

# The Commonwealth of Massachusetts

## DEPARTMENT OF PUBLIC UTILITIES

D.P.U. 21-24

December 15, 2021

Petition of Boston Gas Company d/b/a National Grid for Approval of a Geothermal District Energy Demonstration Program.

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APPEARANCES: Bess B. Gorman, Esq.  
Andrea G. Keefe, Esq.  
National Grid Service Company, Inc.  
40 Sylvan Road  
Waltham, Massachusetts 02451  
FOR: BOSTON GAS COMPANY  
Petitioner

Maura Healey, Attorney General  
Commonwealth of Massachusetts  
By: Donald Boecke  
Jo Ann Bodemer  
Assistant Attorneys General  
Office of Ratepayer Advocacy  
One Ashburton Place  
Boston, Massachusetts 02108  
Intervenor

Robert H. Hoaglund II, Esq.  
Rachel Graham Evans, Esq.  
100 Cambridge Street, Suite 1020  
Boston, Massachusetts 02114  
FOR: MASSACHUSETTS DEPARTMENT OF  
ENERGY RESOURCES  
Intervenor

Courtney Feeley Karp, Esq.  
Jonathan S. Klavens, Esq.  
Klavens Law Group, P.C.  
420 Boylston Street, Suite 610  
Boston, Massachusetts 02116

FOR: HOME ENERGY EFFICIENCY TEAM, INC.  
Intervenor

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## I. INTRODUCTION AND PROCEDURAL HISTORY

On February 18, 2021, Boston Gas Company doing business as National Grid (“National Grid” or “Company”) filed a petition with the Department of Public Utilities (“Department”) seeking approval of a geothermal district energy demonstration program (“Geothermal Project”) submitted in compliance with Boston Gas Company, D.P.U. 20-120, Interlocutory Order on Proposed Demonstration Programs (December 11, 2020). National Grid estimated that the total cost of the demonstration project will be \$15.6 million over five years. The Department docketed this matter as D.P.U. 21-24.

On February 24, 2021, the Attorney General of the Commonwealth of Massachusetts (“Attorney General”) filed a notice of intervention pursuant to G.L. c. 12, § 11E. Additionally, the Department granted the petitions to intervene as full parties of the Massachusetts Department of Energy Resources (“DOER”) and the Home Energy Efficiency Team, Inc. (“HEET”).<sup>1</sup>

Pursuant to notice duly issued on April 12, 2021, the Department held a virtual public hearing on May 12, 2021. The Department received oral and written comments during the public comment period from representatives of Conservation Law Foundation, Mothers Out Front, The Climate Reality Project, Greater Boston Physicians for Social Responsibility, Elders Climate Action, North Shore Community Development Coalition, Inc., Gas Leaks

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<sup>1</sup> On May 4, 2021, the Department granted the petition to intervene as a limited participant of PowerOptions, Inc. On July 15, 2021, PowerOptions, Inc. submitted a notice of withdrawal of counsel and did not submit a subsequent notice of appearance of counsel.

Allies, Sierra Club, and North Parish of North Andover Climate Justice Group and members of the public.

In support of its filing, National Grid sponsored testimony of the following witnesses, all of whom were employed by National Grid USA Service Company, Inc.:

(1) Owen Brady-Traczyk, manager of future of heat in the customer organization;  
(2) Lee Gresham, lead analyst, gas utility of the future team; (3) Stephanie Briggs, director of revenue requirements for New England; and (4) Tomi Uyehara, lead analyst in gas pricing for New England. HEET sponsored the testimony of the following witnesses:

Stephen Bryant, retired gas industry executive, and Donald Cary Smith, president and chief executive officer of Sound Geothermal Corporation and operations manager of Grey Edge Group.

On August 11, 2021, the Attorney General, DOER, and HEET submitted initial briefs. On August 25, 2021, the Company submitted its initial brief. No party submitted a reply brief. The evidentiary record consists of the Company's filing, HEET's prefiled testimony, and responses to 94 information requests issued by the Department, eleven information requests issued by the Attorney General, and four information requests issued by DOER.<sup>2, 3</sup>

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<sup>2</sup> The Department, on its own motion, moves the Company's filing, HEET's prefiled testimony and the responses to 109 information requests into the record in this proceeding.

<sup>3</sup> On May 17, 2021, the Department established a procedural schedule in this matter allowing for discovery, testimony, hearings, and briefs, as necessary. The procedural

## II. COMPANY DEMONSTRATION PROJECT PROPOSAL

National Grid proposes to oversee the installation, operation, and maintenance of geothermal shared-loop systems that consist of ground-source heat pumps (“GSHP”) connected to a network of underground pipes that allow for highly efficient heat transfer at up to four sites within the Company’s service territory (Exh. FOH-1, at 7, 13-14).<sup>4</sup> The Company states that, in furtherance of the Commonwealth’s greenhouse gas emissions (“GHG”) reduction goals, the Geothermal Project is directed at: (1) reducing emissions resulting from customer energy use; (2) promoting non-pipe alternatives; (3) encouraging the development of sustainable heating options; and (4) developing new technologies to advance low-carbon heating solutions (Exh. FOH-1, at 5).

National Grid explained that it will monitor the performance of geothermal shared loops and investigate how they may be deployed optimally to create value for existing gas customers and new customers (Exh. FOH-1, at 10-11). Specifically, the Company will prioritize the installation of shared-loop systems that evaluate one or more of the following concepts: (1) assessing the thermal performance and economics of shared loops serving a larger number of customers with more diverse load profiles than the project completed by

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schedule set a deadline of July 23, 2021, for the parties to request an evidentiary hearing. No party requested an evidentiary hearing. The Department finds that the evidentiary record in D.P.U. 21-24 provide an adequate basis to address the issues raised by the filing without the need for an evidentiary hearing.

<sup>4</sup> The terms “geothermal shared loop,” “geothermal network,” and “geothermal district,” are used interchangeably and refer to the type of geothermal infrastructure design under study in this demonstration project.

National Grid's affiliate, KeySpan Gas East Corporation, in Long Island, New York ("KEDLI project");<sup>5</sup> (2) switching gas customers to geothermal energy as an alternative to leak-prone pipe ("LPP") replacement; (3) installing shared loops to manage local gas system constraints and peaks; and (4) installing shared loops to lower operating costs and GHG emissions for low-income customers and environmental justice communities (together "Site Concepts") (Exh. FOH-1, at 10-11, 14-15).

The Company estimated that the Geothermal Project would cost \$15.6 million over five years,<sup>6</sup> comprised of \$6.4 million of capital and \$9.2 million of operations and maintenance ("O&M") expenses (Exhs. FOH-1, at 29; FOH-5 at 1 (Rev.)).<sup>7</sup> The Company stated that it will use project funding to contribute towards customer-owned equipment and home or business improvements when required at specific shared-loop sites, including: GSHP for space and water heating; appliances such as ovens, stoves, and clothes dryers in

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<sup>5</sup> The KEDLI project included a geothermal shared loop serving ten single-family homes that were using delivered oil or kerosene fuels for primary heating (Exh. FOH-3, at 5-6, 11).

<sup>6</sup> The Company stated that if it can gather sufficient data to meet the learning objectives of the Geothermal Project before the end of the proposed five-year term, it may end the project early to share its findings and recommendations for future geothermal offerings with the Department and stakeholders (Exhs. FOH-1, at 14; DPU 2-2; DPU 4-2). Although specific shared-loop sites have yet to be selected, the Company stated that it is confident that it can execute one or more shared-loop sites to evaluate the proposed Site Concepts within the proposed budget (Exhs. FOH-1, at 29; DPU 1-7).

<sup>7</sup> The Company stated that its proposed budget is based on its experiences with the residential KEDLI project, including GSHP and shared-loop equipment costs, and milestones for site selection, design, and commissioning (Exhs. FOH-1, at 15; FOH-2, at 1-3; FOH-5 (Rev.) at 1).

instances where participants discontinue gas service; and air ducts and/or radiators where required to support geothermal space heating and cooling (Exh. FOH-1, at 18).<sup>8</sup>

National Grid proposed two separate charges for participants to contribute towards the cost of the geothermal shared-loop sites and to evaluate a customer's willingness to pay for a geothermal system. First, the Company proposed monthly customer charges for residential, residential low-income, and commercial and industrial ("C&I") customers of four dollars, three dollars, and four dollars, respectively (Exh. FOH-1, at 24). The Company designed the proposed customer charges based on a portion of the customer-related costs underpinning the Company's existing gas customer charges, such as billing and customer service, to approximate customer charges under wide-scale deployment of geothermal service (Exh. FOH-1, at 24).

Second, the Company proposed to charge participating customers a participant fee for the first 24 months of geothermal service of \$150 per month per GSHP unit for residential customers, \$112.50 per month per GSHP unit for residential low-income customers, and \$225 per month per GSHP unit for C&I customers (Exh. FOH-1, at 25). The Company designed the proposed participant fees to contribute approximately five percent of the costs of the geothermal system and any investments required to support its adoption based on its cost estimates for residential customers (Exhs. FOH-1, at 25; FOH-5, at 2; DPU 1-15;

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<sup>8</sup> For example, in cases where the Company seeks to avoid LPP replacement by converting gas customers served by LPP to geothermal service, participants must agree to disconnect from gas service completely to participate in the project and switch to electric appliances (Exh. FOH-1, at 11, 18).



DPU 1-21). The Company proposed a single participant fee for C&I customers that is 50-percent higher than that for residential customers, based on the assumption that the heating and cooling needs and unique design requirements of C&I customers generally will be more expensive to build and operate than systems serving exclusively residential customers (Exh. FOH-1, at 26). During the proceeding, the Company endorsed an alternative participant fee proposal that lowered the monthly cost for participants across all rate classes by extending the payment term from 24 months to 60 months (Exhs. DPU 2-12; DPU 2-16). The alternative monthly participation fees were \$60 per month per GSHP unit for residential customers, \$45 per month per GSHP unit for residential low-income customers, and \$90 per month per GSHP unit for C&I customers (Exh. DPU 2-16).

After netting out the customer charge and participant fee revenue, National Grid proposed to recover the revenue requirement for the Geothermal Project costs through a reconciling factor called the geothermal district energy demonstration program factor (“GDEDPF”) in the Company’s local distribution adjustment clause (“LDAC”) tariff (Exhs. FOH-1, at 10; RRPP-1, at 5-6; RRPP-5 (proposed M.D.P.U. No. 3.13)). The Company projected that a typical residential heating customer would experience a bill increase between \$0.24 and \$3.48 per year compared to rates effective at the time of the filing, depending on their service territory and the year of the demonstration project (Exh. RRPP-4, at 3, 21).

The Company stated that it will engage with geothermal organizations and stakeholders to inform geothermal workforce development and training efforts, in addition to

sharing data and incorporating learnings in collaboration with the Attorney General, DOER, and NSTAR Gas Company (“NSTAR Gas”) (Exhs. FOH-1, at 31-32, 39; DPU 1-18; DPU 2-17).<sup>9</sup> Lastly, the Company stated that it will file an implementation plan for Department review prior to commencing construction, which will further delineate between Company- and customer-owned equipment (Exh. FOH-1, at 15-16, 23).<sup>10</sup>

### III. POSITIONS OF THE PARTIES

#### A. Attorney General

The Attorney General argues that National Grid’s Geothermal Project will meet statutory requirements and the Department’s policy criteria for demonstration projects if the Company ultimately selects shared-loop sites that conform to the potential scenarios proposed by the Company (Attorney General Brief at 4-7, citing NSTAR Gas Company, D.P.U. 19-120, at 138 (2020); An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy, St. 2021, c. 8 (“Climate Act”), § 99). Accordingly, the

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<sup>9</sup> The Department recently approved NSTAR Gas’ geothermal district demonstration project, subject to certain modifications, in the company’s most recent base distribution rate case. D.P.U. 19-120, at 138-156. The Department also recently approved a comprehensive settlement regarding Eversource Energy’s purchase of the assets of Bay State Gas Company (creating Eversource Gas Company of Massachusetts) and investigations into the Merrimack Valley gas explosions. Eversource Energy/Bay State Gas Company, D.P.U. 20-59/D.P.U. 19-141/D.P.U. 19-140 (2020). As part of the settlement, the Attorney General and DOER will design and administer programs that include, among other things, a geothermal district project. D.P.U. 20-59/D.P.U. 19-141/D.P.U. 19-140, at 35 & n.35, 61.

<sup>10</sup> The Company proposed to own all shared-loop assets outside or below ground of customer premises for the estimated useful life of the assets, which is estimated to be 50 years (Exhs. FOH-1, at 17, 23; DPU 1-8; DPU 1-17).

Attorney General contends that the Department may approve the Geothermal Project if cost recovery is conditioned on a subsequent demonstration by National Grid that the actual program sites selected conform to the Company's proposed Site Concepts (Attorney General Brief at 4-7).

B. DOER

DOER supports the Company's proposed Geothermal Project, arguing that it is consistent with the laws, policies, and criteria for demonstration projects (DOER Brief at 2-5). DOER requests that the Department direct the Company to engage in a formal collaboration process with DOER during the implementation phase of the Geothermal Project (DOER Brief at 5-6). DOER argues that standing meetings with the Company on a quarterly or monthly basis would keep key stakeholders informed and ensure that concurrent geothermal demonstration projects will complement one another in a manner consistent with state policy (DOER Brief at 6-7).

C. HEET

HEET asserts that National Grid's Geothermal Project is consistent with applicable laws, policies, and precedent (HEET Brief at 9, 19-24). Specifically, HEET maintains that geothermal networks provide safe and reliable energy service, are affordable, reduce overall cost impacts to ratepayers and local distribution companies ("LDCs") for transitioning off natural gas, advance the Commonwealth's GHG reduction goals; and support an equitable transition away from natural gas (HEET Brief at 10-19, citing G.L. c. 25, § 1A; G.L. c. 21N, §§ 3, 3A, 4(h); Climate Act, St. 2021, c. 8; Secretary of the Executive Office of Energy and Environmental Affairs' Determination of Statewide Emission Limit for 2050

(April 22, 2020) (“2050 Emissions Limit Determination”);<sup>11</sup> Executive Office of Energy and Environmental Affairs, Massachusetts 2050 Decarbonization Roadmap (December 2020);<sup>12</sup> Exhs. HEET-SHB-1, at 3-4, 6; FOH-1, at 6-7, 36; DPU-HEET 1-1(b)).

HEET also contends that National Grid’s Geothermal Project is reasonable in size, scope, and scale in relation to its benefits, including the development of new data and experience regarding the design, construction, implementation, maintenance, and viability of geothermal networks installed and managed by utility companies (HEET Brief at 19). HEET argues that National Grid’s Geothermal Project will advance knowledge in several important ways based on the Company’s proposed Site Concepts (HEET Brief at 20, citing Exhs. FOH-1, at 11; HEET-SHB-1, at 5, 7; HEET-DCS-1, at 7; DPU 3-18, at 1; DPU-HEET 1-7; DOER 1-3).

In addition, HEET asserts that the Company’s Geothermal Project presents opportunities to demonstrate long-term energy and cost savings for customers that outweigh short-term bill impacts (HEET Brief at 23-24). Specifically, HEET contends that the Geothermal Project presents the opportunity to assess an alternative to additional investment in new natural gas infrastructure that could result in long-term cost savings, including the avoidance of stranded costs (HEET Brief at 23). Further, HEET maintains that the data from

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<sup>11</sup> Available at <https://www.mass.gov/doc/final-signed-letter-of-determination-for-2050-emissions-limit/download>.

<sup>12</sup> Available at <https://www.mass.gov/doc/ma-2050-decarbonization-roadmap/download>.

National Grid's Geothermal Project will enable a better understanding of the full range of benefits, savings, and costs associated with the technology (HEET Brief at 24).

For the reasons stated above, HEET supports National Grid's Geothermal Project as proposed; however, HEET offers several recommendations that it claims will improve efficiencies and optimize the value and use of the information from the demonstration project (HEET Brief at 24). To reduce barriers to participation, HEET recommends that the Department: (1) direct National Grid to work directly with low-income tenants and landlords with low-income tenants rather than dealing only with housing authorities; and (2) provide National Grid flexibility to distribute costs in a way that significantly reduces or removes participant costs, such as the Company's proposed alternative participant fees (HEET Brief at 25). To strengthen data collection, sharing, and transparency, HEET recommends that the Department direct National Grid to: (1) participate in HEET's community charrette process; (2) seek public input on data collection metrics and participate in HEET's development of standard metrics, including by submitting data from the Geothermal Project to HEET's GeoGrid Database; (3) consider the use of control software that integrates data acquisition features; and (4) make, to the extent permitted by law, all data from the Geothermal Projects transparent and publicly available (HEET Brief at 26, citing D.P.U. 19-120, at 153; Exh. DPU-HEET 1-3).

Lastly, to further enhance system performance and project learnings, HEET recommends additional design components and evaluation metrics (HEET Brief at 27). Specifically, HEET recommends that the Department direct National Grid to: (1) design

dynamic shared-loop systems using stochastic modeling and optimization to determine the necessary infrastructure; (2) engage the Company's design team in a third-party design review process; (3) identify significant design features and business models that were not utilized but could have affected performance, efficiency, or cost; (4) include the useful lives of geothermal and gas infrastructure in any comparative analyses of cost; and (5) provide training for the Company's workforce during and after the demonstration project on how to install, operate, and maintain geothermal shared-loop systems (HEET Brief at 27-28).

D. Company

National Grid asserts that the Geothermal Project will analyze shared-loop systems' potential to meaningfully reduce GHG emissions in the Commonwealth attributable to the heating sector and natural gas usage (Company Brief at 12). Additionally, National Grid contends that the Geothermal Project will advance knowledge on the ability of LDCs to offer geothermal service at scale in the future (Company Brief at 12, citing Role of Gas Distribution Companies as the Commonwealth Achieves Its Target 2050 Climate Goals, D.P.U. 20-80; D.P.U. 19-120, at 155).<sup>13</sup> Accordingly, National Grid argues that the Department should find that the Geothermal Project is consistent with the Commonwealth's

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<sup>13</sup> The Department has initiated a process for exploring strategies to enable the Commonwealth to achieve its 2050 climate goals. D.P.U. 20-80, Vote and Order Opening Investigation at 1 (October 29, 2020). Specifically, the Department will explore strategies to enable the Commonwealth to move into its net zero GHG emissions energy future while simultaneously safeguarding ratepayer interests; ensuring safe, reliable, and cost-effective natural gas service; and potentially recasting the role of LDCs in the Commonwealth. D.P.U. 20-80, Vote and Open Opening Investigation at 1.

laws, policies, and precedent (Company Brief at 11-12, citing Governor Charlie Baker, State of the Commonwealth Address (January 26, 2021); Secretary of the Executive Office of Energy and Environmental Affairs' Determination of Statewide Emission Limit for 2050 (April 22, 2020); D.P.U. 20-80).

Further, the Company maintains that the size, scope, and scale of the Geothermal Project are reasonable in relation to its likely benefits (Company Brief at 13-14). National Grid contends that the Company will use the Site Concepts to prioritize shared-loop sites that allow the evaluation of at least one or more potential benefits of geothermal networks (Company Brief at 13, citing Exhs. FOH-1, at 14-15; DPU 1-4). The Company asserts that, as designed, the Geothermal Project will achieve new learnings and analyze aspects of geothermal network installations that are not duplicative of ongoing geothermal demonstration projects administered by NSTAR Gas and the Attorney General and DOER (Company Brief at 14, 17-18; citing NSTAR Gas Company, D.P.U. 21-53, Implementation Plan Q2 2021, at 3-4 (May 4, 2021); D.P.U. 19-120, at 147; Exh. FOH-1, at 38-39).

Moreover, National Grid contends that it has provided detailed program descriptions that support the potential of the Geothermal Project to deliver net benefits in the future (Company Brief at 15, citing Exhs. FOH-1; DPU 2-8; DPU 3-4). The Company also asserts that, based on the Geothermal Project's proposed budget, a typical residential heating customer would experience reasonable annual bill impacts (Company Brief at 15-16, citing Exhs. FOH-1, at 29-30; FOH-5 (Rev.); RRPP-1, at 7, 16-17; RRPP-3; RRPP-4; DPU 1-21). Furthermore, the Company maintains that it has proposed reasonable customer charges

designed to recover the fixed costs of serving customers and reasonable participant fees to enable some recovery from participants of the value they are receiving from their participation in the Geothermal Project and inform future fees and rates for geothermal service (Company Brief at 10, 16-17, citing Exhs. FOH-1, at 24, 26; FOH-5, at 3 (Rev.); DPU 1-26; DPU 1-27; DPU 3-7).

As a way of making the program more affordable to participants and incentivizing participation, the Company asserts that it is open to extending the time period for collecting participant fees up to five years while keeping the same total amount collected (Company Brief at 26, citing Exhs. DPU 2-12; DPU 2-16).<sup>14</sup> However, the Company recommends against extending the term of collecting participation fees to more than five years to avoid any reconciliation issues with respect to tracking, accounting, and risk of customer turnover (Company Brief at 26, citing Exhs. DPU 2-11; DPU 2-12).

In response to the Attorney General, the Company asserts that it will ensure that the shared-loop site will further the evaluation, data collection, and/or knowledge of the Site Concepts (Company Brief at 20, citing Exhs. FOH-1, at 14-15; DPU 3-18). The Company maintains that it may be unlikely to find one shared-loop site that furthers two or more of the Site Concepts simultaneously (Company Brief at 7, 20).

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<sup>14</sup> Extending the payment term to five years would result in monthly fees of \$60 for residential customers, \$45 for low-income customers, and \$90 for C&I customers (Company Brief at 26, citing Exh. DPU 2-16).



In response to DOER, the Company confirms that it is willing to have periodic collaborations with the Attorney General, DOER, NSTAR Gas, and any other interested stakeholders to share best practices and learnings throughout the implementation phases of their respective geothermal projects (Company Brief at 20). Moreover, National Grid asserts that the ability to hire two full-time equivalents to execute the program will be a key element to ensure adequate resources (Company Brief at 20).

With respect to HEET's proposed recommendations, the Company states that it will work with HEET throughout the Geothermal Project implementation process and will strongly consider incorporating the recommendations that meet the Site Concepts; are suitable for specific sites; meet the needs of participating customers; and stay within the project's budget, structure, and timeline (Company Brief at 20). In particular, National Grid agrees with HEET that stakeholder outreach and collaboration are essential, provides that it is open to participating in HEET's community charrette process, and commits to robust outreach efforts within neighborhoods and areas that would be suitable for a shared-loop system (Company Brief at 21).

Regarding HEET's specific technical recommendations, the Company contends that it must retain final decision authority over the design and execution of shared-loop sites to (1) maintain technical flexibility in addressing the specific nature of the sites and (2) stay within the project's budget, structure, and timeline (Company Brief at 23-24). National Grid asserts that it will strongly consider HEET's recommendations concerning dynamic system design, single backup heaters, interconnection with other geothermal networks, and control

software (Company Brief at 23-24). The Company also welcomes a third-party design review process, if it would not hinder National Grid's ability to execute the number of projects necessary to meet the Site Concepts (Company Brief at 24). However, National Grid maintains that it cannot commit to evaluating elements of geothermal projects not considered, designed, or used without a better understanding of the time, costs, data requirements, and other factors necessary to properly execute them through the Geothermal Project (Company Brief at 24-25).

National Grid also asserts that it is premature to develop a formal training program for geothermal systems before the Geothermal Project is concluded (Company Brief at 23-24). Lastly, the Company maintains that it will make reasonable efforts at anonymizing confidential data to enhance public review and any data not shared publicly will be described and redacted in accordance with the Department's practice (Company Brief at 27).

#### IV. ANALYSIS AND FINDINGS

##### A. Introduction

In evaluating National Grid's proposed Geothermal Project, the Department considers the following criteria: (1) the consistency of the proposed project with applicable laws, policies, and precedent; (2) the reasonableness of the size, scope, and scale of the proposed project in relation to the likely benefits to be achieved; (3) the adequacy of the evaluation plan; and (4) bill impacts to customers. D.P.U. 19-120, at 138; NSTAR Electric Company/Western Massachusetts Electric Company, D.P.U. 17-05, at 457; Fitchburg Electric Light Company, D.P.U. 16-184, at 10-11 (2017); NSTAR Electric Company/Western Massachusetts Electric Company, D.P.U. 16-178, at 26 (2017).

Additionally, as part of the Company's refiling of its Geothermal Project, the Department previously directed National Grid to address: (1) how the Geothermal Project is not duplicative of either/both of NSTAR Gas' approved geothermal demonstration project and the geothermal network to be administered by the Attorney General and DOER; and (2) why the Department should allow the Company's proposed Geothermal Project to run concurrently with these two other geothermal programs. D.P.U. 20-120, Interlocutory Order on Proposed Demonstration Programs at 9; see also D.P.U. 16-184, at 11 (requiring demonstration projects to be distinct from one another).

The Department commends the Company for pursuing innovative technologies that may provide benefits to ratepayers and further the goals of the Commonwealth. Subject to the modifications and directives below, the Department approves the proposed Geothermal Project and allows National Grid to install, own, and operate geothermal shared-loop sites as part of its Geothermal Project.

B. Department Criteria

1. Consistency with Applicable Laws and Policies

On October 30, 2020, the Department approved the first geothermal district demonstration project proposed by a utility company in the Commonwealth (see n.9 above). The Department found that (1) geothermal networks had the potential to significantly reduce GHG emissions and (2) geothermal demonstration projects designed to test the effectiveness and scalability of utility-owned geothermal networks had the potential to reduce current barriers to widespread adoption in furtherance of the Commonwealth's climate policies. D.P.U. 19-120, at 139, citing Global Warming Solutions Act, St. 2008, c. 298; 2050

Emissions Limit Determination at 1; 2015 Update to Commonwealth's Clean Energy and Climate Plan for 2020,<sup>15</sup> at 16, 50 (December 31, 2015).<sup>16</sup> We reaffirm those findings (Exhs. FOH-1, at 35; HEET-SHB-1, at 3). Additionally, the experience of developing and maintaining company-owned geothermal shared loops could inform potential regulatory policies related to broad scale geothermal deployment and inform the policy development undertaken in D.P.U. 20-80 on the role of LDCs in the future. D.P.U. 19-120, at 139-140. Accordingly, the Department finds that the intent of National Grid's Geothermal Project is consistent with applicable laws and policies.

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<sup>15</sup> On December 30, 2020, the Secretary of the Executive Office of Energy and Environmental Affairs set the 2030 emissions limit at 45 percent emissions reduction below the 1990 baseline and released the Interim Clean Energy and Climate Plan for 2030 for public comment. Development of the Clean Energy and Climate Plan for 2025 and 2030, <https://www.mass.gov/info-details/massachusetts-clean-energy-and-climate-plan-for-2025-and-2030#interim-clean-energy-and-climate-report-for-2030>. Conversion of gas customers to cleaner energy sources through pathways such as thermal electrification of space heating is a key policy set forth in the Clean Energy and Climate Plan ("CECP"). Interim Clean Energy and Climate Plan for 2030, at 29.

<sup>16</sup> On March 26, 2021, while the Department's investigation into the Geothermal Project was ongoing, Governor Baker signed the Climate Act into law. St. 2021, c. 8. The Climate Act codified the 2050 Emission Limit Determination and endorsed the Department's policy on geothermal demonstration projects by expressly authorizing the Department to authorize pilot projects for the development of utility-scale renewable thermal energy. Climate Act at §§ 8, 99. The Department evaluates National Grid's proposal in accordance with the Department's directives and requirements for demonstration projects in effect at the time of the Company's filing. Utility companies that file proposals for thermal energy pilot projects for Department review and approval after the effective date of the Climate Act shall demonstrate the proposal meets the statutory requirements contained therein. Climate Act at § 99.

## 2. Size, Scope, and Scale

The Department requires distribution companies to fully support proposed pilot programs or demonstration offerings with detailed program descriptions to allow the Department and stakeholders to evaluate the reasonableness of the size, scope, and scale of the proposals in relation to the benefits to be achieved. D.P.U. 19-120, at 138; D.P.U. 17-05, at 460; D.P.U. 16-178, at 30. The purpose of National Grid's Geothermal Project is to support the development and market adoption of sustainable, highly efficient geothermal systems, which are not expected to achieve the scale required to further the Commonwealth's GHG emissions goals without intervention because of the barriers to widespread adoption (Exhs. FOH-1, at 5-10).<sup>17</sup>

The Company proposes to install, own, operate, and maintain approximately four geothermal shared-loop systems serving 20-40 residential and/or commercial customers to explore and report on the potential benefits to the Company's customers of offering geothermal service at scale (Exhs. FOH-1, at 10, 17, 23; DPU 1-4; DPU 1-24; DPU 2-9). National Grid will leverage the Company's access to low-cost capital, ability to recover costs over long periods of time, and reputation in its service territory to investigate how to lower the cost of geothermal service, optimally deploy shared loops to create the best value for customers, and gather data on customers' willingness to adopt geothermal, including barriers

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<sup>17</sup> Barriers to geothermal adoption and market growth in the Commonwealth include: (1) high upfront costs; (2) long payback periods; (3) poor public awareness; (4) lack of access to financing solutions; and (5) supply chain barriers (Exhs. FOH-1, at 35; DPU 1-10).

to adoption such as customer-side conversion costs (Exhs. FOH-1, at 8, 10-12, 35-36; HEET-SHB-1, at 5; DPU 1-16 & Atts.; DPU 2-13; DPU 2-14 & Atts.). Also, the Company will investigate the use of geothermal district energy to reduce natural gas demand in constrained areas and as an alternative to LPP replacement and report data on how the costs of geothermal shared loops compare to new gas infrastructure (Exhs. FOH-1, at 11, 33; HEET-SHB-1, at 4-5; DPU 3-1; DPU 3-2). Further, the Company will study and report on ways to increase equity of access to geothermal service and geothermal service's potential to lower GHG emissions and operating cost for existing low-income customers and environmental justice communities as part of the Geothermal Project (Exhs. FOH-1, at 11, 15, 36; DPU 1-5; DPU 2-3; DPU 2-4; DPU 2-5).

The Company estimates that, including the third-party evaluation plan,<sup>18</sup> it will cost approximately \$15.6 million, consisting of \$6.4 million of capital and \$9.2 million of O&M expenses, to develop the shared-loop systems necessary to satisfy the Company's learning objectives for the Geothermal Project (Exhs. FOH-1, at 29; FOH-5 (Rev.)). To offset a portion of the costs and assess customers' willingness to pay for geothermal service, the Company proposed customer charges and participation fees for the residential, residential low-income, and C&I rate classes (Exhs. FOH-1, at 24-25).

In this proceeding, the Company provides that its proposed \$15.6 million budget is an estimate and that the Company plans to recover the full actual costs of the demonstration

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<sup>18</sup> The estimated budget for a third-party evaluator is \$150,000 each year for four years (Exh. FOH-5 (Rev.)).

project through the LDAC (Exhs. FOH-1, at 10, 30). After consideration of National Grid's description of the potential size, scope, and scale of the Geothermal Project and consistent with the Department's prior approval of demonstration projects, the Department finds it is appropriate to establish a limit on the budget eligible for cost recovery for the Geothermal Project absent prior Department approval. D.P.U. 17-05, at 470; D.P.U. 16-184, at 18; D.P.U. 16-178, at 43. Therefore, the Department approves a budget not to exceed \$15.6 million for the Geothermal Project, and National Grid may submit a petition to the Department for approval of an increase to the budget if necessary.

With respect to the proposed participant contributions, the Company argues that the proposed customer charges and participation fees are reasonable, present great value to participating customers, and meet the standard of review (Company Brief at 17). Nonetheless, the Company acknowledged during this proceeding that low-income customers may find it financially challenging to enroll, and the Company endorsed alternative participation fees by extending the time period for collecting participant fees for residential, low-income, and C&I customers for up to five years as a way to make the monthly cost of participation more affordable and incentivize participation (Exhs. DPU 2-3; DPU 2-11; DPU 2-12; DPU 2-16). After due consideration of the record evidence and arguments presented by the parties, the Department finds that the Company's proposed customer charges and the alternative monthly participation fees of \$60 per month per GSHP unit for residential customers, \$45 per month per GSHP unit for residential low-income customers, and \$90 per month per GSHP unit for C&I customers strike an appropriate balance between the

Company's ability to conduct the demonstration project and enable its learning objectives and ensuring customers have affordable and equitable access to the Geothermal Project

(Exhs. FOH-1, at 23-24; DPU 1-14 & Att.; DPU 2-3; DPU 2-11; DPU 2-12; DPU 2-16 & Atts.).

In support of its proposal, National Grid provided: (1) detailed information on geothermal technology and infrastructure; (2) detailed descriptions of the Geothermal Project's learning objectives; (3) performance metrics; (4) project timelines and milestones; (5) budget estimates; (6) a copy of research and reports on geothermal installations, including the final report on the KEDLI project; (7) conceptual site plans; (8) illustrative terms and conditions for participants; (9) the Company's analysis of participants' potential conversion and operating costs; and (10) potential shared-loop site locations in constrained areas or in areas with LPP scheduled for replacement (Exhs. FOH-1; FOH-2; FOH-3; FOH-5 (Rev.); FOH-6; FOH-8; DPU 1-1 & Atts.; DPU 1-4; DPU 1-5; DPU 1-13, Att.; DPU 1-16 & Atts.; DPU 1-24; DPU 2-3; DPU 2-4; DPU 2-5; DPU 2-9; DPU 2-13; DPU 2-14 & Atts.; DPU 2-18; DPU 3-1; DPU 3-2; DPU 3-4; DPU 3-5; DPU 3-6; DPU 4-4). Based on the record evidence, and with the Department's modifications discussed above, the Department finds that the size, scope, and scale of the Geothermal Project and the associated budget are reasonable in relation to the benefits to be achieved.<sup>19</sup>

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<sup>19</sup> As noted below, the Company must demonstrate the prudence of all expenditures as part of its annual reconciliation filing.



In addition, the Department finds that National Grid's Geothermal Project is not duplicative of NSTAR Gas's geothermal demonstration project because National Grid's Site Concepts prioritize the conversion of various segments of gas customers to geothermal service, including customers in constrained areas, customers in proximity to scheduled LPP replacement projects, and customers in low income and environmental justice communities (Exhs. FOH-1, at 14-15, 37-39; HEET-DCS-1, at 7; DPU 3-20).<sup>20</sup> The Department accepts National Grid's representation that it will ensure each shared-loop site developed as part of the Geothermal Project will be reasonably designed not to duplicate an existing or proposed demonstration project and will not duplicate the other shared loops in the Geothermal Project (Exh. DPU 3-20). Further, the Company demonstrated the potential benefits of allowing the Company's proposed demonstration program to run concurrently with the two other geothermal programs (Exhs. FOH-1, at 37-39; DPU 3-20).

### 3. Adequacy of the Evaluation Plans

The Company provided a detailed set of research questions and metrics to use in evaluating and meeting the Geothermal Project learning objectives (Exhs. FOH-1, at 20-22; DPU 3-4 (Att.)). National Grid explains it will contract with a third-party evaluation, measurement, and verification ("EM&V") firm to measure progress towards the project's learning objectives, measure technical performance of the GSHPs and shared loops, and assess customer benefits and comfort provided by the shared loops (Exhs. FOH-1, at 35;

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<sup>20</sup> As of National Grid's filing, the Attorney General and DOER had not completed the design phase for their geothermal district project (Exh. FOH-1, at 39).

FOH-5, at 1). The Company plans to seek cost recovery and report on the progress and results of its geothermal project, including customer stakeholder and feedback, on or before July 1st of each year (Exh. FOH-1, at 35).

The Department has reviewed and accepts the Company's proposed evaluation plan and preliminary list of research questions. In order to review the costs of the evaluation, the Department directs the Company to provide copies of requests for proposals for the evaluation consultant, submitted proposals, any agreements, and the scope of work, including any additional performance metrics reflecting stakeholder input to the Geothermal Project, when National Grid seeks cost recovery. Additionally, the Department directs the Company to engage with an EM&V firm in the early stages to support baseline cost and GHG emission data for low-income customers and environmental justice communities, and directs the Company provide an update on the aforementioned baselines in its first annual report (Exh. DPU 1-5).

#### 4. Bill Impacts

The Department examines the bill impacts that customers would experience as a result of the demonstration project to assess the reasonableness of the associated costs to an affected customer class. D.P.U. 17-05, at 469; D.P.U. 16-178, at 42; D.P.U. 16-184, at 14-16. National Grid submitted a bill impact analysis based on the estimated cost of the Geothermal Project (Exh. RRPP-4). After review, the Department finds that, on balance, the bill impacts resulting from the Geothermal Project's estimated budget are reasonable. The Department

directs the Company to provide updated customer bill impacts reflecting the reduced monthly participation fee amount with its implementation plan.

C. Other Issues

1. Tariff Modifications

Based on the findings above, it is appropriate for the Company to modify its LDAC tariff as part of its compliance filing in this proceeding. The Department directs the Company to revise its proposed tariff language to reflect the directives in this Order. In addition, the Department notes the following changes: (1) at section 6.14(37), omit the words “average” and “less”; and (2) section 6.14(39) should read, adding the underlined phrase, “the actual investment for assets associated with the Geothermal District Energy Demonstration Program recorded as plant in-service and approved by the Department through the end of the prior GDEDP Investment Year . . .” (Exh. RRPP-5 (proposed M.P.D.U. No. 3.13)). Finally, the Department directs the Company to change all references to “GDEDP” and “GDEDPF” to “GEP” and “GEPF”, respectively, meaning geothermal energy provision and geothermal energy provision factor.

2. Cost Recovery

Only Geothermal Project costs are eligible for cost recovery through the GEPF.<sup>21</sup> With respect to O&M expenses, National Grid must demonstrate that all O&M expenses

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<sup>21</sup> The Company intends to work with participants to utilize Mass Save incentives for energy efficiency investments such as weatherization to improve the Company’s ability to gather data about the performance of geothermal systems through this project (Exh. DPU 1-26). The Company includes energy efficiency costs in its budget outside of its three-year energy efficiency plan in the event that participants

proposed for recovery through the GEPF are (1) incremental to the representative level of O&M expenses recovered through base distribution rates and (2) solely attributable to preauthorized geothermal demonstration project expenses. Massachusetts Electric Company/Nantucket Electric Company, D.P.U. 17-13, at 57 (2018); Model Smart Provision, D.P.U. 17-140-A at 146 (2018); Grid Modernization, D.P.U. 15-120/D.P.U. 15-121/D.P.U. 15-122, at 222 (2018).

As is the case with any costs to be recovered from ratepayers, all Geothermal Project expenditures must be prudently incurred to be eligible for targeted cost recovery. The Department's standard of review on prudence involves a determination of whether a company's actions, based on all that it knew or should have known at that time, were reasonable and prudent in light of the existing circumstances. Attorney General v. Department of Public Utilities, 390 Mass. 208, 229 (1983). Department preauthorization of the Geothermal Project means that the Department will not revisit the prudence of the Company's decision to proceed with those categories of investments. The Department will, however, review the prudence of National Grid's implementation of these investments. D.P.U. 17-13, at 58; D.P.U. 17-140-A at 187; D.P.U. 15-120/D.P.U. 15-121/D.P.U. 15-122, at 220.

As part of this review, the Company must demonstrate that any non-ratepayer funding eligible for use on the Geothermal Project is used to offset the estimated cost of the project.

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require funding that exceeds available Mass Save incentives to meet the project's learning objectives (Exh. DPU 1-26).

D.P.U. 19-120, at 151. Further, consistent with Department precedent and the Geothermal Project's purpose to advance knowledge in the field, National Grid must demonstrate that it coordinated with the Attorney General, DOER, and NSTAR Gas to ensure that the data and insight gathered from the Geothermal Project will be sufficiently distinct from their respective geothermal network projects. D.P.U. 19-120, at 151. Additionally, as a condition of cost recovery, National Grid shall demonstrate that each shared-loop site developed was reasonably designed to evaluate at least one of the proposed Site Concepts (Exh. DPU 3-18). All costs recovered from ratepayers for any expenditures determined to be imprudent shall be refunded through the reconciliation component of the GEPF, with associated interest (Exh. RRPP-5 (proposed M.P.D.U. No. 3.13, § 6.12(35))).

Moreover, the Department emphasizes the importance of the Company's developing and maintaining systematic, ample, and contemporaneous documentation of all Geothermal Project costs for which they seek targeted cost recovery. A failure to provide clear, cohesive, and reviewable evidence demonstrating eligibility will result in disallowance of targeted cost recovery of the expenditures in question. Massachusetts Electric Company, D.P.U. 95-40, at 7 (1995); Boston Gas Company, D.P.U. 93-60, at 26-27 (1993); The Berkshire Gas Company, D.P.U. 92-210, at 24 (1993). National Grid must submit contemporaneous project documentation and other evidence demonstrating that each of these conditions has been met.<sup>22</sup> The Department will review the Company's submissions and

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<sup>22</sup> The Company must provide complete and detailed documentation demonstrating the prudence of capital expenditures for each individual shared-loop site, including a

disallow cost recovery of expenses where the proper showing has not been made. In its annual report filings, the Company shall provide an update on its progress in securing any non-ratepayer funding that can be used to offset the estimated cost of its Geothermal Project.

Lastly, the Department directs the Company to attempt to find a third-party buyer/operator before seeking recovery of any decommissioning costs in a petition before the Department. The Department notes that it will review a request to recover decommissioning costs to the extent that: (1) they are prudently incurred; (2) the Company demonstrates that it has attempted to mitigate costs; and (3) the Company demonstrates that it has made a good faith effort to conduct the demonstration project to directly benefit gas ratepayers in terms of participation or scalability. In the Company's fourth annual report, the Company shall provide a report detailing options for cost recovery of the geothermal systems upon the conclusion of its demonstration project, including addressing system removal and depreciation studies (Exh. DPU 4-6).

The Company proposes to recover the actual costs of the Geothermal Project through the LDAC, to be reconciled against billed revenue annually (Exhs. RRPP-1, at 4-6; RRPP-5 (proposed M.D.P.U. No. 3.13, § 6.12)).<sup>23</sup> The amount included for recovery through the LDAC would be the annual revenue requirement for average annual geothermal investments

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(1) detailed site description, (2) detailed cost estimate, (3) capital spending authorization, (4) variance analysis for a variance between actual and estimated costs that exceeds ten percent; and (5) closure report.

<sup>23</sup> The Company proposes to submit an annual geothermal energy provision factor filing by July 1st, for rates effective November 1st (Exhs. FOH-1, at 10, 35; RRPP-1, at 5).

recorded as in service in the prior year plus the eligible O&M expense incurred in the prior calendar year (Exhs. RRPP-1, at 5; RRPP-5 (proposed M.D.P.U. No. 3.13, § 6.14)). For the first recovery year after the in-service year, the amount would include both the prior calendar year and the current calendar year revenue requirement, and for all future recovery years would include the annual revenue requirement (Exhs. RRPP-1, at 5; RRPP-5 (proposed M.D.P.U. No. 3.13, § 6.14)). The Department finds that the Company's proposal for cost recovery is appropriate, with one exception. Consistent with recovery in other programs, the revenue requirement for the year in which a Geothermal Project investment is placed into service shall be calculated on a monthly basis. E.g., Boston Gas Company, M.D.P.U. No. 60, § 6.13(36); Massachusetts Electric Company/Nantucket Electric Company, M.D.P.U. No. 1445, § 2.11. The Company shall submit the Geothermal Project cost recovery filing as a separate docketed matter no later than July 1st each year, and include testimony and supporting exhibits, including documentation supporting all expenses.

### 3. Implementation Plan

The Company states that it will file an implementation plan for Department review within one year of project approval, prior to commencing construction of any shared loops (Exh. FOH-1, at 15-16). As part of the implementation plan, the Company will establish definitions for what will be owned by customers as part of their GSHP unit and related equipment, and what will be owned by the Company as part of the shared-loop assets (Exh. FOH-1, at 23).

While the Company has provided sufficient information regarding the general design of the Geothermal Project, the Department has concerns with the Company's illustrative customer participation agreement (Exh. FOH-6).<sup>24</sup> The Department directs National Grid to include a standard customer participation agreement ("Agreement") that includes terms and conditions for participants with the Company's implementation plan for the Department's review and approval. The Agreement shall include consumer protections, rights, and obligations including but not limited to: (1) billing and termination procedures consistent with 220 CMR 25.00; (2) the Company's and participants' rights and obligations in the event the participant wishes to voluntarily leave the program and in the event of system performance failure; (3) how the rights and obligations of the Company and participants may change after the conclusion of the demonstration project with respect to the costs of geothermal service; and (4) how the rights and obligations of the Company and participants might change if the Company terminates the Geothermal Project before the end of the five-year term (Exhs. DPU 2-19; DPU 2-20; DPU 3-17). The Agreement shall also include (1) an explanation of the customer charges and participation fees and effective time periods for each, as approved in Section IV.B.2, above; and (2) a statement that National Grid may change any charges or fees associated with the geothermal networks only after notice to the customer and approval by the Department.

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<sup>24</sup> The Company provided an illustrative example of terms and conditions for the Geothermal Project and stated it would further develop the terms and conditions in collaboration with designers; engineers; GSHP installers; EM&V consulting firms; and other parties (Exhs. FOH-1, at 28; DPU 2-23; DPU 2-24).



In addition, the Department directs National Grid to provide a copy of any promotional and application materials prepared for prospective participants with its implementation plan. Promotional and application materials should include information about all costs of participation, including changes in a participant's cost of electricity (Exh. DPU 3-11). Finally, the Department directs National Grid to include a detailed description in the implementation plan of how it has prioritized the participation of existing gas customers (Exh. DOER 1-3).

#### 4. Stakeholder Engagement and Customer Outreach

The Company will collaborate with stakeholder groups and industry organizations and facilitate discussions on how the geothermal industry and utility workforce may evolve in the region (Exh. FOH-1, at 31-32). National Grid also plans to share data and learnings from the Geothermal Project openly and transparently, including collaboration with NSTAR Gas, DOER, and the Attorney General to incorporate findings from their geothermal offerings (Exh. FOH-1, at 32, 39). Further, the Company will engage with low-income customers, customers in environmental justice communities, community organizations, and advocacy groups to gather data on these customers' current energy needs and information on how best to engage these customers about the program (Exhs. DPU 1-5; DPU 2-4; DPU 2-5).

The Department has reviewed the Company's stakeholder engagement and customer outreach proposals and finds they are reasonable. Further, as discussed above, National Grid must demonstrate it has coordinated with the Attorney General, DOER, and NSTAR Gas to ensure that the data and insight gathered from the Geothermal Project will be sufficiently

distinct from their respective geothermal network projects as a condition of cost recovery. Moreover, consistent with the Department's decision in D.P.U. 19-120, at 152-153, the Department directs the Company to (1) distribute a draft annual report to stakeholders for review and welcome comment on the draft filing, including next steps; and (2) include a section in each annual report dedicated to describing the specific stakeholder outreach that was conducted, the input that was provided, and how that stakeholder input was, or was not, incorporated in the demonstration project. The Department also encourages the Company to monitor HEET's community charrettes process and development of standard metrics.

#### 5. Design and Evaluation Recommendations

HEET recommends that the Department direct National Grid to incorporate several design and evaluation modifications into the Geothermal Project (HEET Brief at 26-28). National Grid maintains that it must maintain final decision authority over the design and execution of the Geothermal Project but will strongly consider incorporating HEET's recommendations that align with the Site Concepts; are suitable for specific sites; meet the needs of participating customers; and stay within the project's budget, structure, and timeline (Company Brief at 20, 23-24).

The Department acknowledges HEET's contribution of information on geothermal technology and infrastructure in this proceeding and commends the parties for their willingness to engage and collaborate during the implementation of the Geothermal Project. We encourage National Grid to consider HEET's recommendations that may further the purpose of the Geothermal Project within the budget, structure, and timeline.

V. CONCLUSION

The Department finds the Company's proposal to be in line with the Commonwealth's energy and climate policies, of a reasonable size, scope, and scale in relation to the likely benefits to be achieved, and, subject to the findings above, otherwise consistent with our remaining criteria for evaluating a demonstration proposal. Subject to the directives set forth above and Department approval of terms and conditions for participation in the Company's implementation plan, the Department approves the Company's proposed Geothermal Project.

VI. ORDER

Accordingly, after due notice, public hearing, opportunity for comment, and consideration, it is

ORDERED: That Boston Gas Company's proposed geothermal district energy demonstration project is APPROVED, subject to the modifications contained in this Order; and it is

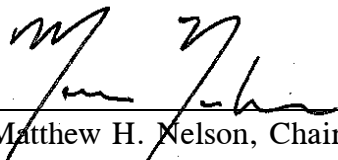
FURTHER ORDERED: That Boston Gas Company's revised tariffs and rate schedules table of contents tariff, proposed M.D.P.U. No. 1.17, and revised local distribution adjustment clause tariff, proposed M.D.P.U. No. 3.13, are DISALLOWED; and it is

FURTHER ORDERED: That Colonial Gas Company's revised tariffs and rate schedules table of contents tariff, proposed M.D.P.U. No. 1.18, and revised local distribution adjustment clause tariff, proposed M.D.P.U. No. 3.13, are DISALLOWED; and it is


FURTHER ORDERED: That Boston Gas Company shall file a revised tariffs and rate schedules table of contents tariff and a revised local distribution adjustment clause tariff consistent with the directives contained in this Order; and it is

FURTHER ORDERED: That Boston Gas Company shall comply with all other directives contained in this Order.

By Order of the Department,

  
Matthew H. Nelson, Chair

  
Robert E. Hayden, Commissioner

  
Cecile M. Fraser, Commissioner

An appeal as to matters of law from any final decision, order or ruling of the Commission may be taken to the Supreme Judicial Court by an aggrieved party in interest by the filing of a written petition praying that the Order of the Commission be modified or set aside in whole or in part. Such petition for appeal shall be filed with the Secretary of the Commission within twenty days after the date of service of the decision, order or ruling of the Commission, or within such further time as the Commission may allow upon request filed prior to the expiration of the twenty days after the date of service of said decision, order or ruling. Within ten days after such petition has been filed, the appealing party shall enter the appeal in the Supreme Judicial Court sitting in Suffolk County by filing a copy thereof with the Clerk of said Court. G.L. c. 25, § 5.