Energy Efficiency Workforce Pathways and Training Resources
The Corps Network

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National Renewable Energy Laboratory
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Since 2020, the U.S. Department of Energy (DOE) has partnered with 40+ national stakeholders in setting and meeting goals to:

- Increase interest and awareness of building energy efficiency careers nationwide
- Simplify and streamline pathways from education training and apprenticeship to careers
- Augment existing education, training, and apprenticeship programs to fill knowledge gaps and improve skill competencies.

The Corps Network (TCN) is a BBWA partner!
In spring of 2022, The Corps Network (TCN) was awarded technical assistance from the BBWA, to provide information on:

1. Careers and career pathways in energy efficiency
2. Knowledge, skills, and certifications recommended or required for those pathways
3. Existing training and resources available for Corps.
4. Energy efficiency regional jobs market analyses for 3 TCN members

The results from the TA are summarized in this presentation, and will be available in a published NREL report by the end of the year.
Agenda

1. Employment in Energy Efficiency
2. Career Pathways in Energy Efficiency
3. Home Energy Professional – Skills and Certifications
4. Training Resources
5. Case Studies
6. Technical Assistance Opportunity
Employment in Energy Efficiency
Overall Employment

99.8% of counties have energy efficiency workers

Data Source: E4TheFuture (2021)
Jobs and Demand

Energy Efficiency Employment by Industry

- Construction: 54%
- Manufacturing* and Trade: 24%
- Professional and Other Services: 22%

* Manufacturing employment only includes jobs involved in the production of energy efficiency goods, not jobs involved in making manufacturing facilities or processes more energy efficient.

Energy Efficiency Employment by Sector

- Heating, Ventilating, and Air Conditioning (HVAC): 48%
- ENERGY STAR® (Appliances and Efficient Lighting): 29%
- Building Materials and Insulation: 19%
- Other (energy audits, building certifications, software, etc.): 4%

The median hourly wage for energy efficiency workers was $24.44, 28% higher than national median.

<table>
<thead>
<tr>
<th>Energy Efficiency Occupations, 2019 Median Hourly Wages</th>
<th>Wages and benefits access vary by industry and occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wages and Benefits Access</strong></td>
<td>Healthcare and Retirement Benefits by Occupation, 2019</td>
</tr>
<tr>
<td><strong>2019 National Median Hourly Wages</strong></td>
<td><strong>Healthcare Benefits</strong></td>
</tr>
<tr>
<td><strong>Energy Efficiency Wage Premium or Discount Compared to National Median</strong></td>
<td><strong>Retirement</strong></td>
</tr>
<tr>
<td><strong>Energy Efficiency Wage Premium Compared to Weighted Construction Median</strong></td>
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<tr>
<td><strong>Construction Managers</strong> $ 45.97</td>
<td>140%</td>
</tr>
<tr>
<td><strong>First-Line Supervisors of Construction Trades and Extraction Workers</strong> $ 31.47</td>
<td>64%</td>
</tr>
<tr>
<td><strong>Electricians</strong> $ 29.76</td>
<td>55%</td>
</tr>
<tr>
<td><strong>Plumbers, Pipefitters, and Steamfitters</strong> $ 29.22</td>
<td>53%</td>
</tr>
<tr>
<td><strong>Heating, Air Conditioning, and Refrigeration Mechanics and Installers</strong> $ 28.32</td>
<td>48%</td>
</tr>
<tr>
<td><strong>Carpenters</strong> $ 25.60</td>
<td>34%</td>
</tr>
<tr>
<td><strong>Insulation Workers, Floor, Ceiling, and Wall</strong> $ 21.38</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Construction Laborers</strong> $ 19.52</td>
<td>2%</td>
</tr>
</tbody>
</table>

Data source: https://static1.squarespace.com/static/5a98c8f80ec4eb7c5cd928ce61/t/606d117ba0ee8f1053ee66206/1617760641036/Wage+Report.pdf
Energy efficiency lags behind the national workforce in diversity

Demographics of Energy Efficiency vs. Other Industry Workforce


** 2022 data source: [https://www.bls.gov/cps/cpsaat18.htm](https://www.bls.gov/cps/cpsaat18.htm)
Career Pathways in Energy Efficiency
Green Building and Energy Efficiency

https://greenbuildingscareermap.org/
HVAC

https://hvaccareermap.org/
Home Energy Professional
Skills and Certifications
The Weatherization Assistance Program (WAP) is a national low-income energy efficiency retrofit program funded by DOE that operates in nearly 800 locations across all 50 states + DC and territories.

The Home Energy Professional (HEP) job classifications and certifications were originally developed for WAP.
HEP Occupations

1. Building Performance Installer or Technician
   “Building Performance Installers perform upgrades to residential homes to reduce heat loss and air leakage and to increase the efficiency and safety of mechanical systems.”

2. Building Performance Crew Leader
   “Building Performance Crew Leaders supervise the installation of energy efficiency upgrades, closely monitoring crew performance, work quality, safety, and customer needs.”

3. Energy Auditor
   “Residential Energy Auditors conduct onsite energy audits and assessments and perform energy modeling to determine the current and desired energy performance, safety, and durability of single-family buildings.”

4. Quality Control Inspector
   “Quality Control Inspectors verify the compliance of energy retrofit work based on applicable installation standards and codes using visual and diagnostic data and specify corrective actions where necessary to achieve the intended performance of installed measures.”

https://greenbuildingscareermap.org/
# Building Performance Installer/Technician

<table>
<thead>
<tr>
<th>Preferred Education</th>
<th>Preferred Experience</th>
<th>Preferred/Recognized Certifications</th>
<th>Preferred Skills and Requirements</th>
</tr>
</thead>
</table>
| High school diploma or equivalent | Experience with hand tools | Building Performance Institute (BPI) Building Science Principles (BSP) Certificate BPI Air Leakage Control Certification BPI Infiltration and Duct Leakage Certification | Technical Skills  
  • Ability to work safely with hand and power tools  
  • Ability to work at heights and on ladders  
  • Ability to safely lift up to 50 lbs.  
  • Ability to work in confined spaces, attics, and basements  
  • Ability to maintain a safe and clean working environment  
 Soft Skills  
  • Positive attitude and desire to learn  
  • Ability to follow directions  
  • Excellent customer service skills  
  • Good verbal and written communication skills  
  • Ability to work independently and as part of a team  
 Other  
  • Basic math skills  
  • Proficient with computers and phones  
  • Valid driver’s license and insurable driving record |
# Crew Leader

<table>
<thead>
<tr>
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</tr>
</thead>
</table>
| High school diploma or equivalent | 3–5 years in construction, HVAC, or building performance installation | BSP Certificate  
Site Supervisor Certificate  
Crew Leader Certification | **Technical Skills**  
- Strong understanding of the residential construction and maintenance industry  
- Knowledge of green building design, green construction, and energy efficiency techniques and technology  
- Strong knowledge of residential weatherizing, insulation, and air sealing techniques and technology  
- Ability to read, interpret, utilize, and train on diagrams, drawings, and equipment manuals  

**Soft Skills**  
- Demonstrated ability and willingness to take on responsibility and leadership roles  
- Ability to motivate, manage, and train a team of building performance installers and technicians at various skill levels  
- Ability to multi-task and juggle multiple priorities  
- Demonstrated attention to detail  
- Strong organizational skills  
- Strong critical thinking and problem-solving skills  
- Ability to maintain a professional appearance |
## Energy Auditor

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>High school diploma or equivalent</td>
<td>1–3 years in building performance installation</td>
<td>Building Analyst Certification, Energy Auditor Certification, RESNET HERS Rater Certification</td>
<td><strong>Technical Skills</strong>&lt;br&gt;- Knowledge of the tools and techniques used in residential energy audits&lt;br&gt;- Knowledge of sustainability, energy efficiency, and green building principles, particularly related to HVAC systems&lt;br&gt;- Strong understanding of the residential construction and maintenance industry&lt;br&gt;- Experience with energy modeling tools and software&lt;br&gt;&lt;br&gt;<strong>Soft Skills</strong>&lt;br&gt;- Demonstrated attention to detail&lt;br&gt;- Strong organizational skills&lt;br&gt;- Strong critical thinking and problem-solving skills&lt;br&gt;- Ability to maintain a professional appearance</td>
</tr>
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</table>
| High School Diploma or Equivalent 2-year vocational/technical school training (construction, HVAC, or other trades) | 1–3 years in construction, HVAC, or building performance installation | Quality Control Inspector Certification (BPI or RESNET) | Technical Skills  
- Strong understanding of the residential construction and maintenance industry  
- Knowledge of green building design, green construction, and energy efficiency techniques and technology  
- Knowledge and understanding of HVAC equipment and technology  
- Strong knowledge of state and local building codes  
- Proficient in reading field drawings  
- Ability to interpret diagrams, drawings, and equipment manuals  
Soft Skills  
- Ability to multi-task and juggle multiple priorities  
- Demonstrated attention to detail  
- Strong organizational skills  
- Strong critical thinking and problem-solving skills  
- Ability to maintain a professional appearance |
Weatherization Assistance Program (WAP) Wage Survey

Data about wages paid by weatherization agencies across the country

- Interactive data and map
- Living wage calculator
- State-level career flyers

https://nascsp.org/wage-surveys/
Energy Efficiency

Education and Training Resources
HEP Training Providers

- **Accredited Weatherization Training Centers**
- **All Accredited Home Energy Performance Training Providers** (Interstate Renewable Energy Council [IREC])
Free and Adaptable HEP Resources

- HEP Job Task Analysis (JTA)
- Standard Work Specifications (SWS)
- Retrofit Installer Job Aids
- 3D House
- Retrofit Installer Badges Toolkit
- Weatherization Standardized Curricula
1. Clear any debris and insulation from around the non-IC rated can light.
2. Enclose box with 3 inches of clearance from lamp to insulation on all sides.
3. Premade boxes can make installation easier when insulation is clear of framing members.
4. Seal box on all sides and edges to make continuous barrier from attic.
5. Top of box must be 0.1 or less and left free of insulation. Flag enclosure for added visibility.

AFTER

When boxed with appropriate clearances and fire-rated materials, fire risk is mitigated and air leakage is reduced.

CHECKLIST
Seal and dam high-temp heat sources in attic

DESired OUTCOME
Ensure safety from fire and prevent air leakage.

Non-Insulation Contact (IC) Recessed Lights
- Where non-IC recessed lights will be left in place enclosures completely surround each fixture.
- Enclosures:
  - Are constructed of fire-rated materials (e.g., 5/8” gypsum wallboard).
  - Maintain 3” clearance between fixture (including wiring, box, and ballast) and insulation.
  - Are free of insulation on top.
  - Are flagged to visually identify the location of the enclosure.
  - All edges, gaps, and cracks of the enclosure, and between the enclosure and attic floor, are sealed with caulk, mastic, foam, or other approved material.
3D House Demonstration
Installer Badges Toolkit

Retrofit Installer Tasks – 25 Badges:

– Work Lead Safe
– Air Seal Attic Floor
– Seal and Dam High-Temperature Heat Sources in Attic
– Prep Attic Floor for Insulation
– Treat Attic Hatch, etc.
### Treat Attic Hatch

Desired outcome: Attic access door or hatches properly sealed and insulated to minimize heat loss or gain and prevent insulation from falling out of attic when accessed.

- Rigid, durable attic hatch blocking/dam is installed in a permanent way;
- Dam will remain 2" taller than final attic insulation depth;
- Hatch is insulated to proper R-value (the maximum R-value structurally allowable, up to the final insulation level of surrounding attic);
- Insulation is durably attached to hatch;
- Access is weather-stripped or otherwise treated to prevent air movement when hatch is closed;
- Access closes with a “friction fit” or latch;
- Trim is air sealed with appropriate material; and
- Airtightness of hatch when closed has been verified with blower door and smoke (or infrared (IR), if temperatures permit).

<table>
<thead>
<tr>
<th>JOB #</th>
<th>DATE</th>
<th>TECH SIGNOFF</th>
<th>INSPECTOR SIGNOFF</th>
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Other Resources (Not HEP-specific)

• Solar Decathlon Building Science Series
• DOE Building Science Education Solution Center
• DOE Building America Solution Center
• High Performance Insulation Professionals (HPIP) Online Training Hub*

* Fee associated with use
Energy Efficiency-Related Apprenticeships and Pre-Apprenticeships

- Home Builders Institute (HBI) Pre-Apprenticeship Programs
- North America’s Building Trades Union (NABTU) Apprenticeship Readiness Program
- International Association of Heat and Frost Insulators and Allied Workers (Insulators Union) Apprenticeship Program
- Union Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry (Union Association) Heating, Ventilation, Air Conditioning and Refrigeration (HVACR) Service Technician Training Programs
- Sheet Metal, Air, Rail and Transportation (SMART) Union Training Programs
Workforce Program Case Studies
Home Energy Career Training, MN

Center for Energy and Environment

• HEP training for individuals from historically under-represented groups
• 5 week paid in-person training (includes BPI Building Science Principles Certification + wrap-around supports)
• Option for paid internships with local utility or WAP agency
  • Energy auditor track
  • Insulation contractors track
• Funded by Xcel Energy
Pennsylvania College of Technology

- Energy efficiency training for individuals from historically under-represented groups
- 3 week paid in-person training (includes BPI Building Science Principles Certification, OSHA 10, and wrap-around supports)
- Hands-on skills training, job shadowing, and networking with local WAP agency
- Soft skills and wrap-around supports also provided
Earth Advantage

• 2-day accredited Green Building Trainee program includes:
  • Industry and careers overview
  • Building science basics
  • Site visit
  • Construction, weatherization, and energy assessment training

• Work with partners around the state to build upon training and provide employment connections

• Earth Advantage has started using the Installer Badges Toolkit to track trainee skills and progress
Technical Assistance Opportunity
Better Buildings Workforce Accelerator Technical Assistance Overview

Subject matter experts are available to help you meet your workforce goals.

**TA Topics**

- Building Codes and Standards
- Building Science Curricula and Training
- Laboratory Upgrades and Design
- Energy Modeling Tools
- Workforce Diversity

**TA Providers**

- FSEC Energy Research Center
- University of Nebraska, Lincoln
- NREL
- Building Science Corporation
- Frontier Energy
- Home Innovation Research Labs
- University of Minnesota
- Pacific Northwest National Laboratory
- Newport Partners LLC
- Steven Winter Associates, Inc.
Technical Assistance Applications Now Being Accepted

Applications are due October 21, 2022

Applications are available from Victor Robertson at TCN
vrobertson@corpsnetwork.org

Completed applications must be emailed with a letter of support from TCN to
BBWorkforceAccelerator@nrel.gov
Questions?
Thank you!
APPENDIX:
Energy Efficiency Regional Market Profile

Philadelphia, PA
State Data

- Energy efficiency workers in PA: 65,397
  - State had 5th highest energy efficiency job growth 2016–2019
  - Energy efficiency employment still 8% below 2019 peak
- Energy efficiency businesses in PA: 10,290
  - 85% have fewer than 20 employees

Local Data

- Energy efficiency workers in Metro Area: 21,303 (Philadelphia-Camden-Wilmington)
- Energy efficiency workers in Philadelphia County: 6,875
- # of energy efficiency workers also available by congressional and state senate district (see link below)

Employment Breakdown

PA Energy Efficiency Employment by Industry

- Construction: 54%
- Manufacturing and Trade: 22%
- Professional and Other Services: 24%

PA Energy Efficiency Employment by Sector

- HVAC: 51%
- ENERGY STAR (Appliances and Efficient Lighting): 19%
- Building Materials and Insulation: 21%
- Other (includes energy auditors): 9%

### WAP – Home Energy Performance Wages (2021)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>PA Avg. Hourly Wage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrofit Installer</td>
<td>$15.50</td>
</tr>
<tr>
<td>Crew Lead</td>
<td>$17.50</td>
</tr>
<tr>
<td>Energy Auditor</td>
<td>$18.50</td>
</tr>
<tr>
<td>Quality Control Inspector</td>
<td>$23.00</td>
</tr>
<tr>
<td>WAP Manager</td>
<td>$26.50</td>
</tr>
<tr>
<td>Intake Specialist</td>
<td>$15.50</td>
</tr>
</tbody>
</table>

Data source: [https://nascsp.org/wage-surveys/](https://nascsp.org/wage-surveys/)
Weatherization Assistance Program

• Local WAP Agencies in PA: 69
• Philadelphia area WAP is provided by:
  – Philadelphia Housing Development Corporation + Energy Coordinating Agency
• WAP + Interstate Renewable Energy Council (IREC) Accredited Training Center(s) serving PA:
  – Energy Coordinating Agency (Philadelphia)
  – Pennsylvania College of Technology Clean Energy Center (Williamsport)