Chapter 5

Additional Policy and Regulatory Issues: A Guide to Building a New Geothermal Energy Industry for the Commonwealth

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By modifying a few existing policies and adopting targeted new ones outlined in this chapter, Pennsylvania could leverage its oil and gas know-how to catalyze geothermal across the Commonwealth, bringing it economic, energy security, and environmental benefits.

INTRODUCTION

According to data from the U.S. Energy Information Administration, Pennsylvania is the second-largest energy producing state in the United States, and a major electricity supplier to the Mid-Atlantic region.[1] As one would expect, especially from an energy leader, the Commonwealth has a suite of energy-related policies, programs, and incentives. While some of them can support geothermal energy development (for heat or electricity), most are broadly designed without significant focus on geothermal.

But small changes to these existing policies and targeted new measures can accelerate the deployment of geothermal energy in Pennsylvania. These include 23 specific actions across the following six key areas of focus:

1. Provide industry with regulatory certainty and eliminate red tape;
2. Encourage adoption of ground source heat pumps for building heating and cooling;
3. Create and expand targeted incentives for direct-use geothermal applications for the industrial and agricultural sectors;
4. Catalyze the creation of thermal energy networks to serve residential, commercial, academic, and public buildings;
5. Advance comprehensive state and regional power

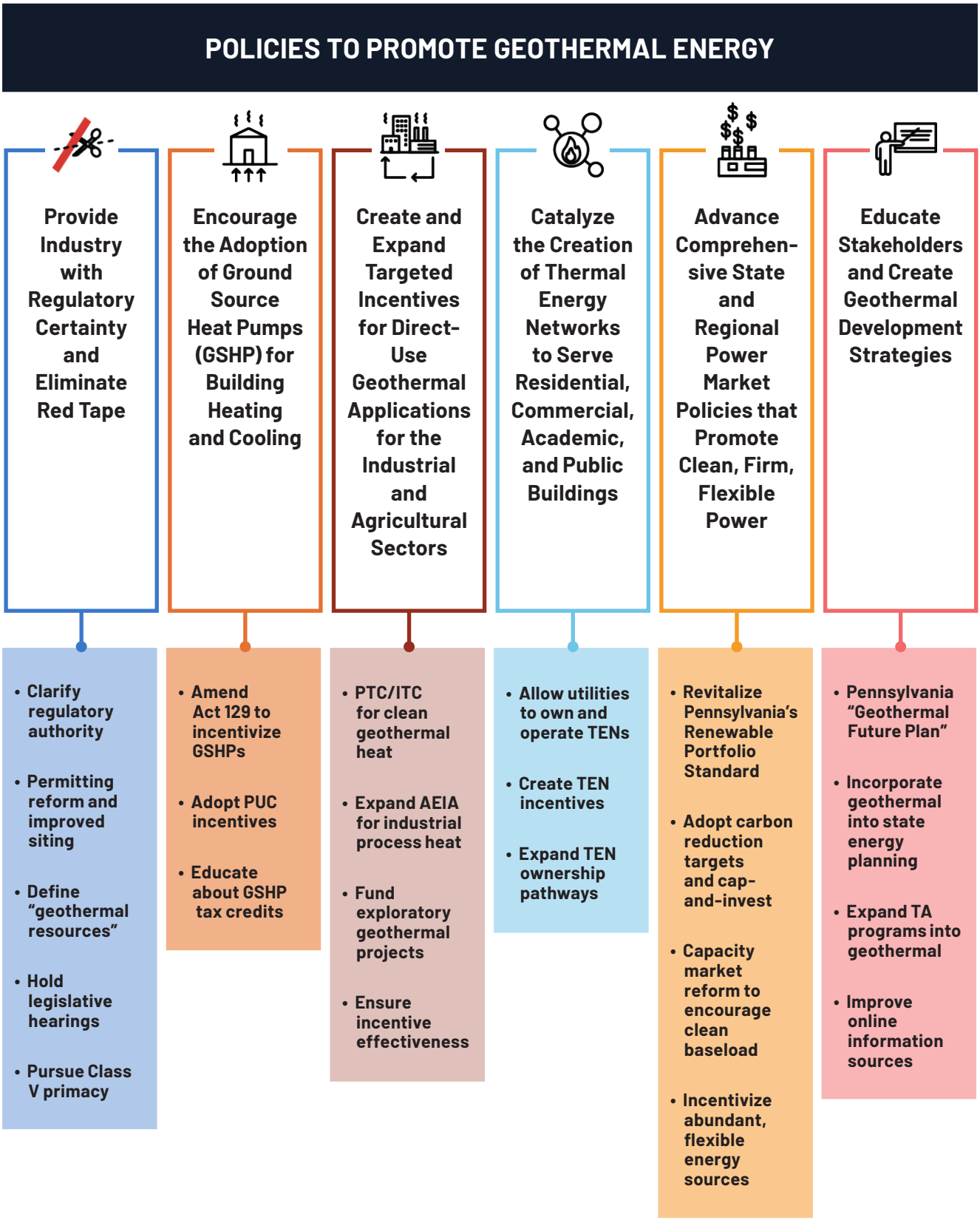
POLICIES TO PROMOTE GEOTHERMAL ENERGY
Provide Industry with Regulatory Certainty and Eliminate Red Tape
Encourage the Adoption of Ground Source Heat Pumps (GSHP) for Building Heating and Cooling
Create and Expand Targeted Incentives for Direct-Use Geothermal Applications for the Industrial and Agricultural Sectors
Catalyze the Creation of Thermal Energy Networks to Serve Residential, Commercial, Academic, and Public Buildings
Advance Comprehen-sive State and Regional Power Market Policies that Promote Clean, Firm, Flexible Power
Educate Stakeholders and Create Geothermal Development Strategies
• Clarify regulatory authority
• Permitting reform and improved siting
• Define "geothermal resources"
• Hold legislative hearings
• Pursue Class V primacy
• Amend Act 129 to incentivize GSHPs
• Adopt PUC incentives
• Educate about GSHP tax credits
• PTC/ITC for clean geothermal heat
• Expand AEIA for industrial process heat
• Fund exploratory geothermal projects
• Ensure incentive effectiveness
• Allow utilities to own and operate TENs
• Create TEN incentives
• Expand TEN ownership pathways
• Revitalize Pennsylvania's Renewable Portfolio Standard
• Adopt carbon reduction targets and cap-and-invest
• Capacity market reform to encourage clean baseload
• Incentivize abundant, flexible energy sources
• Pennsylvania "Geothermal Future Plan"
• Incorporate geothermal into state energy planning
• Expand TA programs into geothermal
• Improve online information sources

Figure 5.1

market policies that promote clean, firm, flexible power; and

6. Educate stakeholders and create geothermal development strategies.

Collectively, these 23 targeted actions, described in more detail below, can help make Pennsylvania a geothermal leader and ensure the Commonwealth continues as an energy-producing powerhouse.

CURRENT POLICY CONTEXT

Pennsylvania is no stranger to promoting energy development. The policies, programs, and incentives already in place that could accelerate geothermal energy development in the Commonwealth include:

- *Alternative Energy Investment Act (AEIA) Programs*—This Act[2] was passed in 2008 when the nation was dealing with high fuel costs and wholesale electricity prices.[3] The Act established several grant and loan programs for businesses, municipalities, and individuals to pursue alternative energy projects. The programs are jointly administered by the Pennsylvania Department of Environmental Protection (DEP) and the Department of Community and Economic Development (DCED) through the Commonwealth Financing Authority (CFA). Some of them could be applied to geothermal. For example, under DCED's Renewable Energy Program, ground-source heat pumps (GSHPs) for small businesses and individual residences are eligible for CFA-administered loans that can cover as much as 50 percent of the installation cost.[4]

- *Alternative Energy Portfolio Standard (AEPS)*—This Act, of 2004, established a set of statewide mandates for electric distribution companies in Pennsylvania to buy power from alternative generation sources.[5] The AEPS divided qualifying technologies into two tiers, with distribution companies needing to meet different requirements for each tier on an escalating basis, as shown in Figure 5.1. Geothermal energy is included in Tier I, along with wind, low-impact hydropower, and other resources. The AEPS narrowly defined geothermal as "electricity produced by extracting hot water or steam from geothermal reserves in the earth's crust and supplied to steam turbines that drive generators to produce electricity."[6] No electric distribution company has used geothermal to meet the requirements to date. The final target increases under the AEPS occurred in 2021; the program requirements will remain on a plateau until the state legislature takes action to renew or update them.

- *Pennsylvania Energy Development Authority (PEDA) Funding*—PEDA finances clean energy projects in the Commonwealth, primarily through loans and loan guarantee programs. Funding is aimed at helping with residential efficiency upgrades and household electrification, including for geothermal projects.[7]

- *Reducing Industrial Sector Emissions in Pennsylvania (RISE PA)*—In August 2024, DEP received a Climate Pollution Reduction Grant from the U.S. Environmental Protection Agency (EPA) of almost $400 million to implement the RISE PA program to reduce emissions from the state's industrial sector. Geothermal projects qualify for RISE PA funding, but as of this writing none of the funds have been distributed yet.

POLICY RECOMMENDATIONS

While the policies described above provide a foundation for progress on geothermal energy in Pennsylvania, more could be done to catalyze geothermal development. Minor changes to these existing policies and creation of new policies and programs could advance Pennsylvania's geothermal energy leadership. This report recommends 23 targeted ideas across six areas of focus as described below.

I. Provide Industry with Regulatory Certainty and Eliminate Red Tape

Pennsylvania has relatively clear regulatory structures related to energy, as one would expect from an energy leader, but state regulatory language and structures are not yet where they could be with respect to geothermal. Pennsylvania could:

1. Clarify regulatory authority for geothermal development.

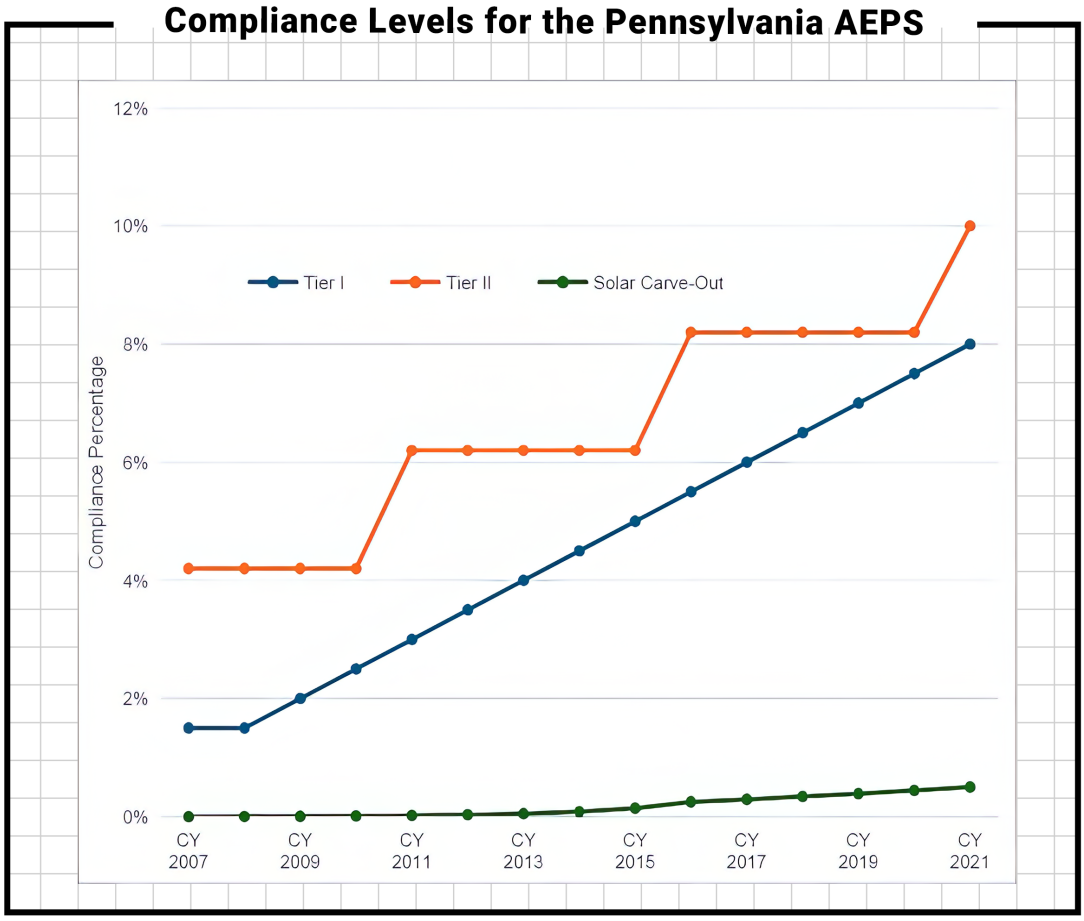

Figure 5.1: Author graph based on data from the Database of State Incentives for Renewables & Efficiency (DSIRE). Source: https://programs.dsireusa.org/system/program/detail/262/alternative-energy-portfolio-standard

Who Takes Action: General Assembly

There is no clear, designated regulator in Pennsylvania to whom geothermal developers can submit plans for approval. Pennsylvania's water well drilling statute imposes some minimal requirements on "non-oil and gas wells" which are designed to protect water resources from pollutants,[8] however these aren't adequate for next-generation geothermal. Deep geothermal wells are quite similar to oil and gas wells; Pennsylvania's oil and gas is regulated via the Office of Oil and Gas Management within DEP. Given the similarity of operations and well-developed nature of Pennsylvania's oil and gas regulations, the General Assembly could designate the same office (perhaps with a broadened name) to regulate next-generation geothermal drilling. These regulations could contain similar safety protocols as for oil and gas, with the caveat that, given the greatly reduced risk of environmentally damaging spills and the absence of a need to manage pooling of mineral rights, geothermal permitting is much simpler than oil and gas permitting.

2. Accelerate clean geothermal with permitting reform and improved siting.

Who Takes Action: General Assembly; Executive agencies (Governor's Center for Local Government Services for model ordinances)

Getting energy infrastructure built for thermal or electricity needs is hard. Pennsylvania could enact permitting reform to streamline geothermal permitting timelines and ensure timely completion of environmental review of projects. Such streamlining would be especially helpful for shallow GSHPs, as the environmental impacts are typically minimal and well understood. State agencies, led by the Governor's Center

for Local Government Services within the DCED, could develop model ordinances that municipalities or other local governments could use to address local zoning issues associated with siting of geothermal and other clean energy projects.

In addition, in May 2024, the Pennsylvania Senate passed SB 832 along party lines. If it were to pass the House and be signed into law, the bill would reorganize the Pennsylvania Energy Development Authority as the Pennsylvania Opportunities with Energy Reliability (POWER) Authority. As with PEDA, the POWER Authority would still fund demonstration of innovative energy projects, but it would also fund research projects for energy extraction, transmission, storage, conversion, or any other project that increases the use or movement of energy in the Commonwealth. The POWER Authority would then create an accelerated alternative permitting program, authorizing third-party professionals to review permits for new electric generation projects and waiving regulations hindering their construction or operation. While further details on applicable project criteria would need to be defined, geothermal (for heat and for power generation) would likely be eligible for funding and may be eligible for the accelerated permitting approach. As of this writing, a different PEDA reform bill that passed the House (HB 2338) is pending in the Senate. HB 2338 would reform PEDA to enable it to better apply for and leverage various federal funding streams that could accelerate clean energy deployment in the Commonwealth.

3. Define "geothermal resources."

Who Takes Action: General Assembly

As mentioned, the AEPS defines geothermal solely in the context of electricity generation. This is the only

statutory definition of geothermal in Pennsylvania. Development of in-state geothermal requires a regulatory pathway, and any regulatory pathway must first have a clear understanding of which energy sources are covered. NREL provides a set of best practices to use when crafting definitions for geothermal.[9] Paired with the proposal on regulatory clarity, the General Assembly could adopt a definition for geothermal that focuses on the resource (hot rock) rather than the use case (heat vs. power), which is especially important when geothermal can be deployed for multiple cascading uses.

4. Hold legislative hearings on geothermal development.

Who Takes Action: General Assembly

Advancing any of the recommendations above will benefit from congressional committee hearings. The Environmental Resources and Energy Committees in both the Pennsylvania House and Senate could hold hearings on geothermal energy production and potential applications in power, industry, buildings, and other areas. These committees have held multiple hearings in recent years on solar, wind, and nuclear energy, as well as energy efficiency, but none on geothermal.

5. Pursue "primacy" for Class V non-hazardous fluid injection wells.

Who Takes Action: Governor (letter of support), General Assembly (statutes and appropriations), DEP (regulations), Attorney General (letter certifying adequate statutory and regulatory authority).

The federal Clean Water Act (CWA) gave the EPA the authority to regulate all underground injection of fluids to ensure substances pumped into the subsurface don't contaminate aquifers and sources of drinking water. All deep geothermal wells fall under the EPA's Class V rule, which regulates the injection of non-hazardous fluids. To reduce the burden on the federal bureaucracy, the CWA allows states with regulatory processes at least as stringent as the EPA's to manage their own in-state wells.[10] Pennsylvania could apply for this "primacy" designation, further accelerating the geothermal permitting process.

II: Encourage Adoption of Ground Source Heat Pumps for Building Heating and Cooling

Ground source heat pumps provide heating and cooling with one set of equipment. GSHPs are clean, exceedingly energy efficient, and cost-saving for Pennsylvania consumers. A recent DOE study found that widespread use of GSHPs would reduce US annual electricity demand by about 15 percent and reduce electrical grid requirements by 33 percent, bringing significant cost savings to consumers.[11] To promote GSHP deployment and tap into these savings, Pennsylvania could:

1. Amend Act 129 to account for total energy savings from fuel switching.

Who Takes Action: General Assembly

Act 129 is Pennsylvania's principal energy efficiency law. The law is squarely focused on reducing electricity use and requires the state's electric distribution companies to demonstrate annual reductions in total electric energy demand during both peak times and throughout the year. It does not account for emissions reductions due to electrification as a form of "fuel switching." As it stands, converting a home from fuel oil to a GSHP does not meet the requirements of the law because, even though installing GSHPs improves overall energy efficiency (and reduces emissions), heat pumps use small amounts of electricity and thus increase total electric load.[12] Vermont[13] has adopted a more holistic energy efficiency program to incentivize homeowners and builders to install geothermal systems, aligned with the overall decrease in energy use. Likewise, states such as Illinois[14] and Minnesota[15] permit utilities to incorporate fuel-switching into energy efficiency portfolios.

2. Enact policies at the PUC that accelerate the use of GSHPs.

Who Takes Action: PUC

There are multiple actions the Pennsylvania Public Utility Commission (PUC) could take to accelerate adoption of GSHPs. It could, for instance, authorize electric distribution companies to enact rebate programs that help reduce the costs to consumers of converting to GSHPs, particularly for consumers who use heating oil.

Maine has pursued such a policy, offering a $3,000 rebate for GSHPs.[16] In addition, the PUC could quantify how much GSHPs help reduce peak-energy loads, and integrate that value into program and utility funding, perhaps in areas of the state with high load growth forecasts.

3. Engage in awareness-building about the new economics of GSHPs.

Who Takes Action: Any state agency with a nexus to building owners, especially public sector owners such as municipalities, school districts, higher education, and health care facilities.

With tax credits existing as of publication of this report, GSHPs may be the lowest first-cost HVAC system option for new construction, major modernizations, and perhaps even system replacements. Building owners, especially large public sector customers, could be good targets for an awareness-raising campaign and technical assistance. Engaging private sector partners such as architects and HVAC designers to ensure they are aware of how the IRA tax credits affect relative system costs could be a valuable way to support a wide array of construction projects. Finally, finding opportunities for agencies to require and support lifecycle cost analyses that incorporate available tax credits could help drive demand for GSHPs by building owners.

III. Create and Expand Targeted Incentives for Direct-Use Geothermal Applications for the Industrial and Agricultural Sectors

As noted in Chapter 3: Geothermal Direct-Use Opportunities, Pennsylvania is the nation's fourth-largest industrial consumer of energy, and meaningful amounts of industrial thermal demand could be well-served by direct use of geothermal energy. Pennsylvania's industrial emissions are also expected to grow as needs like controlled-environment agriculture (greenhouses) expand and as data centers seek to build near low-cost energy supplies. Targeted incentives could accelerate the deployment of direct-use geothermal heat in industry and agriculture. Possible actions include:

1. Enact a production tax credit and/or an investment tax credit for clean geothermal heat.

Who Takes Action: General Assembly

The Pennsylvania General Assembly could establish an industrial process heat credit to support the generation of geothermal heat for use in agriculture, manufacturing, and other strategic sectors. Such a credit should be limited to heat directly related to an industrial process—like heating foodstuffs (e.g., pasteurization or tempering), melting materials, or driving chemical reactions. Allowing the credits to be transferable would provide developers an upfront source of financing, helping them to more readily deploy capital-intensive next-generation geothermal projects.

2. Expand AEIA grant and loan programs to include clean industrial process heat.

Who Takes Action: General Assembly

As noted, Pennsylvania offers grant and loan programs under the AEIA, such as a renewable energy loan program that includes GSHPs. However, the statutory language orients these programs towards residential and small businesses for heating and cooling buildings. Expanding the renewable energy loan program to include users of clean industrial process heat, such as controlled-environment agriculture, dairy processing, or low-temperature petroleum refining, could simultaneously support strategic industries in Pennsylvania, add more renewable energy to the grid, and accelerate the development of the state's geothermal energy industry.

3. Fund exploratory geothermal projects.

Who Takes Action: General Assembly

The DEP and DCED could support next-generation geothermal energy exploration efforts in promising regions across Pennsylvania. For example, Chapter 2, Where to Develop Geothermal highlighted the possibility that the greater Philadelphia area may have good geothermal potential. Funding for exploration wells could help overcome first-of-a-kind barriers, confirm the geothermal resource potential, and lead to geothermal heat pilot projects. Funding for exploratory efforts would require some level of fiscal authorization.

4. Ensure incentive effectiveness.

Who Takes Action: Governor

The Governor's office could convene a group of industrial stakeholders to refine proposals for the above policies to ensure they will incentivize the uptake of geothermal heat.

IV. Catalyze the Creation of Thermal Energy Networks for Residential, Commercial, Academic, and Public Buildings

Pennsylvania could adopt policies and initiatives to promote development of geothermal district heating and cooling, or (TENs). Deploying more TENs could provide clean, affordable heating and cooling to neighborhoods and networks of buildings. The Commonwealth could:

1. Allow gas utilities to build, own, and operate TENs.

Who Takes Action: General Assembly

Gas-fired district heating services already exist in Pittsburgh and Harrisburg, which are regulated by the (PUC). It is not a jump to convert natural gas utilities to directly provide geothermal heating and cooling, as much of the fuel these entities distribute is already used for building heat. And gas utilities already have the experience, workforce, and infrastructure to develop and distribute thermal energy across wide areas. However, current Pennsylvania statutory language is likely to make it difficult for existing natural gas utilities to convert their distribution networks to geothermal district heating. Under state law, a PUC-regulated natural gas distribution company is defined as: "A public utility or city natural gas distribution operation that provides natural gas distribution services and which may provide natural gas supply services and other services."[17] While TENs may be allowed as an "other service" under the definition, the statutory language may be interpreted to require the provisioning of natural gas, making it challenging for Pennsylvania utilities to widely adopt alternative building heating and cooling methods. At the very least, the language is ambiguous. New York and Maryland, with support from gas utilities, labor, and environmental stakeholders, have modified statutory definitions to make it clear that gas utilities can distribute "heat," including through the creation of TENs.[18] Pennsylvania could follow the example set by these states and clarify in statute that gas utilities may opt to build, own, operate, and convert existing natural gas distribution into geothermal TENs.

2. Provide incentives for and encourage adoption of TENs.

Who Takes Action: General Assembly (for financial incentives); Executive agencies and other public entities with large buildings (for serving as anchor tenants) .

Beyond merely allowing the creation of geothermal district heating networks, Pennsylvania could take steps to actively encourage them. Massachusetts, for instance, has a law that allows for networked geothermal projects to be funded out of dollars earmarked for gas-pipe replacement.[19] In Colorado, the state energy office has a Geothermal Energy Grant Program that provides funding support for eligible public and private entities to develop geothermal energy projects, including TENs.[20] Minnesota requires utilities to develop innovation plans, including plans for adoption of ground source "district energy" systems;[21] the state also passed a new law in 2024 bolstering financial support for TENs, including via appropriations for geothermal planning grants and statewide TEN deployment studies.[22] Another form of support could be for publicly owned buildings to serve as "anchor tenants" for TENs, guaranteeing offtake for entities willing to develop the networks.

3. Expand the range of potential owners/operators of TENs.

Who Takes Action: General Assembly

Pennsylvania law could broaden opportunities for TEN development. Vermont law, for instance, opens multiple pathways for TEN ownership.[23] Municipalities can form thermal energy utilities without PUC approval (as they do for water and sewer utilities); existing utilities, businesses, developers, co-ops, and nonprofits can also seek authorization to operate TENs under PUC supervision, setting rates and providing service to thermal energy customers.

V. Advance Comprehensive State and Regional Power Market Policies that Promote Clean, Firm, Flexible Power

In addition to the thermal-focused policies recommended above, there are more comprehensive state policies that could accelerate clean energy broadly, including geothermal applications in electricity. Given the state's status as a major electricity producer, the rising demand for power, and policy initiatives to reduce the environmental and climate impacts of electricity generation,[24] it is important to consider ways to encourage geothermal power development. In addition to some of the policies already listed (such as AEPS renewal), Pennsylvania could advocate for changes in the design of regional power markets to create incentives for clean firm power sources such as geothermal. As explored in *Chapter 2, Where to Develop Geothermal*, the Commonwealth has some hotspots that are suitable for geothermal power generation.

1. Renew, revise, and revitalize the Commonwealth's alternative energy portfolio standard to incentivize next-generation geothermal power and heat.

Who Takes Action: General Assembly

As noted, the AEPS already includes geothermal among the Tier I resources, but its targets have plateaued, and no geothermal has been used to meet the Tier I targets. The AEPS could be renewed, with added provisions to benefit both geothermal heat and power. Governor Shapiro recently proposed an AEPS renewal through his Pennsylvania Reliable Energy Sustainability Standard (PRESS), but policymakers should also consider replicating two aspects of the original AEPS—ones that have helped to jump-start solar energy—for geothermal in Pennsylvania.

First, Pennsylvania could establish a modest but separate compliance target for geothermal technologies, akin to the 0.5% solar set-aside in the AEPS. As Figure 5.2 suggests, the separation of solar energy from other Tier I resources yielded credit prices high enough to induce investment, and as the solar industry matured and costs fell, solar credit prices also fell. Other states are taking similar action for geothermal energy. Maryland[25] and Virginia,[26] for example, have recently passed laws that create or explore set-asides for geothermal heating and

cooling within their Renewable Portfolio Standards. In October 2023, California passed a law aimed at accelerating procurement of reliability-enhancing zero-carbon resources, including geothermal.[27]

Second, to bolster the development of the geothermal industry in Pennsylvania, the Commonwealth could require geothermal resources to be in-state to qualify for credits. That would be a shift similar to a 2017 amendment to the AEPS establishing in-state solar requirements, which led Pennsylvania solar investment to increase by roughly a factor of four.[28]

2. Adopt broad carbon reduction targets and carbon pricing.

Who Takes Action: General Assembly

Pennsylvania has no binding policy target to reduce the greenhouse gas intensity of its energy sector or broader economy. In 2019, Governor Tom Wolf directed the DEP to develop a rule that would permit Pennsylvania to enter the Regional Greenhouse Gas Initiative (RGGI), a cap-and-trade program for the electric power sector in which several northeastern states currently participate. RGGI participation would have placed an explicit price on greenhouse gas emissions from certain power plants in Pennsylvania.[29] Pennsylvania's move to join RGGI is, at the time of this writing, in legal limbo as the Pennsylvania Supreme Court considers challenges. The Shapiro administration has proposed its own carbon policy for the electric power sector, the Pennsylvania Carbon Emissions Reduction Act (PACER), a Pennsylvania-only emissions cap-and-invest regime. Whether through RGGI, PACER, or an economy-wide (as opposed to electricity-only) system, pricing carbon emissions would benefit geothermal energy technologies (and all low- or zero-carbon energy resources) by making them more economically competitive relative to fossil fuels.

3. Encourage clean baseload power in capacity markets.

Who Takes Action: PUC

PJM, the regionally administered grid operator, operates a forward market for electric generation capacity to ensure there are sufficient resources to meet future demand. This market is cost-driven and doesn't, at the moment, differentiate between resources based on their carbon footprint. A recent study by PJM recognized that growth in weather-dependent renewable power generation (especially if not coupled with large-scale energy storage) will likely not be sufficient to meet increasing electricity demand.[30] New baseload resources will be needed. PJM has recently reformed its capacity market to reflect how weather-dependent resources can participate. This type of capacity market approach is advantageous for geothermal power, but Pennsylvania should continue to advocate for capacity market reforms that encourage rapid and substantial investments in the generating of clean firm power.

4. Encourage flexibility in energy markets.

Who Takes Action: PUC

PJM's grid has a need for increased flexibility to allow the grid to absorb higher levels of renewable generation, and manage larger levels of distributed generation and price-based demand response.[31] The PJM market, however, has no current way to incentivize or price flexible services like what geothermal could provide. Pennsylvania could advocate within PJM for the rapid development of such a flexibility market design.

VI. Educate Stakeholders and Create Geothermal Development Strategies

A fundamental challenge to accelerating geothermal energy deployment in Pennsylvania is that many stakeholders don't know much about it, or don't know it is an option in the Commonwealth today. The government could pursue a range of initiatives to educate stakeholders about the potential of next-generation geothermal, and develop strategies to realize it. Pennsylvania could:

1. Develop a Pennsylvania Geothermal Future Plan.

Who Takes Action: Governor, DEP

The Energy Programs Office (EPO) at DEP (or another entity) could spearhead the development of a roadmap charting the future of geothermal energy growth in Pennsylvania. Such a report could be modeled after the Pennsylvania Solar Future Plan,[32] both in the

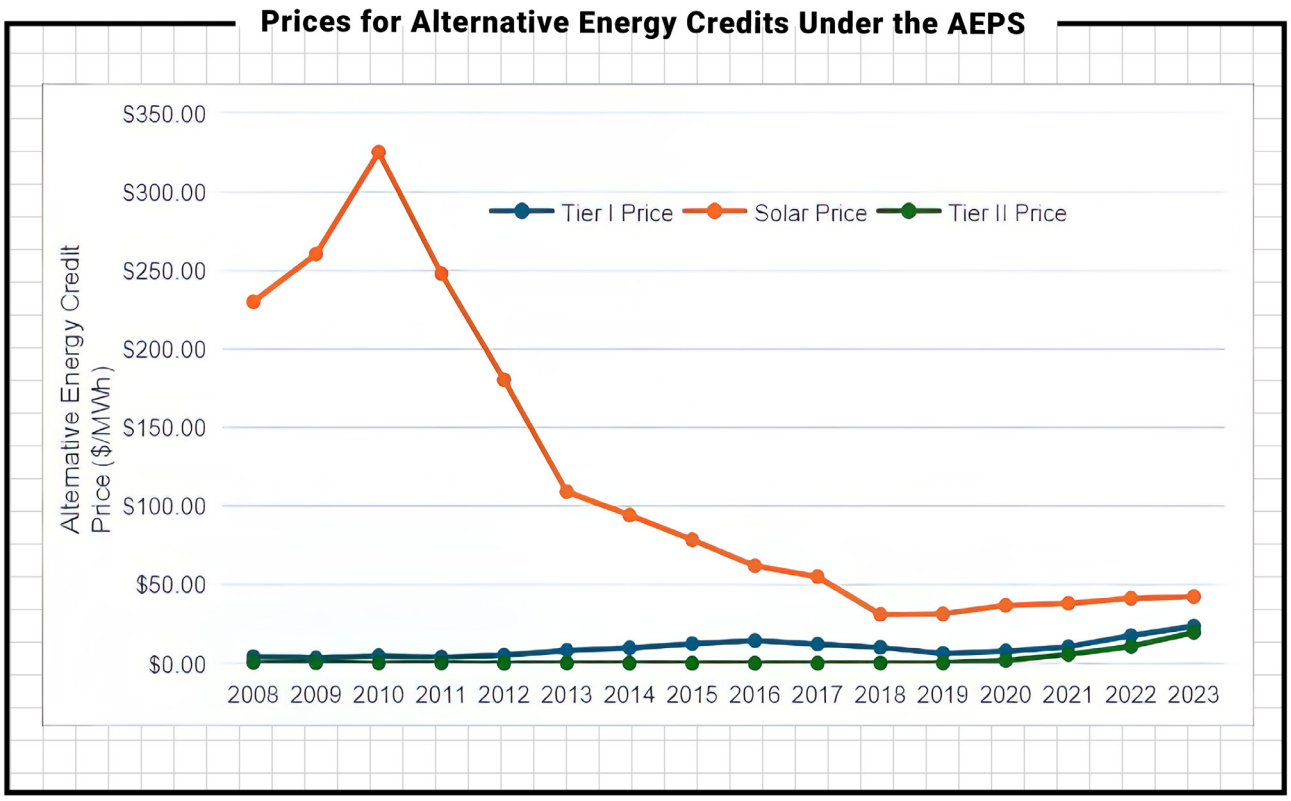

Figure 5.3: Source: Author graphics based on data from the Pennsylvania PUC

scope of its analysis and recommendations, and in its multi-stakeholder approach. Focus areas for a Pennsylvania Geothermal Future Plan could include:

- Assessments of geothermal energy's potential to support the energy needs of strategic sectors of the Pennsylvania economy, including agriculture and manufacturing. This could draw on existing technical assessments of geothermal heat and electricity generation resources (including information in chapters 2 and 3 of this report).

- Strategies and recommendations for how next-generation geothermal could power and cool data centers in Pennsylvania.

- Ambitious but realistic ten-year targets for geothermal energy deployment in Pennsylvania. Targets focused on industrial heating (including agriculture) and building space could be especially useful in giving direction to other potential support mechanisms recommended in this chapter.

- Prioritization of policies to support geothermal deployment targets. This could include incentive programs, ways to reduce administrative burdens or barriers at multiple levels of government, and other measures laid out in this chapter.

- Strategies to harness the deep technical expertise of Pennsylvania's oil and gas sector to support subsurface energy development via geothermal. Oil and gas producers, for example, could earn incentives for drilling geothermal wells.

- Assessment of workforce needs to support a robust geothermal industry in Pennsylvania. This is another area where Pennsylvania's long history of oil and gas development could be leveraged to promote geothermal development.

- Proposals for how government procurement could leverage next-generation geothermal, as it has for a range of other technologies.

- A roadmap for expedited geothermal well and surface facility permits from federal and state regulators.

- Strategies to increase federal geothermal funding in Pennsylvania. For example, Pennsylvania could help farmers and manufacturers using low-temperature thermal energy apply for Rural Energy for America Program (REAP) loans and grants to convert processes to geothermal.[33]

2. Incorporate geothermal into state energy planning.

Who Takes Action: Governor, DEP

The EPO could include a greater role for technologically mature and next-generation geothermal energy in its next Clean Energy Program Plan. The plan is a strategic document that guides the EPO's priorities for programs and activities in clean energy and energy efficiency, among other areas. The current version of the plan will need to be updated at the end of 2025.[34] Several priority areas identified in the current plan are relevant to geothermal energy in Pennsylvania, particularly around energy efficient buildings and industrial decarbonization, but the EPO's discussions of these areas do not currently address geothermal specifically. Geothermal energy is also not considered in the current plan's portfolio of emerging technologies. In the next iteration of the Clean Energy Program Plan, the EPO could more explicitly consider how geothermal energy could contribute to both current and emerging strategic clean energy needs in Pennsylvania.

3. Offer technical assistance for implementing geothermal projects.

Who Takes Action: Governor, PennTAP

Pennsylvania could support a technical assistance program specifically for geothermal. Existing programs of this type in Pennsylvania, like Penn State's PennTAP, focus on end-use energy efficiency (including building energy audits) and combined heat and power technologies.[35] Technical assistance programs help to identify potential users and applications, perform research to outline use cases and benefits, and produce informational resources. A geothermal-specific program could also help with initial feasibility analysis. These types of programs are primarily aimed at larger commercial and industrial customers, but with time and sufficient resources, they could expand to residential and smaller commercial applications (particularly if Pennsylvania could improve incentives for geothermal adoption in residential or small commercial properties). Agricultural applications for geothermal could also be considered as part of such a technical assistance program.

In conjunction with a technical assistance program, state agencies could produce a geothermal playbook that walks school districts, universities and colleges, hospitals, and other big public campuses through the benefits of GSHPs, the steps needed to develop GSHP projects, and the federal tax incentives available.

4. Provide more information on geothermal energy on state websites.

Who Takes Action: Governor, DEP

The EPO could provide more resources about geothermal energy, particularly for direct-use geothermal. The EPO currently offers limited information on next-generation geothermal energy compared to other renewable sources, with only a brief overview of geothermal heating and cooling systems. The content could be expanded to provide more location-specific information about geothermal resources for commercial and industrial customers. It could also identify which electric distribution companies in Pennsylvania offer rebates for residential geothermal heat pumps.

CONCLUSION

Existing measures such as the AEPS, PEDA, and RISE PA could help accelerate geothermal development in Pennsylvania, but additional policies, programs, and initiatives are needed. Implementing the recommendations in this chapter could harness the state's energy leadership and expertise in subsurface energy development to deploy ground-source heat pumps and spur development of next-generation geothermal for industrial direct-use, thermal energy networks, and geothermal power production. Doing so would create economic savings for consumers, create jobs that benefit labor unions and oil and gas companies, and reduce emissions and improve air quality.

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