

The Thermal Workforce

Building Pennsylvania's Clean Heat Workforce



Pennsylvania's heating and cooling systems are entering a period of transition. Gas infrastructure costs are rising even as household gas use declines, increasing the need to scale cleaner, more affordable ways to heat and cool buildings. This transition will require significant investments in energy efficiency, electrification, geothermal, and neighborhood-scale infrastructure.

Pennsylvania's long history as an energy producer means the Commonwealth already has much of the skilled workforce needed to build this future. Roughly **140,000** drillers, pipefitters, electricians, HVAC technicians, insulators, utility workers, and workers across other skilled trades make up the Commonwealth's **thermal workforce**, spanning fossil fuel and clean energy systems. Many have skills that can transfer directly to emerging clean thermal technologies as infrastructure needs evolve.

The Thermal Workforce

- **140,000:** estimated workers in Pennsylvania's thermal workforce
- **82,000:** building energy contractors, the workforce's largest category
- **100,000+:** workers already employed in Pennsylvania's broader clean energy economy
- **300+:** energy-efficiency-related training programs across the Commonwealth

Organized Labor and Independent Contractors

Pennsylvania's thermal workforce includes both **organized labor** and **independent contractors**, with each playing an important role. Independent contractors perform much of the building-level work needed for the transition, including HVAC installation, weatherization, electrical upgrades, plumbing, and heat pump installation.

Organized labor is especially well suited to larger, coordinated infrastructure projects such as thermal energy networks and neighborhood-scale electrification. By aggregating work across multiple buildings, these projects can create the scale and continuity needed to support union crews, apprenticeships, prevailing wages, and long-term workforce planning. Together, organized labor and independent contractors can support the thermal transition at both the infrastructure and building scale.

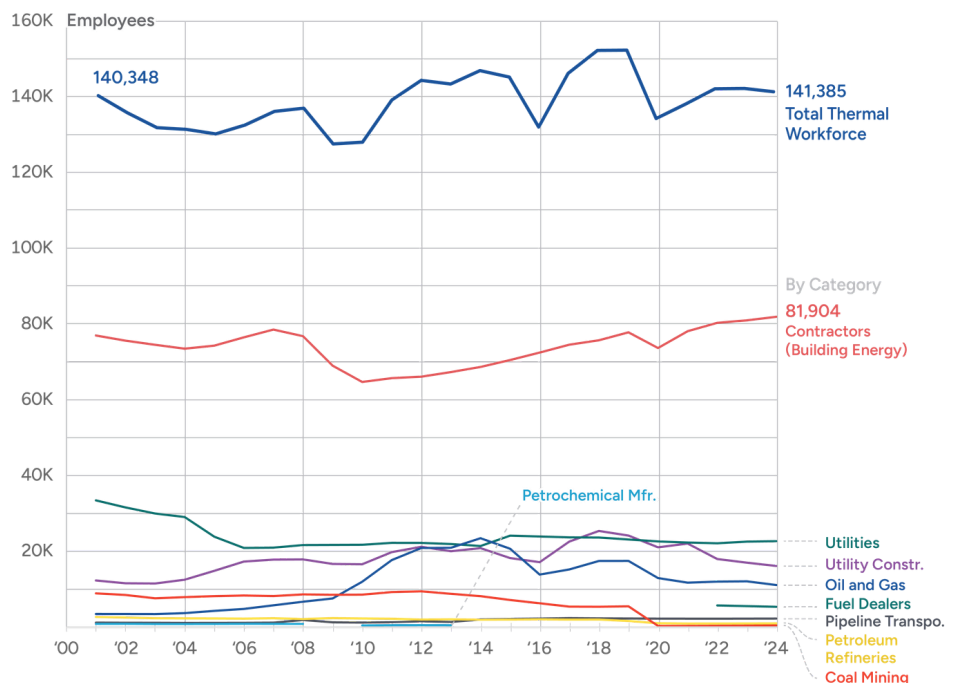
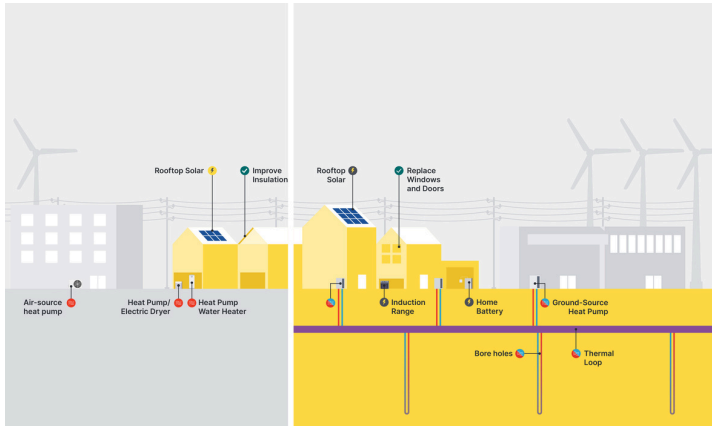


Image: The Thermal Workforce. Top line: Total thermal workforce employment. Bottom line: Thermal workforce by category

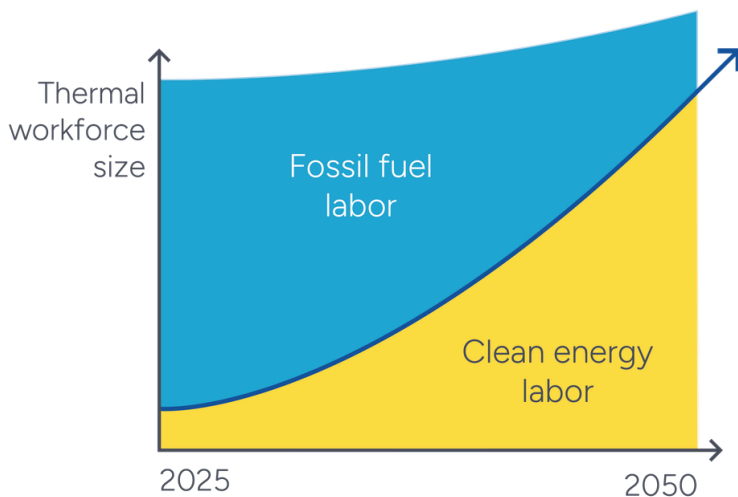
From Gas to Geo

Thermal energy networks (TENs) offer a direct pathway for transferring existing fossil fuel skills into clean thermal infrastructure. TENs use underground piping and borefields to provide shared heating and cooling to multiple buildings.



Neighborhood-scale solutions include electrification (left) and TENs (right).

Gas utility workers who install and maintain mains and services can perform comparable work on TENs, which use similar pipes and installation methods. For example, a driller working primarily on oil and gas projects today can increasingly apply similar expertise to geothermal wells and borefields with targeted retraining. These transferable skills can help retain experienced workers while expanding the workforce needed for the thermal transition.



An illustration of the shift from traditional fossil fuel work to clean energy work

How to Support the Thermal Workforce

Pennsylvania already has substantial training capacity, but programs remain fragmented across regions and occupations, and small contractors often face barriers to taking workers off job sites for training. Workforce development must therefore advance alongside clean heat deployment, with predictable, long-term project pipelines that support investment in training, apprenticeships, equipment, and business growth.

Key recommendations include:

- **Creating durable project pipelines:** Pair workforce development with long-term clean heat investments that provide predictable, sustained demand for skilled labor.
- **Expanding and coordinating training:** Build on existing apprenticeships, training programs, and credentials while improving regional coordination and access.
- **Supporting high-road jobs and small businesses:** Apply strong labor standards to large projects while providing training and technical assistance for independent contractors.
- **Planning with workers and communities:** Engage labor, contractors, utilities, and communities early in thermal infrastructure planning and project development.
- **Adopting a unified thermal workforce framework:** Treat gas, electrification, geothermal, efficiency, and thermal network workers as part of one evolving workforce with transferable skills.