NARUC
National Association of Regulatory Utility Commissioners

NARUC TASK FORCE ON NATURAL GAS RESOURCE PLANNING

EXPERT LEARNING SERIES:
Evaluating Non-Pipeline Alternatives (NPAs)

September 25, 2024

Today's Agenda

Expert Learning Series:

Part 1: Expert speaker presentations *(recorded for website library)*

Moderator: Task Force Chair Johnson, Georgia Public Service Commission

- **Natalie Mims Frick**, Deputy of the Energy Markets and Policy Department, Lawrence Berkeley National Lab
- **Courtney Eichhorst**, Director, Regulatory Strategy, National Grid
- **Josh Figueroa**, Senior Associate, The Brattle Group

Part 2: Q&A with expert speakers *(not recorded)*

Part 3: Lessons learned from Task Force members *(not recorded)*

Additional Topics & Announcements

EXPERT SPEAKER PRESENTATIONS

Expert Learning Series: Non-Pipeline Alternatives

National Association of Regulatory Utility Commissioners Task Force on Natural Gas Resource Planning

Natalie Mims Frick, Berkeley Lab

Contributions by Ron Nelson, Volt Watt Consulting

September 25, 2024

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Context

- Gas system regulations are evolving in response to rapidly changing energy system needs
- Gas assets have long lifespans
- Non-pipeline alternatives (NPA) are an investment or activity that defers, reduces, or avoids the need to construct or replace a pipeline.
- They are an emerging cost and risk mitigation tool that can provide gas utilities with an opportunity to reduce
  - Emissions
  - Gas system costs
  - Customer risk
- Reports are available here: https://emp.lbl.gov/publications/framework-non-pipeline-alternatives

Review Of Select NPA Policies

- Focus was on New York, Rhode Island, Colorado, and California
  - Definitions
  - Policy purpose and filing requirements
  - Integration with other proceedings
  - Project suitability
  - Cost thresholds
  - Resource eligibility
  - Benefit-cost analysis
  - Equity
  - Solution selection processes

Definitions and policy purpose

Definitions

- Capital expenditures (i.e., investments)
- Programs such as energy efficiency or demand response (i.e., activities)
- Remove the need for a traditional gas delivery system investment, defer the investment, or reduce the size of the investment

Policy Purpose

- Reduce costs to customers
- Reduce greenhouse gas emissions attributable to the gas utility

Resource Eligibility

State	Demand Side	Supply Side
Colorado	Energy efficiency, demand response, and beneficial electrification	Recovered methane, green hydrogen, beneficial electrification, pyrolysis of tires, and other cost-effective technology that reduces emissions
New York	Energy efficiency, demand response, and electrification	Renewable natural gas, green hydrogen, and CNG injection (if aligned with state emission reduction goals)
Rhode Island	Cost-effective energy efficiency and conservation	Not defined but permitted
California	Not defined	Not defined but not prohibited

TABLE 6: Summary of Eligible NPA Demand and Supply Resources; by State

Benefit-Cost Analysis

	Benefits	Colorado	New York	Rhode Island	California
Bulk System	Avoided Generation Capacity		✓	✓	
	Avoided Transmission Capacity		✓	✓	
	Avoided Energy	✓	✓	✓	✓
	Ancillary Service Costs		✓	✓	
	Avoided Transmission Costs	✓			
	Avoided Transmission Losses		✓		
Distribution System	Avoided Distribution Capacity		✓	✓	
	Ancillary Service Costs			✓	
	Avoided Distribution Costs	✓			
	Avoided Distribution Losses		✓		
	Avoided O&M		✓	✓	
Reliability/Resiliency	Distribution System Reliability Loss/Gain			✓	
	Distribution System Resiliency Loss/Gain			✓	
	Net avoided restoration costs		✓		
	Net avoided outage costs		✓		
Customer Level	Avoided O&M costs for participants	✓			
	Program participant benefits			✓	
	Program non-participant benefits			✓	
External Benefits	Avoided Greenhouse gas emissions costs	✓	✓	✓	✓
	Avoided Air pollutant emissions costs	✓	✓	✓	✓
	Avoided Water impacts		✓	✓	✓
	Avoided Land impacts		✓		
	Non-energy benefits		✓		
	Benefits to Disadvantaged Communities		✓	✓	

Framework: Three Distinct Steps to a Robust NPA Process

Step 1: Preliminary Screening for Eligible NPA Projects: Capital Project Type

- **Capital Project Type**
  - NPAs can avoid capacity expansion, asset replacement, new business, and public improvement projects
  - Not suitable for emergency projects

Source: Pipecare Group

Step 1. Preliminary Screening for Eligible NPA Projects: Cost and Time

- **Cost Threshold**
  - For an NPA analysis to be cost-effective, capital projects should meet a minimum cost threshold
- **Timing Threshold**
  - Utilities need sufficient time to assess NPAs and implement a solution
  - Size of the project should be related to timing

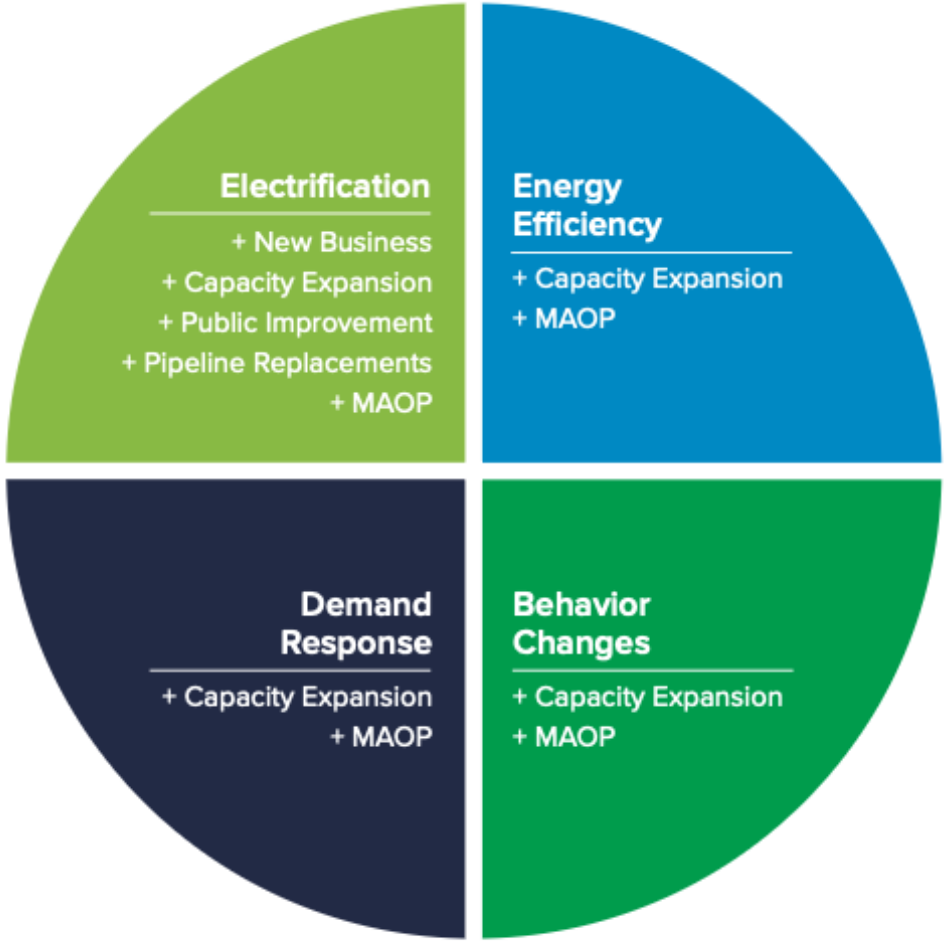
	Small Project		Large Project	
	Cost	Date of Implementation	Cost	Date of Implementation
Large Gas Utility	$1 million to $2 million	24 months or longer	$2 million or greater	36 months or longer
Small Gas Utility	$500k to $1million	12 months or longer	$1 million or greater	24 months or longer

Sample Utility NPA Threshold Requirements

Step 2. NPA Portfolio Development: Eligible Resources

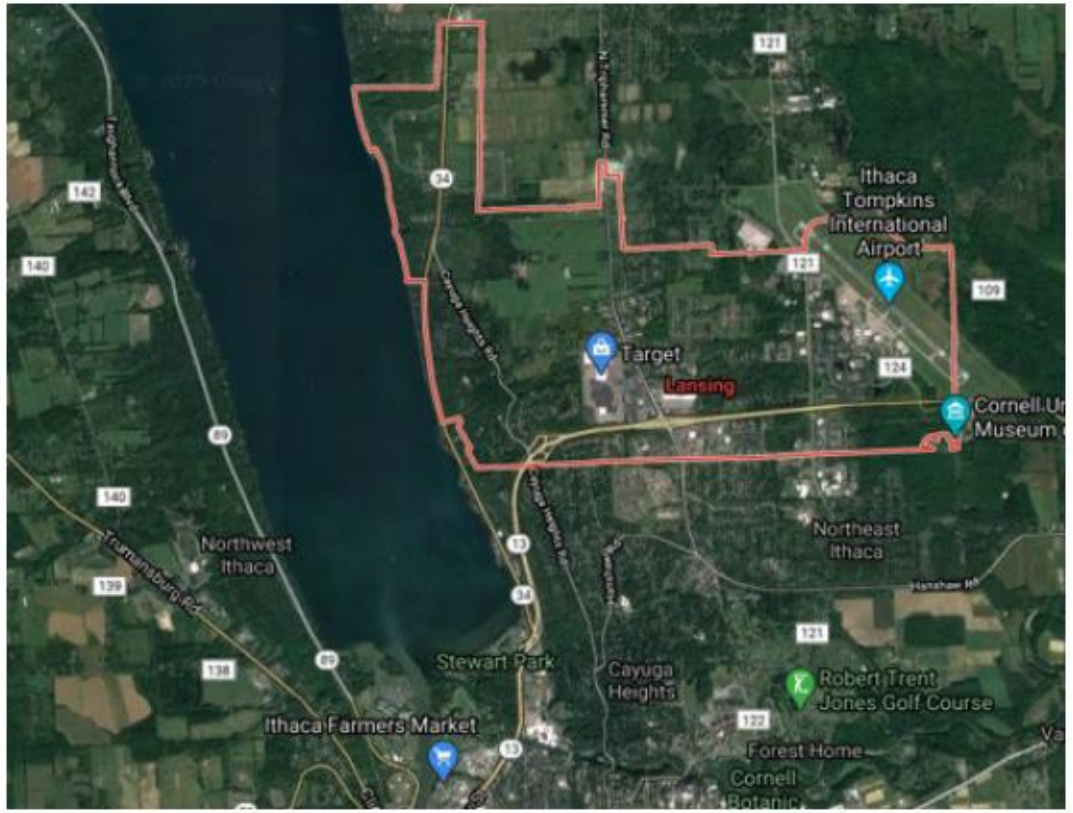
- **Eligible Resources**
  - Demand-side: energy efficiency, electrification, demand response
  - Supply-side: Hydrogen, compressed natural gas trucking, liquified natural gas

- Some demand-side resources are better suited to meet system needs than others
  - Energy efficiency is best suited for capacity expansion and Minimum Allowable Operating Pressure (MAOP) projects
    - Effiency can reduce demand on the specific portions of the system and reduce strain on components



Step 2. NPA Portfolio Development: Project Solicitation

- **Competitive solicitation (**e.g., request for proposals) can be used to seek market-based solutions that will meet system needs
- **Internal utility estimates** can be used to more quickly identify resources, but may not be the least expensive



NYSEG - Lansing, New York NPA

- Issued request for information seeking market based solutions to provide load reilef
- Issued request for proposals from qualified developers to deliver solutions to defer or avoid construction of pipeline
- Created a NPA portfolio of seven of responses, including residential heat pumps, community ground source heat pumps and industrial heat recovery.

Step 2. NPA Portfolio Development: Portfolio Requirements

- Assembly of resources into portfolios
- Verification that portfolios meet project requirements and system needs

Photo by alpha innotec on Unsplash

Photo by Dan LeFebvre on Unsplash

Photo by maitree rimthong

Step 3. NPA Portfolio Evaluation: Benefit-Cost Analysis

- Outcome of benefit-cost analysis is highly depending on benefits and costs included in the analysis
- If an NPA fails the benefit-cost analysis, it may still be less expensive than the traditional solution
- Near term emissions reduction benefits can be significant, especially as the grid decarbonizes

	Gas peak demand change per million cubic feet per hour	Electric peak demand impact per kW (winter)	Electric peak demand impact per kW (summer)
Insulation	-0.01	-0.5	-0.25
Air Sealing	-0.005	-0.1	-0.05
Electrification of Heat (Air Source Heat Pump)	-0.05	10.0	-0.01
Hot Water Heat Pump	-0.005	1.0	0.5

TABLE 5: Sample Assessment of Demand-Side NPA Resources

	2023	2024	2025	2026	2027
New Units Installed	10	20	20	0	0
Total Units	10	30	50	50	50
Total kWh	40,000	120,000	200,000	200,000	200,000
CO2/kWh	1.01	0.95	0.91	0.85	0.78
Total CO2 Emissions	40,400	114,000	182,000	170,000	156,000

TABLE 6: Illustrative Emissions Calculation from Electrification Measure

Step 3. NPA Portfolio Evaluation: Third Party Criteria

- Qualitative factors can also be considered when evaluating NPA portfolios
- Contracting services expose utilities to risk – if the contractor does not deliver the NPA solution, the reliability of the gas system may be threatened

Common Criteria	
Proposal content	Safety
Bidder experience	Customer and socio-economic impacts
Environmental impacts	Scheduling
Project viability	Offer price
Functionality	Customer acceptance
Technical reliability	Cost-effectiveness

TABLE 7: New York Utility Common Criteria for Evaluating NPAs

Step 3. NPA Portfolio Evaluation: Equity

- Quantitative and qualitative strategies for evaluating equity
  - Distributional equity analysis
  - Preference adder

Distributional	• Promoting the equitable distribution of benefits and burdens across all segments of a community and across generations
Procedural	• Promoting inclusive, accessible, and authentic engagement and representation when developing or implementing programs and policies
Recognitional	• Recognizing the historical cultural and institutional dynamics and structures that have led to energy inequities
Restorative	• Providing reparations for past inequities, rectifying practices that perpetuate inequities, promoting accountability for key decision-makers

- Berkeley Lab, Synapse Energy and e4TheFuture developed a distributional equity analysis framework that allows utilities, regulators, communities, and stakeholders to answer questions about the equity implications of utility investments and to consider those implications alongside benefit-cost analysis

- When evaluating the results from the distributional equity analysis, analysts can use the results to inform or refine program design

Example Policy Options to Support NPA

- Consider current natural gas planning requirements and assess opportunities for increased transparency
- Integrated NPA analysis with natural gas and other relevant planning processes
- Include equity considerations with reviewing NPA
- Require all benefits and costs be included in NPA analysis
- Review existing utility financial incentives

Questions States Can Ask

- What information is provided on gas distribution system planning in current proceedings (e.g., electrification, future of gas)? Is the information provided uniformly across gas utilities?
- What demand-side resources are considered in gas planning? How are they modeled?
- What types of gas system investments should include NPA analysis (e.g., capacity expansion)? What are the cost and timing thresholds for utilities?
- Do the benefits and costs considered in gas planning align with other gas proceedings (e.g., demand-side management planning)? Would a benefit-cost analysis guidance document simplify review or improve consistency of utility analysis?
- How are utilities gathering input from vulnerable populations, disadvantaged communities, or communities most impacted by gas planning decisions?
- Are gas utilities financial incentives aligned with state policy goals?

Select Resources

- Non-Pipeline Alternatives: A Regulatory Framework and Case Studies
- Non-Pipeline Alternatives: A Regulatory Framework and Case Study of Colorado
- Non-Pipeline Alternatives to Natural Gas Utility Infrastructure: An Examination of Existing Regulatory Approaches
- National Association of Regulatory Utility Commissioners – Task Force on Natural Gas Resource Planning

Questions?

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Evaluating Non-Pipeline Alternatives

Sep 25, 2024

NARUC Task Force on Natural Gas Resource Planning

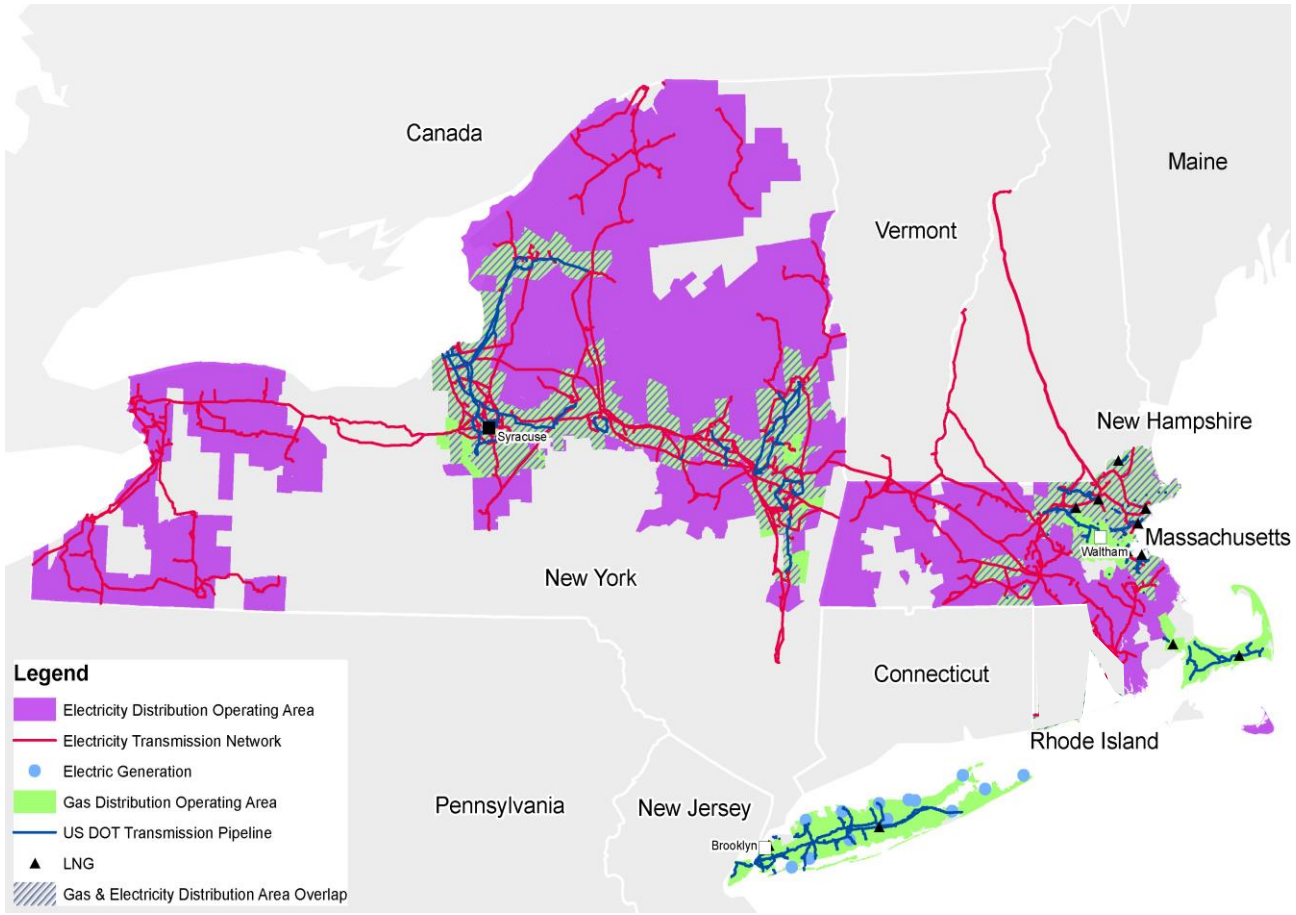
nationalgrid

National Grid Overview

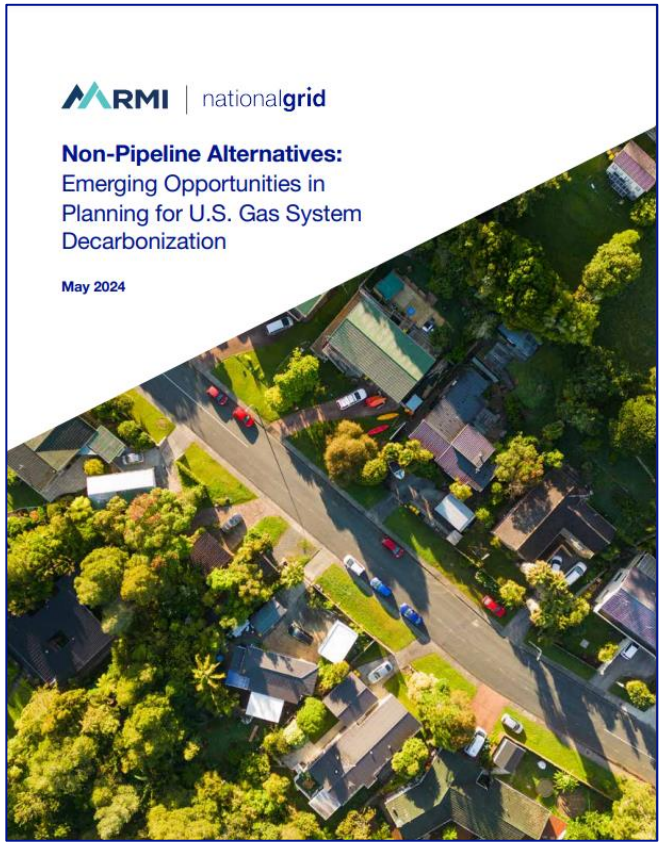
National Grid US serves more than 20 million people throughout New York and Massachusetts.

MA	NY
1.3m electric customers	1.7 electric customers
1m gas customers	2.5m gas customers

US Operating Service Territories



Non-Pipeline Alternatives: Emerging Opportunities in Planning for U.S. Gas System Decarbonization

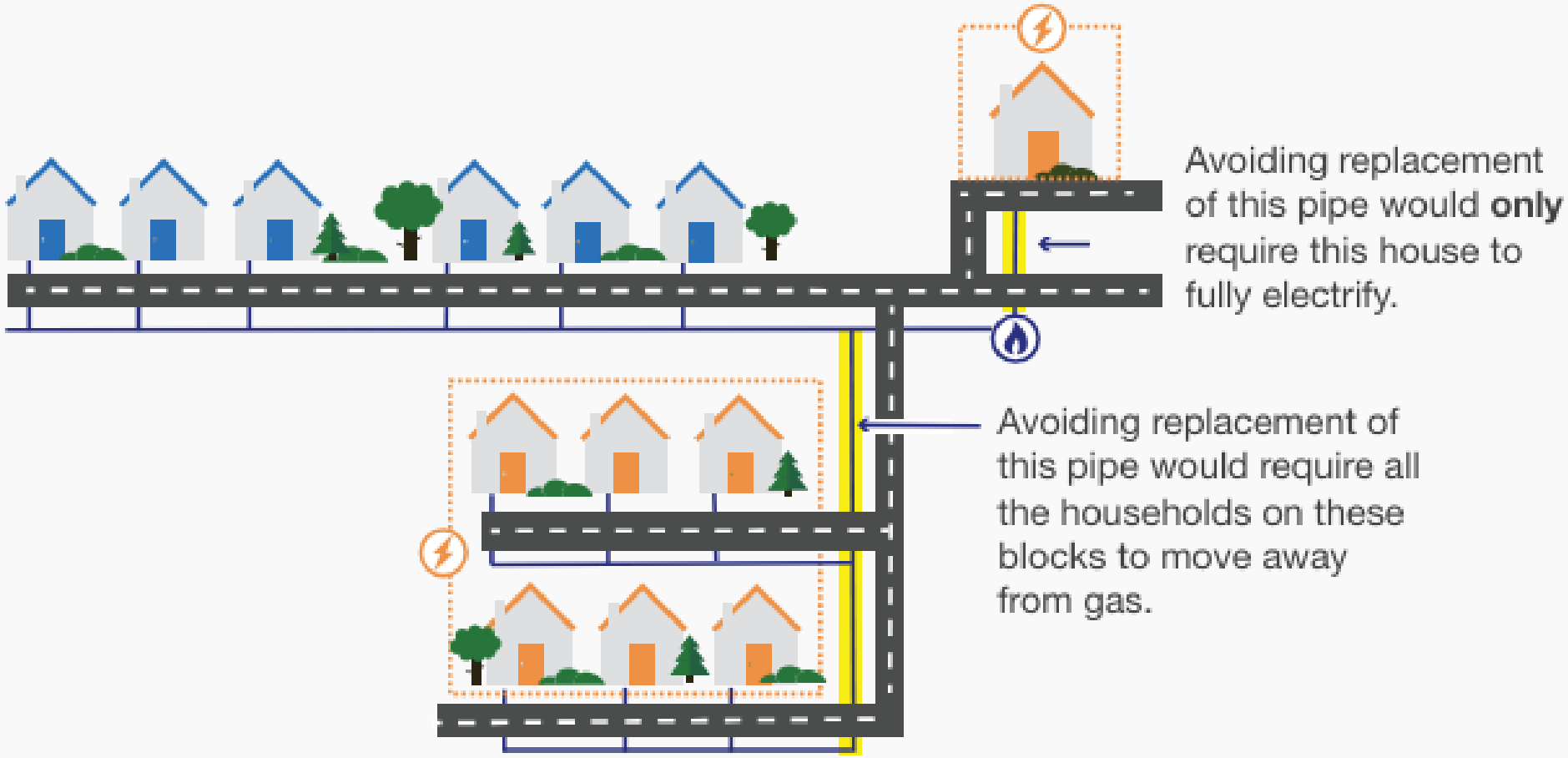


National Grid and RMI analyzed nine NPA case studies from the U.S. and Europe to better understand how NPAs have been most effectively implemented and the opportunities and challenges to scaling up these projects as part of the clean energy transition

Our May 2024 whitepaper aims to describe the current state of NPA solutions and gas transition planning in North America and Europe, and identify projects that have moved toward implementation, including decommissioning of gas infrastructure. We further explore the potential for the expanded use of NPAs and integrated energy planning in the U.S., including the potential role of municipalities in helping coordinate planning at the neighborhood or city scale.

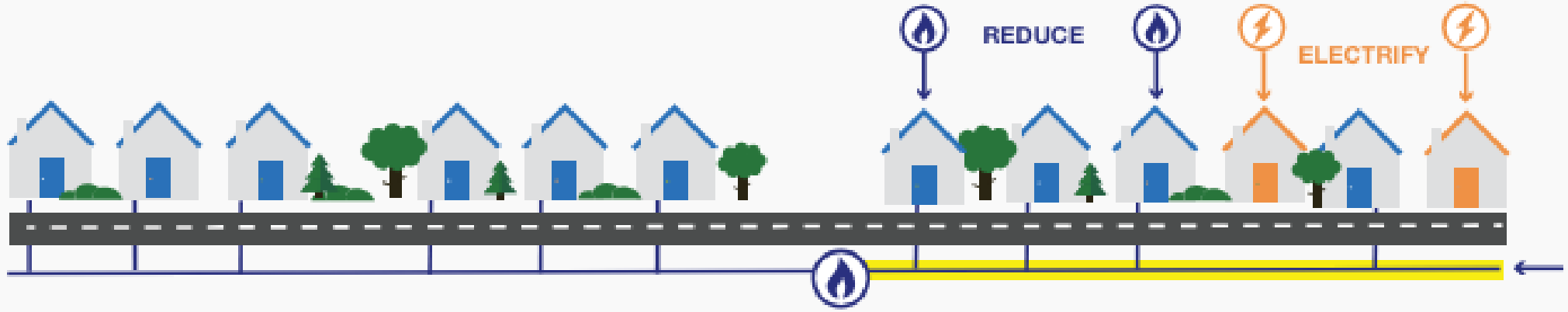
Type 1: Avoided Replacement

Avoided replacement



Type 2: Avoided Capacity Expansion

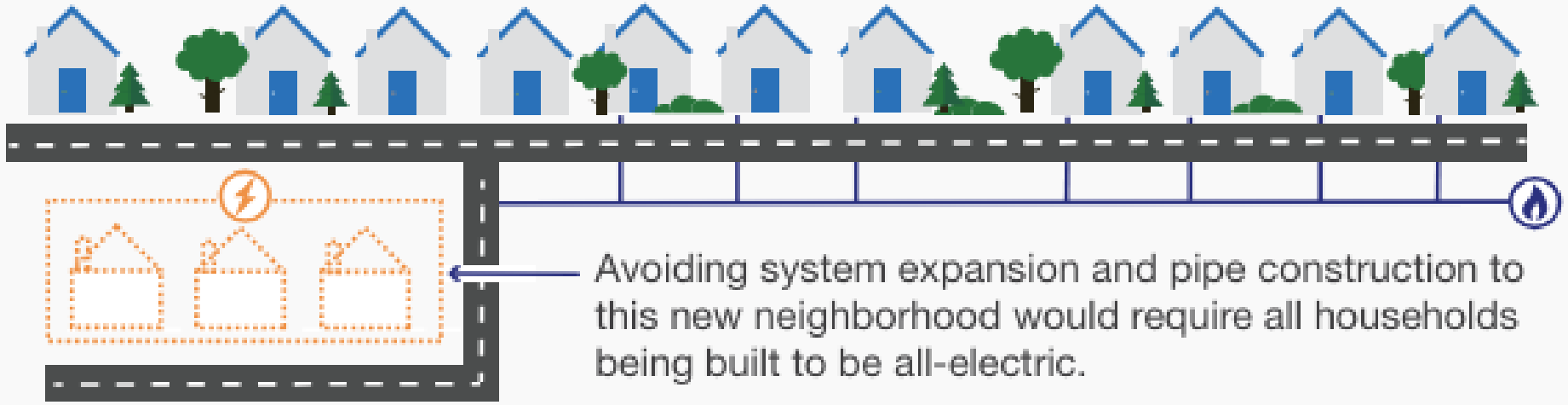
Avoided capacity expansion



To avoid a capacity upgrade for this pipe, buildings beyond this pipe segment would need to reduce their overall gas demand – this could be through incremental reductions across the group, or full electrification of some customers. This reduction would not require 100% participation of all households.

Type 3: Avoided System Extension

Avoided system extension



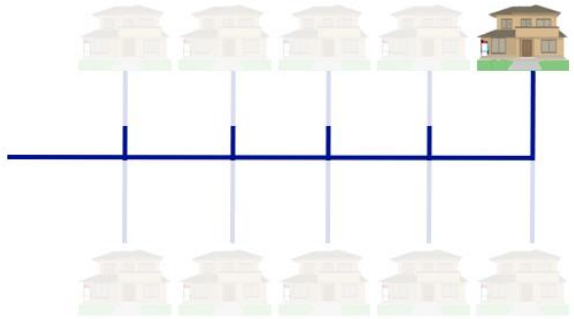
NPAs today are reliant on voluntary customer adoption

Segment A

If 100% of customers on Segment A agree to participate, then all customers on Segment A receive incentives for the full cost of electrification, and the pipe segment is retired.

✓

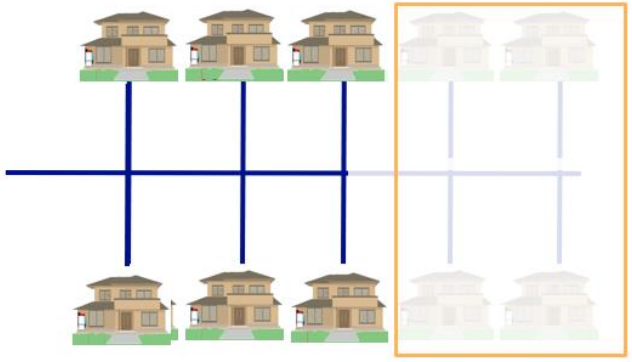
Segment B



If a resident farthest from the gas feeder does not want to electrify,
the pipe segment stays in service.
No avoided infrastructure, so customers on Segment B are not eligible for additional incentives.

✗

Segment C

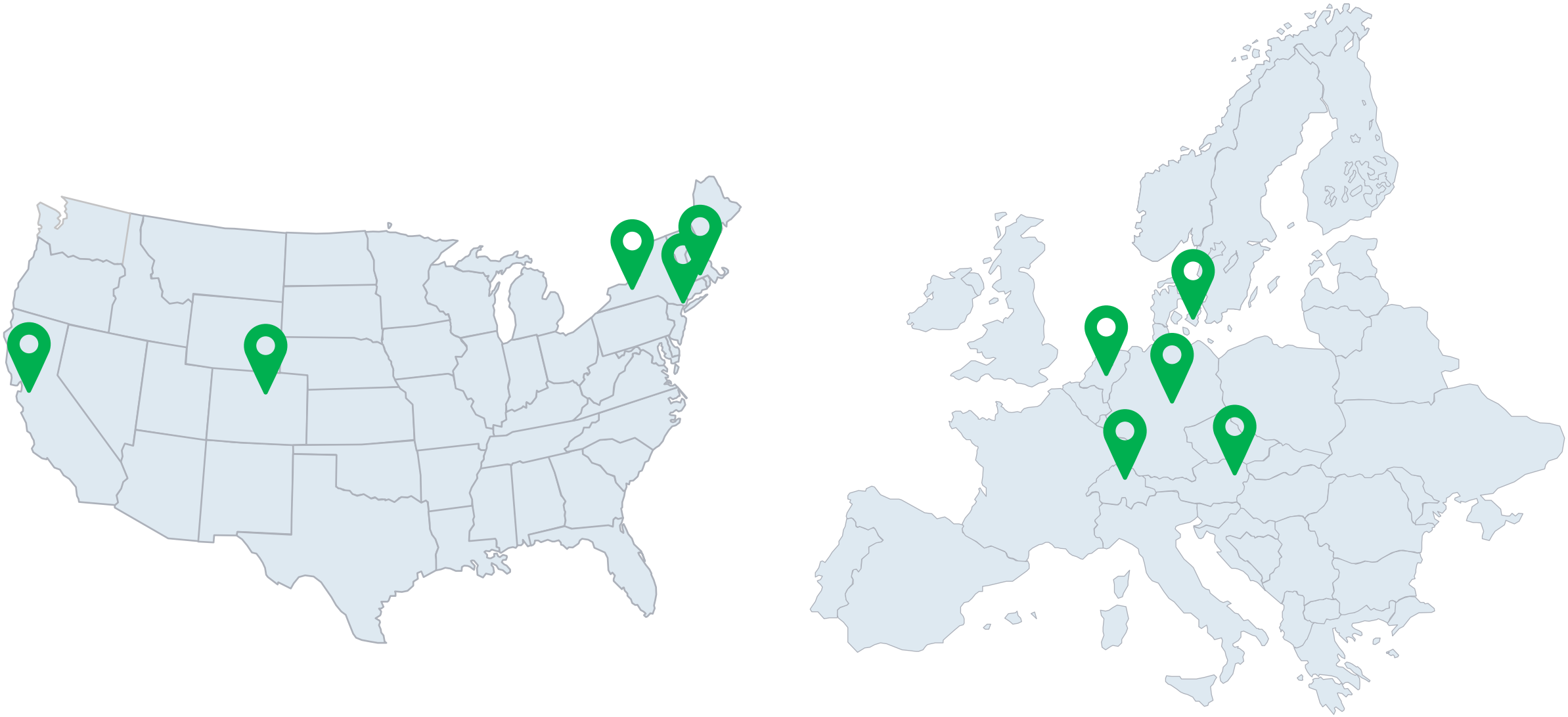


If a contiguous group of residents at the end of a gas segment opt to electrify, then the pipe segment can be retired up to those residents. Participating customers in Segment C receive incentives to fully electrify.

✓

Partial

We saw examples of NPAs and clean heat planning at 5 U.S. utilities and in 5 European countries



Some Insights from NPA Landscape Research Case Studies

- NPA projects underway today reflect diverse energy policy goals and energy system characteristics across different jurisdictions.
- Prioritization of NPA projects should weigh a broad set of criteria, including gas asset risk and hydraulic feasibility, electric capacity, benefit-cost criteria, customer propensity for new technology adoption, and community factors.
- Utility and municipality partnership may be a key element of NPA projects and localized integrated energy planning.
- Decarbonization objective of NPAs and LDC revenue implications of electrification justify broader socialization of NPA costs between gas and electric customers. Alternative funding sources (e.g. local, state or federal taxpayer) should also be considered.
- Individual customer persuasion to reach 100% participation is not a scalable NPA approach for avoided replacement projects.
- Policy change will be needed to evolve the utility business model and obligation to serve to help overcome customer barriers, while retaining the opportunity for cost recovery in a transition away from the use of gas.

Targeted Electrification - Path Forward

Planned next steps include executing targeted electrification pilots in our jurisdictions, collaborating with our peer utilities and stakeholders while continuing to develop our tools and capabilities

Targeted Electrification Pilots	Incorporate learnings from NPA experience to-date and test improved and novel customer and community education and outreach strategies
Stakeholder Engagement	Speaking with towns about integrated energy planning to identify locations to partner on pilots and educate our stakeholders; Engage community leadership and key stakeholders/organizations to garner electrification support.
Cross-Utility Collaboration	Engaging our peer utilities to determine a path forward for collaboration and promoting targeted electrification in our overlapping territories. We plan to use our learnings to inform and influence statewide regulatory framework and policies to match our desired outcomes.
New Tools and Capabilities	Investing in new tools, software, capabilities to support IEP analyses and new processes at scale (i.e., expanding our analyses, developing new use cases).

MA DPU Guidance on Non-Pipeline Alternatives and IEP

Future of Gas (20-80) Order:

- The Department finds that consideration of non-gas pipeline alternatives ("NPAs"), defined broadly to include electrification, thermal networked systems, targeted energy efficiency and demand response, and behavior change and market transformation, is necessary to minimize investments in the gas pipeline system that may be stranded costs in the future as decarbonization measures are implemented. Going forward, the Department states that as part of future cost recovery proposals, LDCs will bear the burden of demonstrating that NPAs were adequately considered and found to be non-viable or cost prohibitive to receive full cost recovery.
- To better understand [targeted electrification] opportunities and constraints, the Department directs each LDC to work with the relevant electric distribution company to study the feasibility of piloting a targeted electrification project in its service territory and submit a proposal by March 1, 2026.

Electric Sector Modernization Plan (ESMP) Order:

- In the 20-80 order, the Department determined that "coordinated and comprehensive planning between electric and gas utilities is needed to facilitate the energy transition" and directed the LDCs and the Companies to consult with stakeholders regarding such a joint planning process.
- Massachusetts LDCs have proposed to: (1) convene a joint utility planning working group ("Joint Working Group"); (2) develop a comprehensive data exchange; and (3) conduct electrification feasibility assessments. The Department directs each company to include status reports on the progress on the IEP processes in its biannual ESMP reports, including, but not limited to, updates on the Joint Working Group, data exchange, feasibility assessments, and targeted electrification projects. (ESMP Order, 8/29/24)

NPAs in the Downstate NY Rate Case

The KEDNY/KEDLI Joint Proposal contains specific, actionable commitments to promote NPAs; NMPC's filing builds upon those commitments.

Standard Planning

NPA evaluations incorporated as part of **standard capital planning process** before proceeding with new or replacement infrastructure

NPA analysis for all main extension > 100 feet

Expanded Projects

Expands the types of projects where NPAs will be considered (*e.g.,* LPP replacement, service line installation, replacements and relocations, system reinforcements, and main extensions)

LPP

Prioritize the **lowest priority pipe** and target the **greatest concentration** of LPP that can be addressed by a NPA

Identify **at least five segments of LPP** that could be abandoned through NPAs

Operate program under a **corresponding timeline** of the LPP program

Establishment of a **five-year cycle**

LPP **implementation plan**

Outreach & Education

Implementation contractor to help inform customers

Expanded communication channels (*e.g.,* public events, knocking on doors)

Stakeholder Engagement

Robust **reporting requirements**

Stakeholder Meetings to discuss program and elicit feedback

DACs

Prioritize **LPP NPA** projects in DACs

NYCHA

Work with **NYCHA to develop a large-scale NPA**

Non-Pipeline Alternatives: Benefit Cost Analysis Frameworks

PRESENTED BY

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SENIOR ASSOCIATE

PRESENTED FOR

NARUC TASK FORCE ON NATURAL GAS RESOURCE PLANNING

SEPTEMBER 25, 2024

Brattle

Agenda

- Overview of Benefit Cost Analysis
- Evolution of Non-Pipeline Alternatives
- Five Steps to Developing an NPA Framework
- Takeaways

Overview of Benefit Cost Analysis

Benefit Cost Analysis (BCA) is a systematic process for identifying, quantifying, and comparing the expected benefits and costs of an investment

- BCAs go beyond traditional least-cost tests that aim to minimize the revenue requirement by instead considering a broad framework of benefits and costs to *maximize the net benefits* of an investment decision
- The types of benefits and costs considered and how they are measured is important
  - Desired Outcome: What benefits and costs should be measured to incentivizing the desired goal?
  - Perspective: Whose net benefits are being considered (*i.e.*, customer, utility, society)?
  - Alternatives: What is the "but-for" alternative that is being compared to?
  - Timeframe: What is the relevant frame that the net benefits should be measured?

Least Cost Tests:

- Net present value of revenues minus net present of costs > 0
- Goal is to minimize impacts on revenue requirement

Benefit Cost Analysis:

- Broader spectrum of monetary and non-monetary benefits & costs
- Ratio of benefits to costs > 1
- Goal is to maximize net present

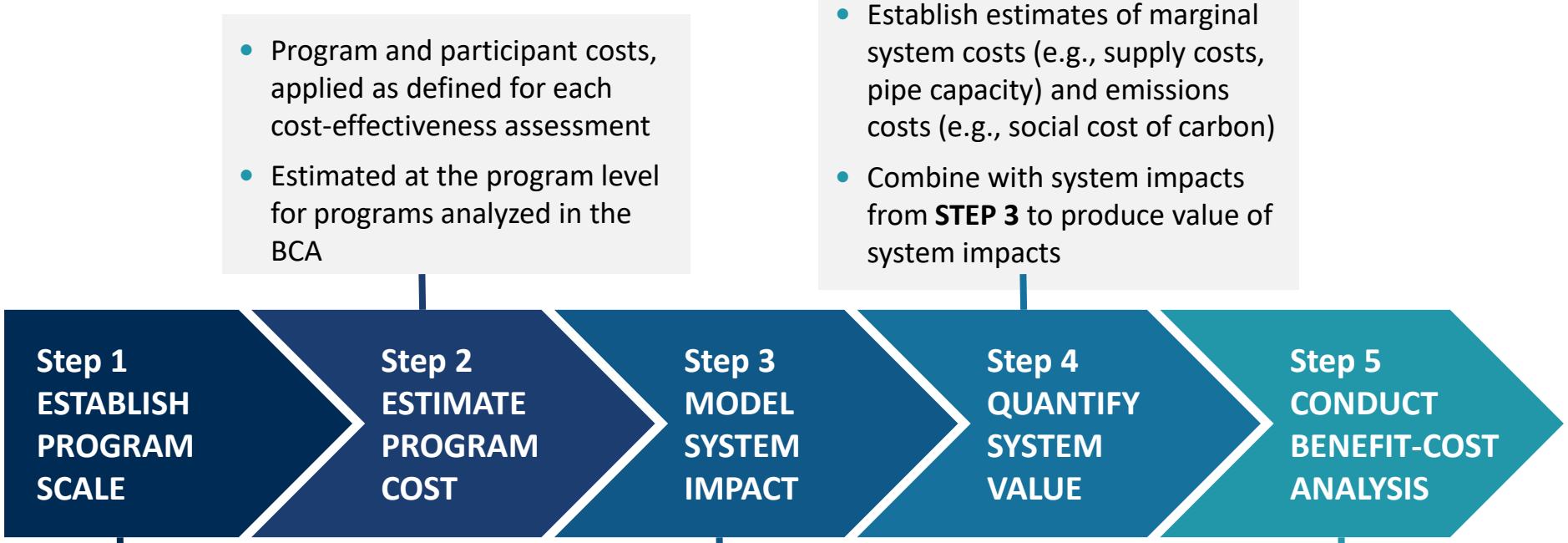
Evolution of Non-Pipeline Alternatives

Non-Pipeline Alternatives (NPA) started as a way to address reliability concerns but have since evolved to help achieve state climate and energy policy goals

- In 2017, Con Edison became the first LDC in the country to explore energy efficiency, demand management, and NPAs to meet a forecasted shortfall of peak day pipeline capacity[1]
- The "Smart Solutions for Natural Gas" program was technology agnostic and contemplated the use of demand- or supply-side solutions that:
  - Provide incremental gas supply
  - Displace or eliminate customers' peak day requirements for gas
  - Do not involve the construction of new pipeline infrastructure
- Con Edison worked with the NYS PSC and stakeholders to develop a BCA framework to evaluate the impact of substituting non-traditional solutions for pipeline capacity
  - The BCA framework was modeled after the company's Non-Wires Solutions program, which was put in place to avoid the need to build a $1 billion substation in NYC
- Following the passage of NY's Climate Leadership and Community Protection Act in 2019, NPAs shifted focus towards deploying demand-side solutions to avoid gas system investments and help reduce emissions
- Other states have since adopted or are investigating NPAs to aid in achieving clean energy policy goals

1: Petition of Consolidated Edison Company of New York, Inc. for Approval of The Smart Solutions for Natural Gas Customers Program, New York Public Service Commission Case 17-G-0606, September 29, 2017.

Steps to Developing an NPA BCA Framework



- Based on utility-specified goals and objectives for NPAs
- Scale includes breadth of supply- and demand-side technologies that can be deployed to achieve desired outcome (*e.g.*, reduced emissions attributable to heat pump adoption)

- Program and participant costs, applied as defined for each cost-effectiveness assessment
- Estimated at the program level for programs analyzed in the BCA

- For each program, estimate per-participant energy system impact (e.g., annual or peak demand) and emissions impact (e.g., tons of CO_2)
- Combine with participation estimates from **STEP 1** to produce system impact estimates for participants

- Establish estimates of marginal system costs (e.g., supply costs, pipe capacity) and emissions costs (e.g., social cost of carbon)
- Combine with system impacts from **STEP 3** to produce value of system impacts

- Energy system and emissions value from **STEP 4** is compared to program costs from **STEP 2** to produce cost-effectiveness metrics (benefit-cost ratio, NPV)

Establishing the NPA Program Scale

Step 1
ESTABLISH
PROGRAM
SCALE

Scope of an NPA program will vary depending on the desired outcome:

- Reduce emissions
- Address reliability need
- Reduce costs by deferring or avoiding gas investments
- Others?

The desired outcome is informed by the "but-for" scenario

Eligibility of supply- and demand-side technologies depends on NPA program's objective

- Technology agnostic vs. technology-specific

Example Non-Pipeline Alternatives Technologies

Supply Side	Demand Side
Local Storage	Energy Efficiency
Trucked CNG or LNG	Demand Response
LNG	Electric Heat Pump
RNG	Gas Heat Pump
Hydrogen	Networked Geothermal

Perspective: Cost Effectiveness Tests

Step 2
ESTIMATE
PROGRAM
COST

Benefit and cost streams included in BCAs depend in part on the perspective one is taking when evaluating NPA programs

The Societal Cost Test (SCT) is the most commonly used cost-effectiveness test in existing NPA frameworks

- Reflects impact of direct benefits/costs
- Accounts for cost of externalities (*i.e.*, cost of emissions) and other non-standard benefits (*i.e.*, reliability & resiliency)

Other costs tests may be considered alongside SCT to evaluate NPA projects

Table 1. Cost-effectiveness tests

Test	Perspective	Key question answered	Impacts accounted for
Participant cost test[10]	Customers participating in a program	Will program participants' costs be reduced?	Includes the benefits and costs experienced by the customers in the program
Ratepayer impact measure[11]	Impacts on rates paid by all customers	Will utility rates be reduced?	Includes the benefits and costs that will affect utility rates, including utility system benefits and costs plus lost revenues
Program administrator cost test/ utility cost test	The utility system	Will utility system costs be reduced?	Includes the benefits and costs experienced by the utility system
Total resource cost test	The utility system plus participating customers	Will utility system costs plus program participants' costs be reduced?	Includes the benefits and costs experienced by the utility system, plus benefits and costs to program participants
Societal cost test	Society as a whole	Will total costs to society be reduced?	Includes the benefits and costs experienced by society as a whole
Jurisdiction-specific test	Regulators or decision-makers	Will the cost of meeting utility system needs while achieving policy goals decrease?	Includes utility system costs and benefits and any additional costs and benefits associated with achieving applicable policy goals

John Shenot, Using Benefit-Cost Analysis to Improve Distribution System Investment Decisions, Regulatory Assistance Project, November 2022

Impact Factors for a Societal Cost Test

Step 2
ESTIMATE
PROGRAM
COST

Electrification NPA Program Costs

- Utility provides the budget to carry out its proposed program
- Without the electrification program, older fossil heating systems would have been replaced with new fossil heating systems
- True cost of the program is the "incremental cost" of heat pumps over fossil heating systems, rather than the all-in cost of heat pump acquisition (*federal tax credit is applied*)

Electrification NPA Program Benefits

Standard

- **Avoided Fuel Costs**
  - Natural gas
- **Avoided GHG Emissions**
  - CO2, CH4, N2O
- **Avoided Criteria Air Pollutant Emissions**
  - NO2, SO2, PM2.5, CO, Lead, Ground level ozone
  - Public health impacts include reduced incidence of premature mortality, non-fatal heart attacks, hospital admissions, bronchitis, respiratory symptoms, asthma, etc.
- **Avoided Methane Leakage**
  - National NG leakage rates expected to increase over time
- **Avoided Maintenance Costs**
- **Avoided Gas Infrastructure Costs**
- **Increased Generation Costs**
- **Increased Gen. Capacity**
- **Increased T&D Capacity**
- **Increased F-Gas Emissions**
  - Used as refrigerants in heat pump unit
- **Increased Power Sector Emissions**
- **Increased REC Costs**

Non-Standard

- **Reliability & Resilience Risk**
  - Increased use of electricity for heating increases exposure to prolonged power outages.
- **Job Creation Benefit**
  - Increased demand for heat pump installations will require more trained technicians.
- **Price Volatility Benefit**
  - Heat Pump customers are shielded from commodity price shocks.
- **Fuel Security**
  - Utility is less dependent on fossil fuels for space heating, but also exerts additional strain on electric grid.
- **Convenience Benefit**
  - Heat pumps that also provide cooling remove the need for installing separate AC unit.
- **Other Public Health Impacts** such as cardiovascular effects, upper respiratory effects, cancer, reproductive and developmental effects.

Measuring System Impacts of NPAs

Step 3
MODEL
SYSTEM
IMPACT

NPAs can have various energy and non-energy system impacts, depending on the type of technologies permitted in the scope of the program.

- System impacts measured on a capacity (Dth per peak day) or volumetric (Dth per day) basis

Energy Efficiency	Electrification	On System CNG Storage
• Avoided gas commodity Costs • Avoided peak day gas supplies • Avoided gas capacity infrastructure • Lower emissions	• Avoided gas commodity costs • Avoided peak day gas supplies • Avoided gas capacity infrastructure • Increased electric commodity costs • Increased electric capacity • Lower gas emissions • Increased electric emissions	• Avoided Peak Day Supplies • Avoided on-system capacity • Increased O&M • Increased reliability and resiliency

Quantifying Value of Relevant System Impacts

Step 4
QUANTIFY
SYSTEM
VALUE

Marginal costs and impacts are the relevant metric when quantifying the value of an NPA to the system

- Value of system impacts should be measured on a capacity (Dth per peak day) or volumetric (Dth per day) basis

Marginal costs should be as specific to the NPA being evaluated as possible, which may require additional analysis to develop these metrics

- Scope: system-wide, transmission/distribution, geographic, project-specific, etc.
- Timing: what is the marginal source of gas or electric supply?

Some regulatory jurisdictions have guidance on how specific benefit and costs streams should be measured

Methodology to value system impacts should be updated on a semi-regular basis to reflect:

- Updated inputs/assumptions (*e.g.*, utility data, third-party inputs)
- Latest best-practices for valuing benefit and cost streams

Benefit Cost Analysis – Bringing it All Together

Step 5
CONDUCT
BENEFIT-COST
ANALYSIS

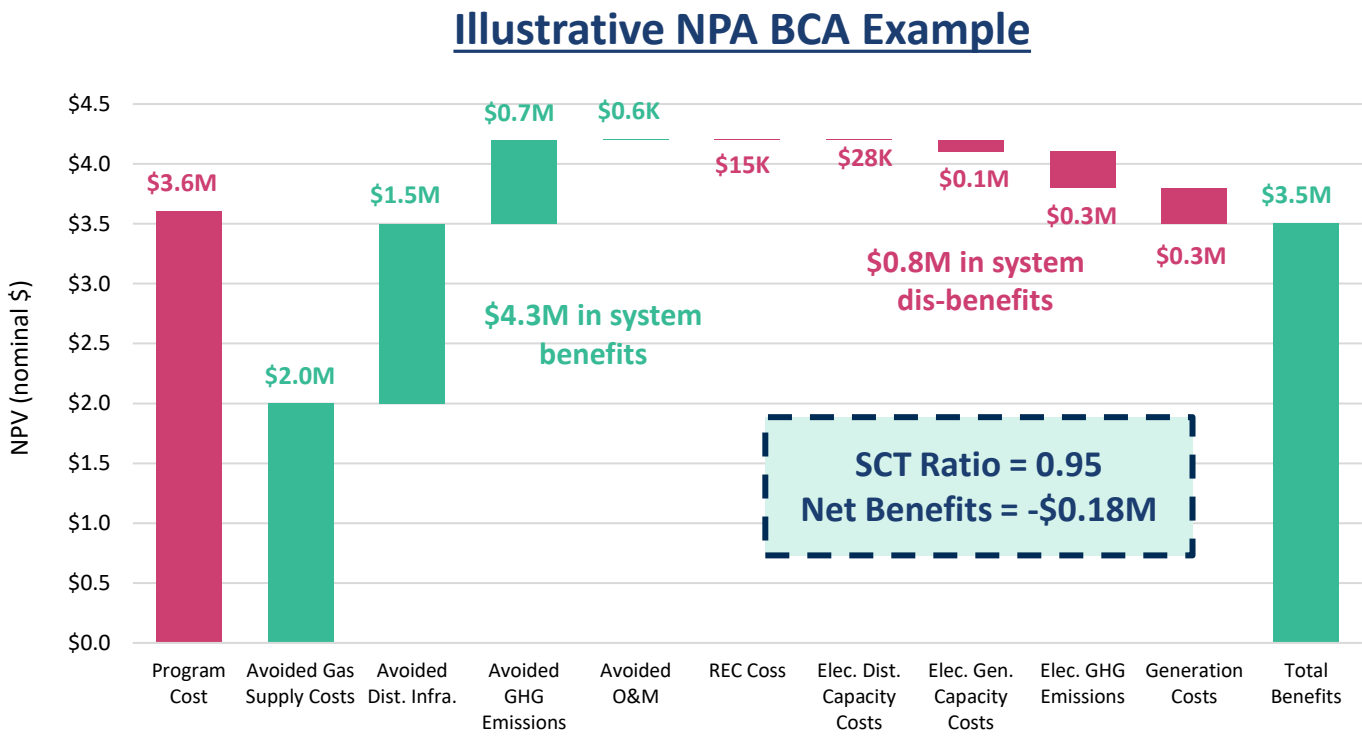
The cost effectiveness ratio is calculated by estimating the net present value of each benefit and cost stream

- Value of benefit/cost stream ($) = Participation estimates x system impact x value of system impact

Benefits and costs are typically discounted at utility allowed rate of return, but other discount rates may be considered (*e.g.*, societal discount rate)

If cost effectiveness ratio is greater than or equal to 1.0, NPA passes BCA test

- If ratio is less than but close to 1.0, may consider if other non-energy benefits or externalities are real but unquantified



Takeaways

- Benefit Cost Analysis (BCA) is used as a systematic process for identifying, quantifying, and comparing the expected benefits and costs of non-pipeline alternatives
- Scope and perspective of NPA program matters – NPA programs were initially developed to address a utility reliability need but are now commonly used to help achieve state climate and energy policy goals
- Societal Cost Test is the most commonly used metric in NPA evaluations because it considers the broadest set of benefits/costs, including GHG emissions and other externalities
- Marginal gas and electric system impact estimates should be up to date and specific to the NPA being evaluated, which may require further analysis to develop these metrics
- NPA BCA frameworks require regular review and updates to accurately reflect the value of system impacts and industry best-practices for measuring benefit/cost streams

Q&A WITH SPEAKERS

Moderator: Task Force Chair Johnson, GA Public Service Commission

- **Natalie Mims Frick**, Deputy of the Energy Markets and Policy Department, Lawrence Berkeley National Lab
- **Courtney Eichhorst**, Director, Regulatory Strategy, National Grid
- **Josh Figueroa**, Senior Associate, The Brattle Group