Making the Transition to Integrated Energy Planning

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Faye Brown – Director, Gas Delivery Solutions, Future of Heat Engineering



Faye Brown joined National Grid in November 1999 and currently serves as the Director of Gas Delivery Solutions and Future of Heat Engineering. Her responsibilities include engaging with internal and external stakeholders to identify the needs, develop strategies and plans to deliver the long-term network capacity needs and meet the Company's policy to achieve net zero greenhouse gas ("GHG") emissions. In this role, she manages a team of engineers who work collaboratively with other teams to provide support for NPA projects and development of an integrated energy planning process.

Faye joined the Company, then known as KeySpan Energy Delivery New England, in 2002. She advanced to Engineering Manager and Principal Engineer and was promoted to her current role in June 2023. Although most of her time with the Company was in Gas Engineering, from 2008-2011, she was a Lead Resource Planner in Construction. From 1994-2002, prior to joining National Grid, she worked in the telecommunications construction industry in various project management roles.

Faye holds a BS in Electrical Engineering from the Widener University. Faye and her daughter, her dog and 2 cats reside in Marlborough, Massachusetts.

National Grid is taking action to achieve net zero greenhouse gas emissions and deliver the fair, affordable and clean energy future to 2.3 million customers in more than 240 towns and cities across the Commonwealth



... via our networks..

3K es of Electric Transmission & Sub-Transmission	18.5K Miles of Electric Distribution	~1.3M Electric Customers
11.2K	∼3k	~950K
es of Gas Distribution Main	Miles of Leak Prone Pipe	Gas Customers

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... by our teams....



... making connections...

200MW	~1,800	18K+
Total Distributed Energy Resources connected 2022	EV Chargers enabled to date	Heat pumps installed via Mass Save programs in 2022 ~30% above goal
2.3GW DER connected to our network	~32K Additional EV Chargers to be enabled via Phase 3 programs	45K+ Additional heat pumps targeted to installed via Mass Save by 2024

... and supporting our communities.

13K+ Hours of employee volunteerism

\$4+ Million in charitable contributions

Our MA regulators have set direction across both commodities on the importance of Gas - Electric planning coordination

MA DPU 20-80-B Order (i.e., our future of gas proceeding)

- "...the Department finds that the clean energy transition will require coordinated planning between LDCs and electric distribution companies"
- Requires that all future gas network investments will require analysis of nonpipeline alternatives to show prudency
- By 2026, every MA LDC must file a Targeted Electrification Demonstration project

MA DPU 24-11 Order - Electric Sector Modernization Plan (i.e., our **future of electric proceeding**)

- "The Companies' IEP proposals are a necessary first step in the development of an **IEP process that will enable** customers to transition from natural gas heating to electric heating, leading to the **achievement of statewide GHG limits**."
- Requires the Companies to establish a joint utility IEP stakeholder working





Realizing our clean energy vision requires a shift to Integrated Energy Planning (IEP)



Summary of our progress on IEP and where we are headed

What we have done	What we are working on now	Where we are headed
•Pilot desktop analyses	•Evaluating IEP capability needs internally	•Continue to develop the IEP and NPA
•Whitepapers:	 Establishing data sharing protocol 	process (as we learn)
Peer benchmarking with Rocky Mountain	•Cross-utility collaboration	•Investing in new capability (people, tools,
Institute (RMI)	•Stakeholder engagement to develop an IEP	sonware)
Internal whitepaper	Framework	•Continued collaboration with stakeholders
•Included IEP chapter and proposal in our		navigate challenges & unknowns
Electric Sector Modernization Plan, approved		
•Filed our Targeted		
Electrification Demonstration Program in		
12/2024		
•Filed our Climate Compliance Plan with the		
proposed stakeholder informed NPA		
Framework on 4/1/2025		

We highlight a few examples of these items on the following slides...

What we have done

We've conducted Desktop Analysis to explore the impacts of IEP on our gas and electric networks

- 1. Selected two towns (1 Urban and 1 Suburban):
- Where we provide gas & electric service
- Have a high inventory of Leak Prone Pipe (LPP) segments
- Have diverse conditions on electric network
- 2. Performed two analyses:
- **Full Electrification**: Evaluated the impacts of fully electrifying heat for all residential gas customers, which identified some feeders may need to be upgraded and others that likely did not need upgrades
- **Targeted Electrification**: Evaluated the impacts of targeted electrification of LPP segments that can be retired without negative impact to the rest of gas system, on electric feeders identified to likely not need upgrades

3. Considered three electric loading scenarios (high, medium and low) given the uncertainty on electric peak impacts from fully electrifying homes
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What we have done

Findings and learnings from initial projects and analyses

Findings:

- The system impacts of full heat electrification are location dependent and influenced by multiple factors, including the existing size and capacity of electric infrastructure and heat pump peak demand
- Full electrification (i.e., town-level electrification) likely not costeffective, but targeted electrification may be cost-effective depending on a variety of factors

Learnings:

- 1. New tools and resources are needed to scale the analysis and consider multiple scenarios / sensitivities
- 2. There is a wide range of potential peak load impacts of heat pumps
- 3. System characteristics and location drive outcomes and investment needs
- **4. Customer action and adoption** is necessary to optimize investment planning (i.e., see chart to the right)
- 5. Cross-utility collaboration will be critical, and we will need to develop new processes to facilitate that collaboration





What we have done

National Grid and RMI collaborated on a whitepaper to better understand implementation successes and challenges of non-pipeline alternatives Three types of NPAs Non-pipeline alternatives (NPAs) Avoiding replacement of this pipe would only 1. Avoided Intended to simultaneously reduce greenhouse gas require this house to fully electrify. replacement emissions and defer, reduce, or avoid the need to construct or upgrade the natural gas system, with Avoiding replacement of potential for ratepayer savings. this pipe would require all the households on these blocks to move away Includes customer installation of all-electric from gas. equipment or connection to other lower-carbon infrastructure, including thermal energy networks. 2. Avoided REDUCE ELECTRIFY Capacity Integrated energy planning Expansion Understanding how the gas, electric, and customer To avoid a capacity upgrade for this pipe, buildings beyond this pipe segment would need energy systems interact and bringing that knowledge 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% into utility and energy planning processes to help participation of all households. meet long-term climate goals. This enables a better understanding of how customers are impacted by the 3. Avoided clean energy transition to create cost-effective solutions that preserve the safety and reliability of Capacity systems customers rely on. Extension Avoiding system expansion and pipe construction to this new neighborhood would require all households **National Grid** 9 being built to be all-electric.

The white paper analysis reveals the benefits and the challenges regulators and utilities must carefully balance

Canada

Hydro Québec



- 1. Current NPA projects reflect diverse energy policy goals
- 2. There's no one-size-fits-all cost-benefit analysis
- 3. There's a range of criteria to weigh
- 4. NPA projects can be funded through a series of different sources

5. To conduct IEP, regulatory support is needed to enable cross-utility data sharing and decision-making, and to invest in new tools and capabilities.

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Europe

- 6. Utility and municipality partnerships
- 7. Individual customer persuasion to reach 100% participation is not a scalable NPA strategy.
- 8. Policy change will be needed

What we are doing now

MA Targeted Electrification Demonstration Program, as required by MA 20-80 Filed: 12/6/24

118 customers on 14 LPP segments with average of 8 customers per segment

All upfront full home electrification costs will be covered. Customer will be eligible for National Grid's forthcoming heat pump rate & receive a bill credit

Cold Climate ASHP for heating/cooling, and all electric appliances will replace gas powered ones

Decommission any pipe segments where 100% of customers on a LPP segment agree to fully electrify

PROGRAM GOALS:

Test how targeted electrification can eliminate replacement of LPP through electric alternatives for all gas equipment and enable gas decommissioning

Attempt to decommission one or more leak-prone gas pipe segment through coordinated whole-home electrification of customers, in environmental justice communities if possible

Increase understanding of selected customer sentiment towards electrification, our ability to influence that sentiment, and how financial incentives may shift behavior to help inform future customer engagement for scaling of NPAs

Develop learnings regarding internal capabilities and processes needed to successfully deliver & scale NPAs, from gas segment identification to customer acquisition to electric grid impact analysis

Program Locations:

residential homes in Leominster & Winthrop

Costs:

Estimated costs assume all 14 segments achieve full participation, are approximately \$11M. The Demonstration Program will also leverage existing Mass Save funding, estimated at \$3M.

Cost Category	Mass Save Funding	Demonstration Program
Program Admin		\$1,040,808
Marketing & Outreach		\$425,000
Whole Home Electrification	\$2,643,590	\$8,896,810
Bill Credits		\$601,800
Electric Network Upgrades - Opex		\$26,180
EM&V		\$300,000
Total		\$11,290,598

Program Implementation: Customer (Energy Transition Solutions Team)

We are evaluating our capability needs and testing/piloting new technology

We've conducted a "digital process reimagination" effort to provide more structure and direction to the **capabilities we need to conduct and implement NPAs at scale**

Scale = ~100s of evaluations of NPAs per year. Recall that MA 20-80 requires the gas LDCs to evaluate the NPA potential for every single gas infrastructure investment in our capital plan going forward.

Some example capability needs include...

NPA Project Management to help track status/steps for hundreds of NPAs across end-to-end and function as a system of record for NPA assessments	Streamlined Electric Assessment. Need streamlined capability to evaluate electric hosting capacity to support NPA
Gas Assessment. Evaluate the hydraulic feasibility of the NPA and/or identify the gas demand reduction need for each non-LPP NPA assessment.	NPA Benefit Cost Analysis. Need a well-defined BCA framework tool that is updated annually with relevant data inputs.
Gas/Electric Mapping and Modeling. Universal premise identifier for gas to electric asset mapping, including for non-NG overlap.	IEP Data Sharing / Framework. Need a framework and processes for data exchange needed to facilitate IEP

NPA Framework Overview

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What do the DPU 20-80 orders say about developing an NPA framework?

- + DPU's 20-80-B the Order states that gas utilities must consider NPAs for all projects that seek cost recovery under the initial NPA framework. The full NPA framework developed in collaboration with stakeholders may consider materiality screening.
- + The proposed NPA analysis framework must be consistent with DPU principles laid out in Order 20-80-B and 20-80-C:
 - Safeguarding ratepayer interests and maintaining affordability for customers;
 - Ensuring safe, reliable, and cost-effective natural gas service;
 - Ensuring compliance with state and federal laws and regulations;
 - Minimizing the burden on low- and moderate-income households as the transition proceeds; and
 - Facilitating a just workforce and energy infrastructure transition.
- + DPU Order does not specify evaluation criteria for LDCs to consider in the NPA analysis framework and states that "good faith engagement with stakeholders and consensus, where possible, will support a showing of reasonableness"*
- + With a consultant, the joint LDCs developed an NPA Working Group is to solicit input from stakeholders on the NPA framework

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*DPU 20-80-C at 27 14

NPA Identification Process



NPA Framework Overview

- Defines outline of processes which the Companies will use to identify likely NPA Candidates
- Each step in the NPA Identification Process is accompanied with requirements the Companies must fulfill when reviewing their projects
- Ensures optimal use of resources by avoiding time and resource expenditures for projects that are not high likelihood candidates

Project Identification (1/3)



Timelines highly dependent on project type and size and experience with the NPA Process

Project

Estimate

0-6 month

0-6 month

3 – 12 month

Traditional:

NPA:

3 - 36 month

24 – 48 month

16

Budgetary

Cost

Estimates

Detailed

Engineering

Contractor

Selection

Project Identification (2/3)



Reference: Table 1a) Types of Capital Projects

Program	High Level Descriptions (may vary by LDC)	Part of NPA review
GSEP	Replacement of leak-prone infrastructure	Yes
Reliability - Capacity	Projects to increase the capacity of the system such as system reinforcements, new gate stations and new regulator stations	Yes
Reliability - Replacement	Replacement projects such as Low-Pressure Conversion and Flood Hardening Projects, MAOP Compliance	Yes
Gate Stations & Regulator Stations	Replacement of equipment in poor condition to improve system reliability	Yes
LNG/LPGA	Provide critical gas supply that supports the system	Yes
Resiliency	Projects that increase the overall ability of the natural gas system's ability to withstand and recover from significant disruptions such as natural disasters and extreme weather events	Yes
New Customer Request	New Customer services and main extensions	Yes
DOT/Municipal Relocations	Address gas main conflicts related to the state DOT or Municipal reconstruction	Yes
Master Meter Compliance	Replacement of customer owned piping beyond the meter set to bring it up to compliance	Yes
Emergent	Unplanned work that addresses immediate safety concerns	No
Other Reliability	Projects that support the gas system (Stub Cut-offs, Corrosion Control, Tools and Equipment, etc.)	No
Metering	Work on Residential and C&I meters (i.e., meter exchanges), improvements to complex meter installations	No
Facilities	Work to facilities such as fencing, building maintenance, painting, security.	No
Information Technology	Investments in IT equipment and systems such as those used for pressure regulation, gas dispatch, customer billing cybersecurity, etc.	No

Project Identification (3/3)

Project Identification	Th Pi id	ne Companies shall initiate the NPA Identification ocess as defined in this NPA Framework for all projects entified as requiring such review.	Program	Electrification	Thermal Network Systems	Energy Efficiency & Demand	Behavior Change and Market Trans-	Supply Side Solution	Asset Rehabilitation	Traditional Gas System Investment
Initial Viability Testing	Th th co pr	ne Companies shall review viable NPA candidates with e following NPA technologies and solutions, or mbination of solutions, as defined in Table 2 and ovide results of said evaluation.	GSEP			NA	NA	NA	✓	*
System Feasibility Poviow	•	The NPA Identification Process will	Reliability - Capacity	4	4	¥	4	¥	*	¥
Electric System		consider a wide array of NPA technologies and solutions, depending on the program type.	Reliability - Replacement	4	4	NA	NA	NA	~	*
Review	•	The LDCs will review the viable NPA candidates with the following technologies and measures:	Gate & Regulator Stations	*	*	*	*	✓	*	4
Benefit Cost Analysis		Electrification such as Air Source or Ground Source Heating Pump	LNG/LPGA	✓	✓	✓	✓	✓	✓	*
Project Authorization		 Thermal Network Systems Energy Efficiency & Demand Response 	Resiliency	*	*	NA	NA	NA	NA	4
Project		Behavior Change and Market Transformation	DOT/Municip al Relocations	*	4	NA	NA	NA	NA	*
Prioritization		Supply Side Solutions Technologies and solutions will be updated	Master Meter Compliance	*	*	NA	NA	NA	NA	4
Project Execution		with the Framework as they evolve								18

Reference: Table 2) NPA Technologies and Solutions

Initial Viability Testing



• The Initial Viability Testing criteria will start with what was used in the interim process, these criteria and their thresholds will be refined and updated as the process evolves and pilots are implimented :

- Safety and Reliability needs
- Timing of project
- Customer composition
- Regulatory compliance
- Upfront Cost comparison
- The LDCs will provide their Initial Viability Testing Criteria as they evolve based on experiences gained as part of cost recovery filings to provide the Department with an avenue to continuously evaluate the Companies' Initial Viability Testing Criteria.

System Feasibility Review



 This review performed by Long Term Planning includes an analysis using a hydraulic model (Synergi Gas) to simulate system flow on the highest demand days and show the impact that decommissioning the asset will have on the overall system. This step may lead to a re-scoping of the project area.

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• Step 0 Electric review is a first cursory if the electric system can safely and reliably serve the additional load, and the level of investment needed (Step Zero Review).

Thresholds of Step 0 that ends NPA process:

- · greater costs than the gas capital project, or
- greater expected timeline than the gas project allows, or
- Or requires detailed electric study with study costs greater than 25% of gas Capital project (regional Study/ ESMP)

*Barriers: Data Sharing Waiver, which was approved on 3/11/2025

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Electric System Review

GAS EV



- For the EDC to be able to sufficiently evaluate the impact of a considered NPA, the LDC must provide customer and system information to the EDC
- The EDC will provide the necessary detailed electrical equipment upgrades and cost and timeline to implement them.
- The electric distribution system operators will provide the electric rate impact test (eRIM) as part of the BCA.

Thresholds that end NPA process

- Negative eRIM
- Electric system upgrade timeline exceeds gas project need

*Barriers: Data Sharing Waiver, which was approved on 3/11/2025

Benefit Cost Analysis (1/2)



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Participant Cost Test

Cost	Benefit
Behind the Meter Costs such as heating systems, appliances, weatherization, electrical upgrades	Funding availability through the states EE program
Increase in electric energy bills	Federal and other non-EE related incentives, tax benefits, grants, or funding opportunities
	Behind the Meter investment
	Electric rate subsidies made available through the NPA Project

Gas Rate Impact Measure

Cost	Benefit
Lost Revenue from electrified customers	Avoided revenue requirements stemming from the avoided capital investments.
Remaining Capital Investments and the resulting net present value revenue requirements.	Avoided gas supply cost through a demand-reduction induced price effect (DRIPE)

Electric Rate Impact Measure

Cost	Benefit	
Net present value revenue requirements from incremental capital investments	Increased electric revenues from electrified customers	
Negative electric supply cost impact from reverse demand- reduction induced price effect (DRIPE)		

Total Resource Cost Test

Cost	Benefit
Project Implementation Cost	Electric Avoided Costs
Performance Incentive Costs	Gas Avoided Costs
Project Participation Cost	Delivered Fuel Avoided Costs
	Other Resource Benefits
	Non-Energy Impacts
	Social Cost of Carbon



Project

Identification

The Department's Order directs the Companies to conduct a benefit cost analysis (BCA) to ensure any technically viable NPA is in the interest of the customers, participants, and society at large. D.P.U. 20-80-B, at 98 n.66.

Companies must use the TRC, at a minimum, to determine NPA viability

For every project which passes the initial viability test and the Electric System Impact Assessment, the Companies shall furnish a BCA that includes one or more of the following tests as appropriate - a gas and electric rate impact measure (RIM), a participant cost test (PCT), and a total resource cost test (TRC). For the TRC, the Companies shall use the most currently approved TRC in the 3-year Energy Efficiency Plan with all applicable

- · Companies will pursue a viable, costeffective NPA with the BCA tests ≥ 1 .
- Companies will be engaging a 3rd party consultant to verify BCA tool and Inputs

Project Authorization



- All Companies have internal project authorization and approval processes which approve solution design and budget allocation to a specific project. These processes generally include a documented Project Authorization Form which outlines the need, impact of the need, the preferred solution, and all alternatives considered.
- The Companies will be updating these existing documentation and authorization process to include the NPA Identification Process and projects will only be able to proceed to implementation if they have provided sufficient evidence through the NPA Identification Process.

Items to include in Authorization forms:

- Gas project stats WO#, planned FY, cost estimate, need by date (if if different than planned FY), program/ type of work, scope of work
- NPA project stats NPA method (ex. electrification), cost estimate, additional incentive levels, funding method/ cost recovery, Pass/Fail results of previous steps, forecasted time to implement process.

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Project Prioritization

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If more NPAs are identified than can be reasonably implemented in a specific timeline the Companies shall consider prioritizing their NPA projects in this order:

Projects will be put through a prioritization matrix that will consider timeline needs, compliance obligations, state and municipal project coordination, and customer specific issues that may impact execution timeline

Project Execution

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Next Steps and Challenges

- Continue meeting with the IEP JU Working Group as required from the ESMP Order to collaborate with other EDCs on process for NPAs and IEP
- 2. Actively participate in IEP Stakeholder Working Group Process
- 3. Continue to Advance our learning, thinking and build capability on IEP, NPA, Targeted Electrification and Networked Geothermal

QUESTIONS

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