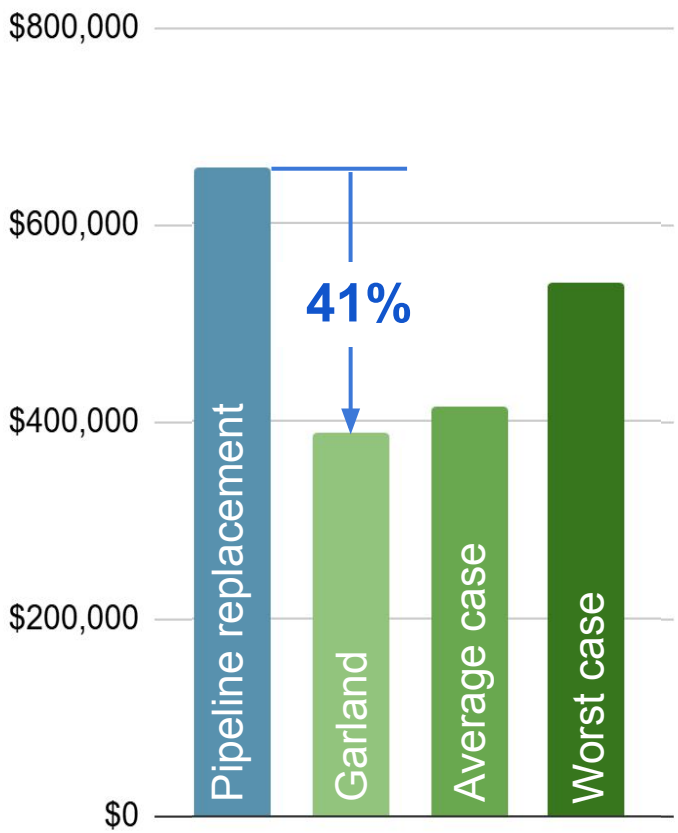
Source: Survey and interviews with south Garland Road residents, January 2025

And some concerns…

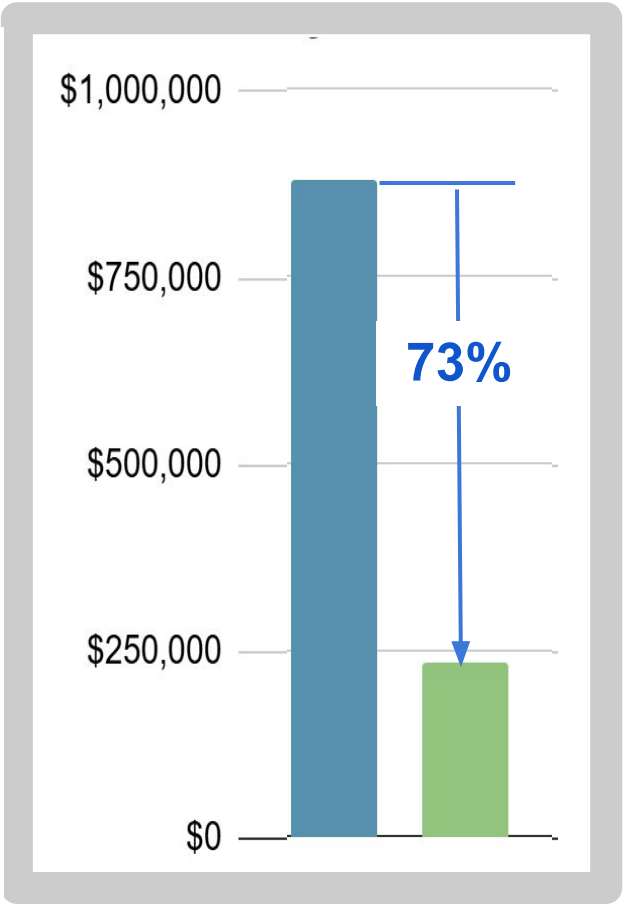
- Some prefer gas cooking
- Some don't want to carry upfront costs
- Some feel maxed out on amperage

Garland Road Electrification Pilot Economics

Capital costs 41% lower



25-yr carbon costs 73% lower



Annual operating costs flat

Capital Expenses

Direct capital expenses are 41% lower with electrification

Pipeline Replacement Costs

Source: MA DPU filing 24-GSEP-24

Pipeline length	600'
Avg installation cost/mile	$3.20M
Avg % salvage value of pipe	-80%
Salvage value (or cost) /mile	$2.56M
Total cost to replace/mile	$5.76M
Replacement cost for Garland	**$654,545**

Cost of Electrification - Garland case

Uses actual conditions specific to Garland Road

Item	# Units	Unit Cost	Total Cost
Whole house heat pump	5	$21,000	$105,000
Duct installation	3	$15,000	$45,000
Minisplit heat pump	11	$7,000	$77,000
HP water heater	10	$6,000	$60,000
Induction stove	9	$2,700	$24,300
Dedicated 40A circuit	9	$1,200	$10,800
HP clothes dryer	3	$1,500	$4,500
Electrical panel upgrade	4	$3,000	$12,000
Driveway heater	1	$13,000	$13,000
Management overhead	1	10%	$35,160
Total cost to electrify Garland			**$386,760**

41% lower

More on key sources, assumptions, and calculations are shown in the appendix that follows.

Alternate Capital Expense Scenarios

Capital expenses are **far lower** even with more extreme scenarios

Cost of Electrification - Average case

Applies average published adoption rates to a 10-home street

Item	% Need	Unit Cost	Total Cost
Whole house heat pump	80%	$21,000	$168,000
Duct installation	30%	$15,000	$45,000
Minisplit heat pump	15%	$14,000	$21,000
HP water heater	100%	$6,000	$60,000
Induction stove	95%	$2,700	$25,650
Dedicated 40A circuit	50%	$1,200	$6,000
HP clothes dryer	100%	$1,500	$15,000
Electrical panel upgrade	50%	$3,000	$15,000
Street transformer	100%	$20,000	$20,000
Management overhead	100%	10%	$37,565
Average cost to electrify a 10-house street			**$413,215**

Cost of Electrification - Worst case

Assumes all electrification costs are required on a 10-home street

Item	% Need	Unit Cost	Total Cost
Whole house heat pump	85%	$21,000	$178,500
Duct installation	85%	$15,000	$127,500
Minisplit heat pump	15%	$14,000	$21,000
HP water heater	100%	$6,000	$60,000
Induction stove	100%	$2,700	$27,000
Dedicated 40A circuit	100%	$1,200	$12,000
HP clothes dryer	100%	$1,500	$15,000
Electrical panel upgrade	100%	$3,000	$30,000
Street transformer	100%	$20,000	$20,000
Management overhead	100%	10%	$49,100
Maximum cost to electrify a 10-house street			**$540,100**

37% lower

18% lower

Pipeline Replacement Costs

Replacement cost for Garland	**$654,545**

More on key sources, assumptions, and calculations are shown in the appendix that follows.

Long Term Costs

25-year costs of carbon are over **$600,000 lower** with electrification…

Carbon Cost for Gas Use - 25 yrs

Follows 2024 EPA guidance for social cost of carbon

Tons of carbon/1000 kWh	0.433
Therms/kWh	29.3
Tons of carbon/therm	0.013
Social cost of carbon/ton	$260
Value per therm removed	$3.30
1-yr gas use on Garland, therms	10,650
25-yr gas use, therms	266,250
25-yr carbon cost	**$878,251**

Carbon Cost for Electric Use - 25 yrs

Follows 2024 EPA guidance for social cost of carbon

Avg CO2 tons/1000 kWh	0.433
Gas use on Garland, therms/yr	10,650
Gas use on Garland, kWh/yr	312,045
Weighted avg gas use efficiency	0.88
Energy use on Garland, kWh/yr	274,600
% electricity from fossil fuels	55%
CO2 emissions from elec, tons/yr	65
Social cost of carbon/ton	$260
20-yr carbon cost	**$233,706**

73% lower

…while annual operating costs remain **unchanged**

Operating Costs

Annual costs for current gas use on Garland, vs if converted to electricity, at current rates

Item	Avg Use	Unit Cost	Monthly Cost	Efficiency	Energy Requirement	Annual Cost
Annual average gas use*	1000 therms	$1.5529	$12	0.88	880 therms	**$1,697**
Converted to electric use	29,300 kWh	$0.184530	$10	3.0	8595	**$1,706**

More on key sources, assumptions, and calculations are shown in the appendix that follows.

The Bigger Picture

Garland Road:
Initial investment: **$387K**
Long-term benefit: **$878K**

Massachusetts:
2025 GSEP: **$900M**
Long-term benefit: **?**

But:
Garland road is only 0.1 miles of pipe, and there are thousands of miles of pipe to go. We need to solve for, not just identify barriers, to **electrify at scale**.

To Help Electrify At Scale:
Eliminate the obligation to serve gas
(*not* the obligation to serve electricity).

Thank You

Garland Road Electrification Pilot

Appendix

- Sources
- Assumptions
- Calculations
- Survey data

Gathering Sentiment and Electrification Status

Resident Survey

Garland Road Resident Questionnaire

To be filled out by interviewer after a brief description of the project's purpose *Today's date: ___/___/25*

About You | Name: | Address:

Email or phone (preferred contact):

About Your Home

Primary heat source: ☐ Gas ☐ Oil ☐ Heat pump ☐ Other:_____
(select one)

Primary heat delivery: ☐ Forced air ☐ Hot water ☐ Steam ☐ Other:_____

Backup heat source: ☐ Gas ☐ Oil ☐ Heat pump ☐ Other:_____
(only if relevant)

Backup heat delivery: ☐ Forced air ☐ Hot water ☐ Steam ☐ Other:_____
(only if relevant)

Hot water heating: ☐ Gas ☐ Oil ☐ Electric ☐ Other:_____

Stovetop cooking: ☐ Gas ☐ Induction ☐ Electric

Clothes drying: ☐ Gas ☐ Electric ☐ Other:_____

Electrical panel amps: ☐ 60A ☐ 100A ☐ 200A ☐ 400A ☐ Unsure
(take photo if unsure)

About Pipeline Replacement

As you may know, National Grid recently proposed replacing the gas pipe under Garland Rd for about $300K. Recent Massachusetts law now permits them to instead use that money to electrify homes, including their appliances, and therefore not have to maintain the gas line, which could then be retired.

What barriers to getting this done most concern you?

If these barriers could be addressed, how supportive would you be for electrifying?

Very Against This	Somewhat Against This	Neutral	Somewhat Supportive	Very Supportive
☐	☐	☐	☐	☐

The Massachusetts Department of Public Utilities will ultimately decide what utility infrastructure investments go forward… any message you'd like them to hear?

Volunteer Instructions

To photograph someone's electrical panel…

Get a shot of the largest circuit breaker switch at the top of the panel

If you zoom the photo on your screen before shooting, you should be able to see the amperage rating stamped on the end of the switch (in this case, 200 amps)

Garland Road Electrification Pilot Appendix

Key Sources and Assumptions

Pipeline Replacement Costs	
Pipeline length	600'
Avg installation cost/mile	$3.20M
Avg % salvage value of pipe	-80%
Salvage value (or cost) /mile	$2.56M
Total cost to replace/mile	$5.76M
Replacement cost	**$654,545**

Sources for each row in the “Replacement Costs” table are as follows:

- From MA DPU filing 24-GSEP-03
- From MA DPU filing 24-GSEP-03, Attorney General's testimony
- From MA DPU filing 24-GSEP-03, Exhibit SC-4-1, subsection (d)
- (Avg installation cost) X (Avg % salvage value)
- (Avg installation cost) + (Salvage value)
- (Total cost) / 5280 ft/mile X 600 ft of pipe on Garland Rd

Overhead Costs - 20 yrs	
LDAF overhead, $/therm	$0.668
Therms eliminated/year	10,650
Overhead eliminated/year	$7,114
20-yr value of overhead	**$139,490**

Source for LDAF information from:https://www.mass.gov/info-details/cost-of-gas-adjustment-factor-rates-and-information#:~:text=The%20cost%20of%20gas%20adjustment,to%20recover%20costs%20related%20to:
20-yr value assumes that OH costs track inflation

Garland Road Electrification Pilot Appendix

Key Sources and Assumptions

Carbon Cost - 20 years	
Tons of carbon/1000 kWh	0.433
Therms/kWh	29.3
Tons of carbon/therm	0.013
Social cost of carbon/ton	$250
Value per therm removed	$3.17
1-yr therm use on Garland	10,650
20-yr therm use	213,000
20-yr value	**$675,577**

Source for carbon costs:
https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf
2% discount rate used
2035 emission year used as average for 20 yr period

Energy Usage		
Building Type	MMbtu Gas Use	Use in Therms
Northeast SF owned	82.3	823
Northeasy MF 2-4 units	54.9	549
Slote SF owned, 2020	108.1	1081
Average SF home		1000
MF bldg (3 units)		1,650
Total for Garland (9 SF, 1 MF)		10,650

Source for average home gas usage:
http://eia.org/
Total is based on Garland's mix of 9 SF homes and 1 @ 3-unit MF building
Consumption may be greater than regional averages since homes on Garland are larger than average

Garland Road Electrification Pilot Appendix

Key Sources and Assumptions

Cost of Electrification

Item	Cost
5 Heat pumps @ $18,000	$90,000
3 Duct installations @ $5,000	$15,000
11 Minisplits @ $6,000	$66,000
10 HP water heaters @ $6,000	$60,000
9 Induction stoves @ $2,700	$24,300
9 new 40A circuits @ $1,200	$10,800
3 HP clothes dryers @ $1,500	$4,500
4 panel upgrades @ $3,000	$12,000
1 driveway heater @ $13,000	$13,000
Total cost to electrify Garland	**$295,600**

- Electrification costs are based on a detailed survey of each home, identifying what would be required to fully electrify each one based on the current equipment in the home.
- Where necessary, added 40A circuits were assumed for induction stoves.
- Where the existing main electrical panels were below 200A, an upgrade was assumed to be necessary.
- The complete house equipment survey can be found on the following page.

Carbon Cost for Elec - 20 yrs

Avg CO2 tons/1000 kWh	0.433
Gas use on Garland, therms/yr	10,650
Gas use on Garland, kWh/yr	312,045
% electricity from fossil fuels	55%
CO2 emissions from elec, tons/yr	74
Social cost of carbon/ton	$250
20-yr value	**$204,333**

- Carbon statistics from the current EPA report: https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf
- Fossil fuel electricity mix is from ISO-NE: https://www.iso-ne.com/about/key-stats/resource-mix

Garland Road Electrification Pilot Appendix

Electrification unit costs were based on the most locally available samples or averaged from multiple sources

Electrification Unit Costs

Source	Whole house heat pump	Heat pump ductwork only	Minisplit per zone	Heat pump water heater	Induction stove	Separate 40A circuit for stove	Heat pump clothes dryer	Service upgrade from 100 to 200A	Solar system	Driveway Heater
Estimated frequency of need	80%	30%	15%	100%	95%	50%	100%	50%		
(All costs before incentives)										
Energy Sage	16,000								33,000	
Mass Save	22,000								30,000	
HeatSmart Newton (33 HP's)	19,188							2,567		
Homeguide.com	8,000		6,000							
This Old House	16,000	5,300	3,300					2,200		12,900
Elephant energy				6,000	2,300	1,000				
Rewiring America	19,500			5,000				3,000		
Mass CEC	18,300									
TECH Clean CA	19,000			5,400		1,200	1,300			
Efficiency Maine			4,600							
Efficiency Maine - S Portland			5,200							
NYSERDA	16,300									
MA Air Source HP			6,600							
Reddit (single case)						1,200				
Slote (single cases)	16,100		8,000		3,100	1,200			31,000	
Green Building Advisor							1,400			
Best Buy website					2,300		1,500			
FIXr								3,000		
Khang (single case)							1,400			
Today's Homeowner		4,750								
Phil Hanser, NCCE										
AVERAGES	$18,932	$5,025	$5,617	$5,467	$2,567	$1,150	$1,400	$2,692	$31,333	$12,900
Selected averages	$19,188		$5,905							
W/ MA 6.25% tax	20,387		6,274	5,808	2,727		1,488			
W/ 3% tax (service-heavy items)		5,176				1,185		2,773	32,273	13,287
Revised AVGS rounded	21,000	5,000	7,000	6,000	2,700	1,200	1,500	3,000	32,000	13,000

Note: Shaded area denotes change made from earlier estimates to HP costs - done 5/12/25

Garland Road Electrification Pilot Appendix

Electrification requirements were based on a house-by-house assessment

Primary heat source	Gas	Gas	air-source heat pump		Gas	hybrid (see 'heating notes')	Electric	heat pump	gas		Unit subtotals	Unit costs	Total costs
Primary heat delivery	forced air	Forced air	Forced air		Hot water	Forced air	Hot water	mini splits	forced air				
# of heating systems	3	1	2		1	2	1	1	1				
Whole house HP?	0	1	0	1	0	0	1	0	1	1	5	$18,000	$90,000
Ducts needed?	0	0	0	1	0	0	1	0	0	1	3	$5,000	$15,000
Minisplit?	6	0	0	0	2	2	0	1	0	0	11	$6,000	$66,000
Backup heat source	n/a	n/a	gas		heat pumps		n/a	gas	n/a				
Backup heat delivery	n/a	n/a	forced air		minisplits	Forced air	n/a	?	n/a				
Hot water	gas	Tankless, but not known if gas or electric	Electric		Gas	Gas	electric	gas	gas				
HP DHW needed?	1	1	1	1	1	1	1	1	1	1	10	$6,000	$60,000
Stovetop	gas	Gas	Induction		Gas	Gas	Gas	gas	gas				
Induction stove?	1	1	0	1	1	1	1	1	1	1	9	$2,700	$24,300
New circuit?	1	1	0	1	1	1	1	1	1	1	9	$1,200	$10,800
Clothes drying	electric	Electric	electric		Gas	Electric	electric	electric	electric				
HP dryer needed?	0	0	0	1	1	0	0	0	0	1	3	$1,500	$4,500
Elec panel amps	100 in all (not sure)	200	200		200	200	100	200	200				
Panel upgrade?	1	0	0	1	0	0	1	0	0	1	4	$3,000	$12,000
Specialty gas use						1					1	$13,000	$13,000
Grand Total													**$295,600**