

INTEGRATED ENERGY MODELING TOOL FOR ELECTRIC AND GAS INFRASTRUCTURE DECISION SUPPORT

nationalgrid

BUSINESS PROBLEM

As National Grid lays out their roadmap to achieve net zero emissions goals by 2050 a major issue is the complete reduction in usage of natural gas. There are many opportunities available to reduce natural gas usage, however the four most prevalent for National Grid in this area are: Geothermal Heating, Renewable Natural Gas, Heating Electrification, and Hydrogen Blending. The problem for National Grid is knowing where each technology should be used to minimize costs to the end user and still meet all heating demands.

DATA SOURCES

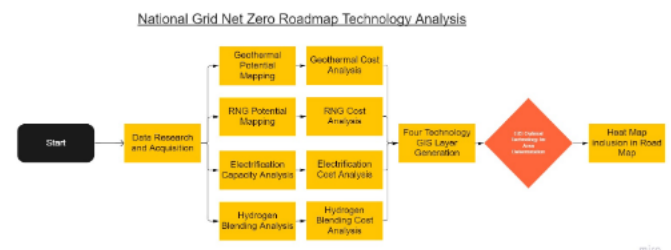
Existing data was limited to gas network mapping for New England and New York. Additionally, mapping of Leak Prone Piping (LPP) was included as well as pressures required for each area to achieve peak heating needs.

Data Types and Format

Data is in numerical format via Excel sheets as well as GIS shape files for network layout and ratings.

APPROACH

The initial approach is to determine current capacity to support electrification or hydrogen blending. Following will come a cost analysis for each technology in each area. Then, we'll analyze thermal capacity vs. cost for each of these options. All data will be compared in a case study format for two cities.



IMPACT

A step-by-step integrated (electric and gas) approach to determine the cost to customer for both electrification or hydrogen blending. Allowing the company to take this factor into consideration when determining how they will lay down their decarbonization strategy.

DRIVERS	There is a large push for decarbonization of the heating industry by 2050, and one of the many factors that go into rate cases is how a shift in company operations/expenditures will affect the customer. So the solution lies within how can we minimize impact to the customer while still proceeding to meet our net zero goals.
BARRIERS	Lack of readily available research on hydrogen blending in excess of 20%, difficulty in quantifying risk given that research in the area needs improvement. Difficulty generalizing costs given major differences in technology and areas where they may be utilized.
ENABLERS	The team which the company placed me on was an integrated team, both National Grid electric and National Grid gas. This infrequent occurrence allowed for quick resolution of questions from both sides of the company, allowing for better comparison of data/strategy. Especially with regards to electrification.
ACTIONS 	The solution has not been implemented but is under review by the company.
INNOVATION	Having full access to company gas and electric data allowed for an actual comparison of true gas send out with true electric loading. Allowing for, given the heat loading assumptions utilized, true estimates of cost for electrification.
IMPROVEMENT	It provided the answer to which decarbonization of heating strategy results in lower cost to the customer for two cities in the region of study.
BEST PRACTICES	Ensure integration of both sides of the utility (if it serves both arms) to enable true data access and minimize assumptions. Additionally, invest more time in the regulatory processes behind rate case determination.
OTHER APPLICATIONS	Similar methodology could be applied to compare other decarbonization of heating technologies such as renewable natural gas (RNG) or networked geothermal.