

HEAT PUMP TRAINING TOOLKIT



PARTNERS IN ENERGY
Collaborating to Support Clean Energy Careers

Table of Contents

Table of Contents	2
Acknowledgment of Sources	3
Xcel Energy Clean Energy Careers and the Role of Toolkits	5
Training Coordination	6
Timeline for Preparation	6
Location	6
Outreach and Invites	6
How to Get Contractors Interested	6
Timing	7
Hands-on Training/Props	7
Training Topics	8
Assumed Prior Knowledge	8
Core Heat Pump Knowledge and Cold Climate Considerations	8
Module 1: Introduction & Pre-Project Work	9
Module 2: Sizing, Selection, Controls, and Setpoints	10
Module 3: Piping, Wiring, Valves & Technical Topics	12
Module 4: Soft Skills, Rebates & Customer Engagement	14
Gathering Feedback	15
Trainee Survey	15
Trainer Self-Reflection	15
Appendix A – Planning Timeline/Checklist	16
Timeline	16
Checklists	16
Initial Preparation	16
Training Materials	17
Reminders During Training	17
Training Follow-up	17
Appendix B – Engagement Templates	19
Flyer	19
Email Invitation	19
Email Follow-up	19
Appendix C – Sample Feedback Survey	21
Appendix D – Sample Feedback Survey	23
Appendix E – Air-to-Water Systems	23
Module 1: Introduction & Pre-Project Work	23
Module 2: Sizing, Selection, Controls, and Setpoints	23
Module 3: Piping, Wiring, Valves & Technical Topics	24
Module 4: Soft Skills, Rebates & Customer Engagement	25

Acknowledgment of Sources

The content in this Heat Pump Training Toolkit was adapted from the [Office of Energy Efficiency & Renewable Energy Curated Programs: HVAC Technician](#) and the [HVAC Excellence Checklist](#), along with insights and feedback from local HVAC experts to ensure relevance for Colorado’s climate and market needs.

Xcel Energy Clean Energy Careers and the Role of Toolkits

Xcel Energy is supporting organizations that are building the clean energy future with a new workforce development program in Colorado. The Clean Energy Careers program (CEC) is building the skills of job seekers and the existing workforce to better enable beneficial electrification. Launched in the spring of 2025, this program was developed to support **Xcel Energy's Clean Heat Plan**, which is bringing more than \$400 million to Colorado to reduce greenhouse gas emissions. CEC serves Xcel Energy's communities throughout Colorado and, for certain program offerings, is focusing on the High Country, Western Slope, and Southern Colorado which have had historically less investment in the workforce. CEC offers financial and technical support to workforce development stakeholders in Colorado that are developing strategic partnerships and developing and upskilling the clean energy workforce. The program focuses on growing the occupations of home energy auditors, insulation and air sealing technicians, and HVAC heat pump technicians.

This toolkit was developed as part of a collaboration between Xcel Energy Clean Energy Careers and workforce development partners across the state with the goal of building a common understanding of best practices in heat pump installation and programming.

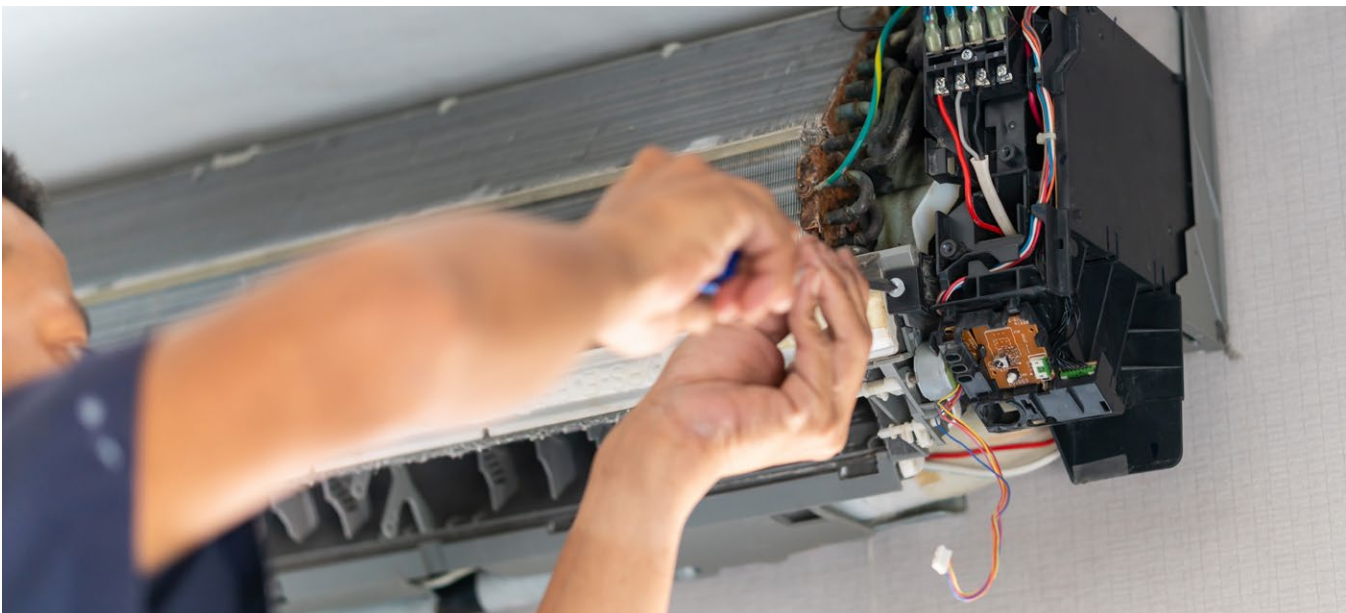
Using This Toolkit

This document outlines what is needed to plan and conduct residential or small commercial heat pump training for experienced HVAC contractors. The goal of the toolkit is to promote training consistency across the state by providing guidance on:

1. How to coordinate and host a training.
2. Key topics and elements that should be included in the training focused on air-to-air heat pumps.
3. How to collect and use participant feedback to improve future training.

This toolkit is not intended to be a comprehensive collection of training materials (e.g. PowerPoint slides, posters, etc.) or comprehensive training for those who don't already have HVAC installation experience.

Xcel Energy assumes no liability during project implementation. This toolkit is only intended to provide information and general resources to guide experienced HVAC trainers.



TRAINING COORDINATION



Training Coordination

Coordinating a heat pump training involves logistical planning, targeted outreach, and strategies to motivate contractor participation. This section outlines practical steps for selecting a location, inviting participants, and organizing the event timeline.

Timeline for Preparation

Preparing for training can be time-intensive, depending on the frequency that training is offered and if the trainer has conducted similar training in the past. It is recommended to start preparation at least 10 weeks before the training date. A suggested timeline and checklists are provided in [Appendix A – Planning Timeline/checklist](#).

Location

Location selection significantly affects participation, cost, and effectiveness of training. Some considerations when selecting a location are listed below:

- Choose a location near the service territory of your targeted trainees and somewhat centrally located
- Consider locations that are familiar to participants are preferred
- Locations that allow hands-on engagement of heat pump systems are preferred

Outreach and Invites

To conduct outreach and send invitations, it is best to use pre-existing channels where possible. These may include a contact list from local organizations, contractor associations, unions, trade school networks, and equipment suppliers.

In the invitation, it is recommended to include a brief business case or justification for a heat pump focus, topics of the training, logistics (including location and time), and any additional perks for attending (e.g. free food, compensation, or raffle prizes).

How to Get Contractors Interested

There are two primary barriers or disincentives that prevent contractors from being interested in attending a training. Primarily, training requires meaningful upfront time investment from contractors. This time commitment can impinge on their time in the field completing work and earning profit. The second barrier is lack of knowledge and/or interest in installing heat pump technology. To address these challenges, collateral and invite language must be crafted carefully to overcome disinterest in, or skepticism of the value of the training. In invitation collateral, include a business justification near the beginning. Outline the market trends that are increasing heat pump adoption such as available rebates and the evolved state of available technologies that can meet the needs of Colorado residents. A sample invitation can be found in [Appendix B](#).

Making the Business Case

To help make the business case for attending your training, connect it directly to funding available to support project work.

- **Step 1:** Get your training [Energy Skilled recognized](#).
- **Step 2:** Encourage attendees to become an [Xcel Energy Trade Partner](#).
- **Step 3:** Based on interest contractors can also join the [Love Electric qualified installer list](#), become a registered contractor for the [Colorado Energy Office Home Energy Rebate program](#), and join the [Colorado Contractor Hub](#).

Timing

Trainings hosted during the busiest time of the year are less likely to attract trainees. Consider scheduling training during off-peak seasons for HVAC contractors. Many HVAC companies have reported that winter is the least busy season. Spring training can also be a good option to set up contractors for success during the busy summer season. Be sure to have bad weather backup plans if winter trainings are scheduled.

Hands-on Training/Props

Examples of training aids that can be included in your training:

- Include at least one operating heat pump unit for live demonstration. Coordinate with distributors or manufacturers to borrow a demo unit.
- Alternatively, use cutaway models, refrigerant cycle boards, or virtual tools (see examples in Figure 1 and Figure 2)



Figure 1: Refrigeration cycle board by Tecquipment



Figure 2: Heat Pump Reversing Valve Cutaway from Tech-Labs

TRAINING TOPICS



Training Topics

The following sections provide guidance on the minimum requirements for heat pump training. Please modify as necessary.

Assumed Prior Knowledge

Trainees are expected to have prior knowledge from working in the HVAC industry. Some examples of relevant knowledge areas that are expected to already be known include those listed below. If you believe your trainee audience may be missing any of these topics, provide additional resources or incorporate refreshers into the training.

Trainees should already understand or competent with:

- Refrigerant thermodynamics and the vapor-compression cycle
- Psychometrics and comfort parameters
- Residential air-conditioning and electric heating systems
- Refrigerant charging, recovery, recycling, and reclamation*
- Soldering/brazing techniques and safety*
- Safety procedures (ladder use, fall prevention, refrigerant and nitrogen handling)
- Use of common HVAC instruments and tools (anemometer, thermometers, gauges, vacuum pump, micron gauge, leak detector, charging scale, ohmmeter, ammeter, voltmeter, tubing tools, wireless probes/apps, etc.)
- Thermostat basics

* Stars indicate areas where refresher training are most commonly needed.

Core Heat Pump Knowledge and Cold Climate Considerations

To ensure all technicians have a common understanding of heat pump installation, operation, and maintenance, the following core topics should be covered in your training. This list is intended to be a guide to help you develop your curriculum rather than an exhaustive list and includes key considerations to include for Colorado’s cold climate and high-altitude locations.

Module 1: Introduction & Pre-Project Work

Learning Objective: Trainees understand basic heat pump operation, identify when heat pumps are appropriate, and apply pre-installation weatherization strategies.

Estimated Time: 1-1.5 hours

Core knowledge Topics and Cold Climate Considerations

Topic	Description	Cold Climate Considerations
Heat Pump Types	Be able to distinguish between mini-split and ducted heat pumps in both all-electric and dual-fuel configurations.	Understand performance differences for cold climate models.
Vapor Compression Cycle Basics	Understand how heat pumps move heat through all phases of the vapor compression cycle	Describe how high-altitude and cold climates impact performance.

Topic	Description	Cold Climate Considerations
Use Cases and Market Applications	Understand when to consider dual fuel vs. all-electric applications. Be able to describe the backup heating design and sizing for each case.	Dual-fuel systems may be preferred for homes with limited electrical capacity or extreme cold snaps. It can also be a good choice for poorly insulated and difficult to weatherize homes.
Heat Pump Benefits	What are the benefits of heat pumps for both customers and contractors? How to determine customer's primary motivation (cooling, cost savings, reduced dependence on fossil fuel, improve indoor air quality) and ensure the installation meets their needs.	N/A
Operating Costs	Be able to compare the operating costs between an Air Source Heat Pump and a fossil fuel system. Be able to calculate the impact of economic or thermal balance point controls on utility bills.	Include discussion of how balance-point settings affect cost during prolonged cold periods.
HVAC Terminology and Energy Labels	Understand EER2, SEER2, and HSPF2 ratings and how to communicate their relevance to homeowners.	Show understanding of HSPF and COP and how low ambient temperatures affect performance.
Weatherization Impact on Heat Pump Installation	Understand the importance of applying weatherization and efficiency improvements before sizing/installation.	Understand the importance of proper weatherization for cold-climate performance.
Basic Customer Experience	Be able to explain what to expect from a heat pump versus a fossil fuel system including longer run times, quieter fan, cooler air, and set it and forget it controls.	Explain why longer run times are normal and why avoiding deep nighttime setbacks prevents discomfort.

Example Training Aids:

- Slides or posters of system types
- Equipment cutaway or demo unit
- Performance-curve visuals for cold-climate models
- Altitude correction charts

Module 2: Sizing, Selection, Controls, and Setpoints

Learning Objective: Trainees can size and select appropriate heat pumps, apply manufacturer requirements, and configure controls for optimal performance. Note that many of these topics are applying HVAC system design best practices to heat pumps rather than new procedures.

Estimated Time: 2-2.5 hours

Core knowledge Topics and Cold Climate Considerations

Topic	Description	Cold Climate Considerations
Manual J, S, and D Fundamentals	Be able to apply standard ACCA Manual J, S, and D procedures to heat pumps to optimize utility costs, home comfort, and equipment lifetimes. Understand the benefit of using blower door testing.	Account for altitude and extreme temperatures in load calculations.
Sizing Approaches	Understand the different methods for sizing heat pumps (e.g. sizing for cooling, partial heating, or full heating). Be able to appropriately size the backup system based on system design.	Understand proper sizing for cold-climate units (avoid under/oversizing), and use of manufacturer cold-climate performance data. Be able to explain the benefits of variable speed systems to meet heating and cooling needs.
System Design and Selection Principles	Be able to recommend systems that meet customer needs and will work well with their home, duct configuration, and outside unit location.	Understand outside unit placement best practices for snow and ice.
Voltage Testing in Homes with Solar PV Systems	Describe how to test performance voltage in homes with Solar PV and compare to manufacturer specifications to determine if voltage mitigation is needed.	N/A
Static pressure and airflow	Understand how airflow and existing ductwork affect heat pump performance and how to optimize the system. Including airflow estimation or measurement methods.	Be able to apply best practices for duct sealing and insulation to prevent heat loss.
Balance Point Concepts	Understand the basis for different balance point settings, including a thermal balance point and an economic balance point. Understand how to choose the appropriate option to meet customer expectations.	Explain how thermal and economic balance points shift in prolonged cold periods and why the backup heat may run more during these periods.

Topic	Description	Cold Climate Considerations
Implications of Balance Point Selection	Understand the performance and cost implications of different balance point choices based on system type (all-electric vs. dual fuel)	N/A
Expanded Tables and Blower Performance Data	Be able to use expanded tables to verify system performance at operating conditions and blower performance data to set fan speed for existing duct work.	Be able to interpret manufacturer performance tables for low ambient conditions and blower data for altitude corrections.
Capacity Calculations	Understand capacity calculations and how to use linear interpolation. Share tools such as NEEP's cold climate ASHP product list and sizing tool .	Understand altitude and low-temperature capacity corrections.
Heat Pump Cycling and Staging	Be comfortable with the heat pump cycles including defrost cycling. Be able to communicate what the customer should expect.	Highlight defrost cycle frequency and customer messaging for cold weather.
Pressure Testing and Evacuation Best Practices	Understand how pressure testing and evacuation best practices differ for heat pumps as compared to traditional AC units.	Understand how cold temperature heating conditions affect unit pressures.
Thermostat Settings	Understand thermostat setup, testing, and setpoints for both all-electric and dual fuel systems. Describe the benefits of a communicating thermostat to control variable speed systems. Be able to choose the correct programming to optimize system performance including switchover to and staging of backup systems.	Explain how lockout temperatures and staging impact comfort and cost during cold snaps.

Example Training Aids:

- Design-software demo to simplify Manual J calculations
- Thermostat simulator
- Balance point calculators for economic and thermal balance point

Module 3: Piping, Wiring, Valves & Technical Topics

Learning Objective: Trainees can correctly install, commission, and troubleshoot mechanical and electrical components of residential/small-commercial heat-pump systems.

Estimated Time: 2.5-3 hours

Core knowledge Topics and Cold Climate Considerations

Topic	Description	Cold Climate Considerations
Start-up Procedure	Understand the proper startup procedure, including airflow, charging, and sub-cool/superheat.	Be able to explain how cold climate impacts set-up and when follow-up visits may be required.
Commissioning	Understand the process of commissioning, performance testing, and documentation of system performance including any rebate program requirements. This should include ACCA 9 Quality installation verification protocols.	Know what conditions are necessary for proper commissioning and how cold weather heating operation may impact results.
Wiring and Communication Protocols	Be able to wire and verify low-voltage connections for inverter-driven heat pumps and troubleshoot communication errors between indoor and outdoor units.	Ensure sensor wiring and communication integrity during low-temperature operation.
Electrical-Panel Assessment	Be able to perform load calculations on the electrical panel, identify capacity constraints, and recommend upgrades for heat pump installations. Understand how smart load sharing devices can help avoid panel upgrades.	Account for electric resistance backup loads in cold climates.
Valves, Tubes, Switches, and Gauges	Be able to identify, test, and service key components such as reversing valves, TXV/EXV, and pressure switches during installation and troubleshooting.	Discuss how frost and low ambient conditions affect valve operation including failure in defrost cycle and impact of refrigerant viscosity at very cold temperatures.
Condensate Management and Drains	Understand condensate management best practices.	Understand condensate-drain installation best practices for cold climates, as well as insulation and condensate management in sub-freezing environments.
Compressor Types and Operation	Understand compressor types and operation including single, multi-stage, and variable speed compressors.	Be able to describe how variable speed or multistage compressor help the heat pump manage cold weather conditions.

Topic	Description	Cold Climate Considerations
Supply Fans	Be able to verify supply fan operation, adjust sequencing, and confirm airflow meets manufacturer specifications.	Consider fan speed adjustments for altitude and duct heat loss including emphasis on duct sealing and insulation.
Accumulator	Be able to inspect and service the accumulator to prevent liquid refrigerant return to the compressor.	N/A
Heat/Cool Relay	Understand how the heat pump switches from heating to cooling and what to expect in event of relay failure.	N/A
Defrost Cycle Control and Testing	Understand the sensors used to trigger a defrost cycle and how to test for proper function.	N/A
Liquid-Line Bi-Flow and Suction-Line Filter Driers	Describe the purpose of filter driers.	N/A
Refrigerant Pressure	Understand the refrigerant pressure differences in heating versus cooling modes.	N/A
Compressor Efficiency Testing	Understand how to conduct compressor efficiency testing.	Describe how cold climate and altitude will impact system performance.
Common Start-Up Failures	Understand and be able to diagnose common start up failures such as incorrect refrigerant charge, air in refrigerant lines, electrical wiring errors, and sensor or control issues.	N/A
Troubleshooting	Understand how to troubleshoot heat pump systems for common errors such as improper air flow, improper balance point settings, and relay or sensor failures.	Cold weather start-up failure can occur if the crankcase heater is not energized.

Example Training Aids:

- Live or mock heat-pump unit

Module 4: Soft Skills, Rebates & Customer Engagement

Learning Objective: Trainees can effectively communicate with customers, leverage rebate programs, and apply best practices for business growth and customer satisfaction.

Estimated Time: 1-1.5 hours

Core knowledge Topics and Cold Climate Considerations

Topic	Description	Cold Climate Considerations
Utility Rebates	Be able to identify rebate eligibility, complete documentation accurately, and explain rebate benefits to customers.	Highlight rebates for cold-climate-rated models and dual-fuel systems.
State and Federal Incentives	Understand the landscape of state and federal incentives, including requirements and eligibility criteria.	Explain how incentives apply to high-efficiency systems designed for low ambient conditions.
Customer Messaging	Understand the most important topics in customer messaging, including the benefits, comfort, and operation tips (e.g. minimal nighttime setbacks) for heat pumps.	Understand best practices in communicating comfort expectations in cold climates.
Common Questions	Understand the most common customer questions and misconceptions around heat pumps.	Explaining dual fuel vs. all-electric options and balance-point operations.
Business Development	Understand services differentiation and how to build customer trust.	Position cold-climate expertise as a differentiator in marketing.

Example Training Aids:

- Sample rebate forms from local utilities – see [appendix C](#) for links
- Customer-education handouts (e.g. [EnergySTAR® Air Source Heat Pump Fact Sheet](#) or Xcel Energy’s [Top Ten Tips for Getting the Most out of Your Heat Pump](#))

GATHERING FEEDBACK



Gathering Feedback

It is best practice to solicit feedback after every training session from participants. This provides information on how to improve future versions of the training.

Trainee Survey

At the end of training, distribute an anonymous survey to every participant or send survey via email within one week after the training has concluded for larger groups – see sample in [Appendix B – Engagement Templates](#).

If response rate is of concern, consider incentivizing participation. Gift cards for completion are a common method to encourage participation.

To make the feedback most useful:

1. **Look for overall trends** rather than isolated comments. Was there a clear consensus on pacing, topic coverage, or session length?
2. **Identify actionable changes.** If many participants felt the training was too long, decide whether that points to reducing content, improving pace, or breaking the training into modules.
3. **Document your adjustments** between sessions so future trainers can see what's been tried.

If feedback is scattered or there is no clear consensus, it is acceptable to leave the material as is and monitor feedback over time.

Trainer Self-Reflection

Immediately following the training sit down and complete a self-evaluation of the training to help guide future training adjustments. Questions to ask yourself may include:

1. What went well?
2. Where was there confusion?
3. What could be improved?

This self-reflection can be combined with participant feedback to holistically look at the training and to provide a basis for making training design improvements prior to the next training.



Appendix A – Planning Timeline/Checklist

A suggested timeline for someone new to the process, as well as preparation checklists are provided below.

Timeline

This is a typical timeline for preparing for your training. Early planning can help ensure the training goes smoothly and trade partners have adequate time to plan for attendance.

Timing	Activity	Templates Provided
10 Weeks Before	Identify target audience & service area	N/A
9 Weeks Before	Develop invitee list and confirm outreach partners	N/A
8 Weeks Before	Select and reserve training location	N/A
7 Weeks Before	Draft and finalize outreach material (email, fliers, etc.)	Email invite and flier (see Appendix B – Engagement Templates)
6 to 1 Week Before	Conduct outreach and track RSVPs	N/A
1 Week Before	Send reminder to registrants	Reminder email (see Appendix B – Engagement Templates)
Training Week	Complete training and track attendance	N/A
1 Week after	Collect feedback from attendees and review to inform future trainings	Feedback survey (see Appendix B – Engagement Templates)

Checklists

When first reviewing the checklists, ensure there is nothing missing for your training. If there are multiple people involved, label who has what responsibility.

Initial Preparation

Mark When Complete	Item	Logistics/Schedule/Notes	Responsibility
<input type="checkbox"/>	Develop invitations		
<input type="checkbox"/>	Develop invitation distribution list		
<input type="checkbox"/>	Distribute invitations		
<input type="checkbox"/>	Develop agenda		
<input type="checkbox"/>	Distribute agenda (either with invitation or at workshop)		
<input type="checkbox"/>	Develop presentation materials (PPT)		
<input type="checkbox"/>	QC any data slides or materials		
<input type="checkbox"/>	Plan any workshop activities		
<input type="checkbox"/>	Plan, order food based on RSVPs		
<input type="checkbox"/>	Send reminder email to registrants 1 week before training		

Training Materials

Mark When Complete	Item	Responsibility
<input type="checkbox"/>	Copies of agenda(s)	
<input type="checkbox"/>	Sign-in sheet	
<input type="checkbox"/>	Sign-in sheet pens/markers	
<input type="checkbox"/>	Name tags or tents	
<input type="checkbox"/>	Building navigation signage	
<input type="checkbox"/>	Masking or clear tape for signs	
<input type="checkbox"/>	Handouts/activity materials	
<input type="checkbox"/>	Flip chart	

Training Materials continued

Mark When Complete	Item	Responsibility
<input type="checkbox"/>	Flip chart markers	
<input type="checkbox"/>	Computer	
<input type="checkbox"/>	Projector	
<input type="checkbox"/>	Screen	
<input type="checkbox"/>	Power strip/extension cord	
<input type="checkbox"/>	Food and food service items	

Reminders During Training

Mark When Complete	Item	Logistics/Notes	Responsibility
<input type="checkbox"/>	Remind folks to complete sign-in sheets (and collect the completed pages).		
<input type="checkbox"/>	Stick to the agenda and allow everyone an opportunity to participate.		
<input type="checkbox"/>	If someone is dominating the conversation, politely ask them to pause and let others participate.		
<input type="checkbox"/>	Take notes to identify any points or questions that require post-training follow-up.		

Training Follow-up

Mark When Complete	Item	Logistics/Notes	Responsibility
<input type="checkbox"/>	Prepare notes or reference materials.		
<input type="checkbox"/>	Follow-up and respond to any questions/requests that emerged during the training that could not be answered in-person.		
<input type="checkbox"/>	Distribute post-training survey, notes or reference materials, and thank you to participants.		

Training Follow-up continued

Mark When Complete	Item	Logistics/Notes	Responsibility
<input type="checkbox"/>	Cross-check sign-in sheets against invitation list to determine overall participation levels and gaps.		
<input type="checkbox"/>	Analyze the results of the post-training survey and make necessary changes to training materials/curriculum/preparation steps as necessary.		
<input type="checkbox"/>	Ensure that final copies of all materials (PPT, outline, etc.) are saved for future trainings		

Appendix B – Engagement Templates

The following outreach and engagement language can be customized for your training.

Flyer

Stay current with equipment your customer’s demand! Attend a heat pump training hosted by <provider>.

All-electric and dual-fuel inverter heat pumps (ducted and ductless) are now outselling gas furnaces nationwide. Cold-climate-rated systems deliver strong performance even at low temperatures. With new tax credits and rebates, consumers are increasingly seeking heat-pump-trained HVAC contractors who can do the job right. To help grow your business and meet customer needs, join the training to learn about heat pump systems!

Class Details:

Where:

When:

Time:

Instructor:

Cost:

Class Outline:

1. Introduction and pre-project work
2. Sizing, selection, controls, and set points
3. Piping, wiring, valves and technical topics
4. Soft skills, rebates, and customer engagement

<Recognition or certification, e.g. NATE or Energy Skilled>

Register At: <website or email>

Email Invitation

The following is sample language you may customize to send as an invite to the training.

Subject: Stay Current with Customer Demand and Attend a Heat Pump Training with <Organization>

The <X organization> is hosting a <FREE-include if relevant> heat pump training on <X date> <for only \$XX – include if not free> at <X location> and would like to invite you to attend. Please see the attached flyer for more information and reach out with any questions. Feel free to forward this invitation to anyone for whom it may be appropriate. We look forward to seeing you there!

Email Follow-Up

The following is sample language you may customize to send after the training.

Subject: Thank You for Attending the Heat Pump Training

Thank you for taking the time to attend our heat pump training. We hope you found it valuable. If you have not already, be sure to sign your company up as an [Xcel Energy Trade Partner](#), join the [Love Electric qualified installer list](#), become a registered contractor for the [Colorado Energy Office Home Energy Rebate program](#), and join the [Colorado Contractor Hub](#).

To help us improve this training moving forward, please take 5-10 minutes to complete this short survey: [<link to survey>](#). Feel free to reach out with any further questions or learn more about our equipment that qualifies for state and utility rebates.

Appendix C – Utility Rebate Programs

The information below can be used to identify key community partners with heat pump rebates that should be shared with your class to highlight the business case for heat pump installation. Use the map in Figure 3 to identify the electric utility serving the area where your training is located, then use **Table 1** to look up relevant utility rebate programs to share with your trainees. Your contractors can use utility rebate programs to lower cost of services and drive business.

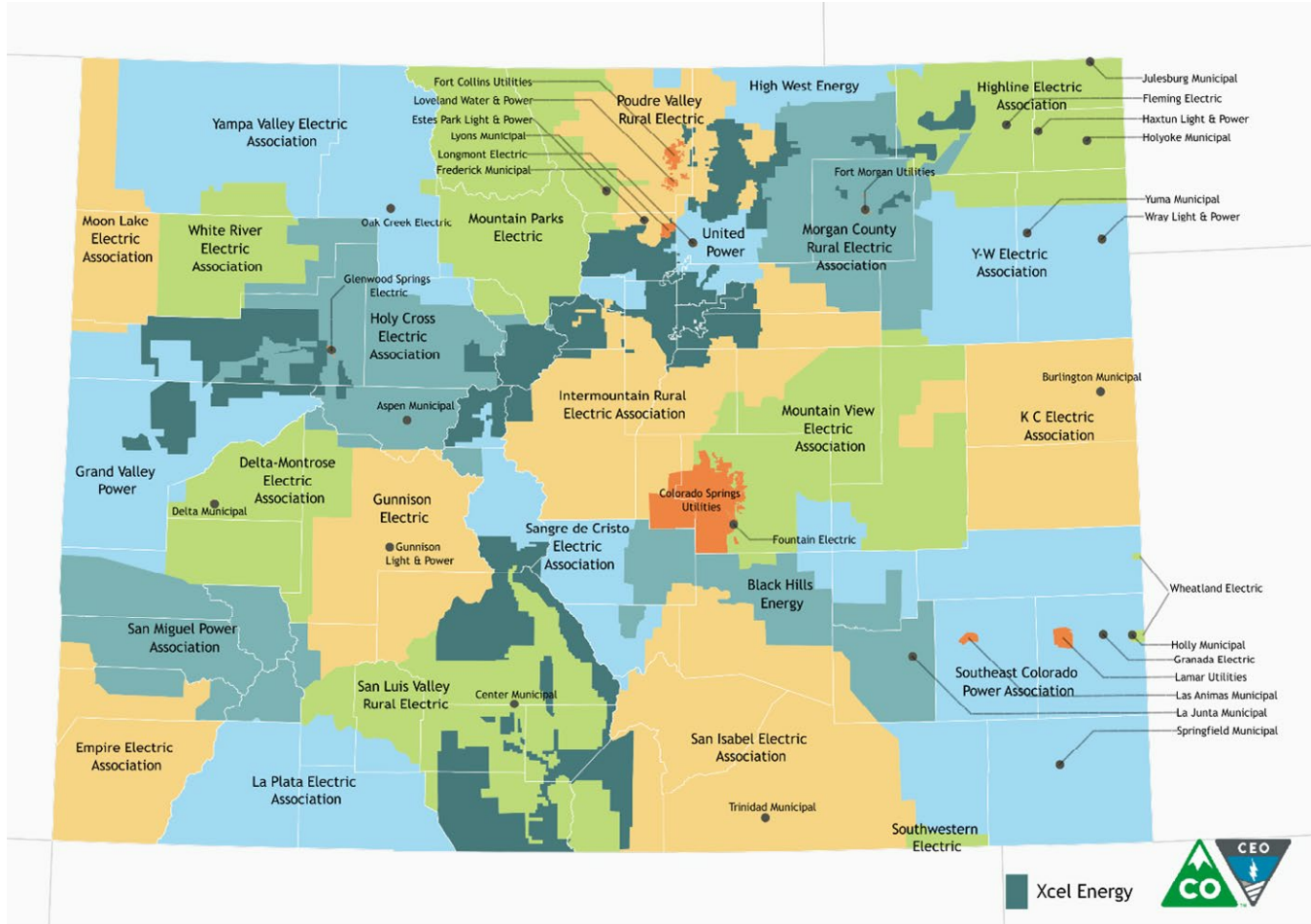


Figure 3: Electric utility service territory in Colorado

Table 1: Utility Heat Pump Rebates

Utility Name	Sector	Link to Rebates
Xcel Energy	Residential	https://co.my.xcelenergy.com/s/residential/heating-cooling/heat-pumps
Xcel Energy	Commercial	https://co.my.xcelenergy.com/s/business/lighting-equipment-rebates/hvac-r
Xcel Energy Mountain Energy Project	Grand, Lake, Eagle, & Summit Counties	https://co.my.xcelenergy.com/s/residential/home-rebates/mep-rebates
Colorado Springs Utilities	All	https://www.csu.org/rebates-incentives/residential-hvac
Gunnison Electric	All	https://www.gcea.coop/energy-efficiency/rebates/heating-cooling-rebates/
High West Energy	All	https://highwest.coop/rebates
Holy Cross Energy	All	https://www.holycross.com/member-programs/energy-efficiency-and-rebates
KC Electric Association	All	https://www.kcelectric.coop/rebates
Mountain Parks Electric	All	https://mpei.com/rebates
Mountain View Electric Association	All	https://www.mvea.coop/save-energy-money/rebates/electric-heat-pump-rebates/
Poudre Valley REA	Residential	https://pvrea.coop/for-members/rebates/heating-cooling-rebates/
Poudre Valley REA	Commercial	https://pvrea.coop/for-members/rebates/heating-cooling-rebates/
San Isabel Electric	All	https://siera.com/rebates/
San Louis Valley REC	All	https://www.slvrec.com/rebates
San Miguel Power Association	All	https://www.smpa.com/energy#berebates
Sangre de Cristo Electric Association	All	https://www.myelectric.coop/energy-efficiency/energy-efficiency-credit-programs/heat-pump-rebates/
Southeast Power Association	All	https://secpa.com/rebates
United Power	All	https://www.unitedpower.com/heat-pumps
White River Electric Association	All	https://www.wrea.org/rebates

Appendix D – Sample Feedback Survey

This draft survey can be created in Microsoft Forms or other survey software for easy distribution or a physical copy can be shared during the training.

Thank you for participating in our training. Your feedback will help us shape future trainings and should take no more than 5 minutes.

1. Overall, how relevant was this training to your work?

- Not relevant Somewhat Neutral Relevant Very relevant

2. Do you feel that the training added value to your skillset?

- Yes No
- Please explain

3. Do you feel that the time you invested in the training will increase your ability to make profit (i.e. was it a worthwhile investment of your time)?

- Yes No
- Please explain

4. The topics covered matched my current skill level and experience.

- Strongly disagree Disagree Neutral Agree Strongly agree

5. Which topics did you find most valuable? (Check all that apply)

- System Design & Sizing ...<List all major topics covered in the training>

6. Were there any topics that were missing or needed more detail?

- (Open-ended)

7. The instructor(s) explained technical topics clearly and effectively.

- Strongly disagree Disagree Neutral Agree Strongly agree

8. Rate the balance between lecture and hands-on demonstrations.

- Too much lecture About right Too much hands-on

9. How would you rate the pace of the training?

- Too slow Just right Too fast

10. How satisfied were you with the overall logistics (location, timing, materials, registration)? Rank each on a scale of 1 (least satisfied) to 10 (most satisfied).

- (ranked list, where each of location, timing, materials, registration is its own row)

11. How confident are you in applying what you learned on the job?

- Very confident Confident Neutral Somewhat confident Not confident

12. Would you recommend this training to other HVAC professionals?

- Yes No Maybe

13. Overall, how satisfied are you with this training?

- Very satisfied Satisfied Neutral Dissatisfied Very dissatisfied

14. Any additional comments or suggestions for improvement?

- (Open-ended)

Appendix E – Air-to-Water Systems

While this training focuses on air-to-air systems because they are the most common, some communities have significant numbers of existing hydronic heating systems where air-to-water heat pumps may be a better option. Below are some key considerations of how air-to-water systems vary from air-to-air systems to weave into training where hydronic systems are more prevalent.

Module 1: Introduction & Pre-Project Work

Learning Objective: Trainees understand basic heat pump operation, identify when heat pumps are appropriate, and apply pre-installation weatherization strategies.

Topic	Air-to-water Heat Pump Systems
Heat Pump Types	Understand how air-to-water systems differ from air-to-air systems.
Vapor Compression Cycle Basics	Understand how to optimize flow rate in the water-side heat exchanger.
Use Cases and Market Applications	Be able to describe when an air-to-water system would be the recommended retrofit option and how to ensure the existing hydronic system can heat effectively with lower temperature heat.
Heat Pump Benefits	Describe how air-to-water heat pump systems can leverage existing hydronic infrastructure.
Operating Costs	N/A
HVAC Terminology and Energy Labels	Be able to describe how using lower temperature systems or backup system boosters impact efficiency.
Weatherization Impact on Heat Pump Installation	Understand how weatherization can allow a system to run at lower water temperatures and, in turn, improve efficiency.
Basic Customer Experience	Same as air-to-air considerations.

Module 2: Sizing, Selection, Controls, and Setpoints

Learning Objective: Trainees can size and select appropriate heat pumps, apply manufacturer requirements, and configure controls for optimal performance.

Topic	Air-to-water Heat Pump Systems
Manual J, S, and D Fundamentals	Understand how to use load calculations for hydronic distribution.
Sizing Approaches	Understand how low-temperature vs. high-temperature hydronic systems impact sizing and design of the heat pump system.
System Design and Selection Principles	Be able to describe the role of buffer tanks, mixing valves, and outdoor reset controls in proper system design.
Static pressure and airflow	Not applicable
Pump sizing and water flow rates	Understand how to confirm pump size and water flow rates provide appropriate heating with lower temperature water provided by heat pumps.
Balance-Point Concepts	Same as air-to-air considerations.
Implications of Balance-Point selection	Same as air-to-air considerations.

Topic	Air-to-water Heat Pump Systems
Expanded Tables and Blower Performance Data	Understand how to use manufacturer tables for outlet water temperature and capacity, especially at low outside air temperatures.
Capacity Calculations	Same as air-to-air considerations.
Heat Pump Cycling and Staging	Understand how to use a buffer tank to prevent short cycling including appropriate integration of backup heating systems.
Pressure Testing and Evacuation Best Practices	Same as air-to-air considerations.
Thermostat Settings	Be able to program hydronic controls with outdoor temperature reset and mixing valves.

Module 3: Piping, Wiring, Valves & Technical Topics

Learning Objective: Trainees can correctly install, commission, and troubleshoot mechanical and electrical components of residential/small-commercial heat-pump systems.

Topic	Air-to-water Heat Pump Systems
Start-up Procedure	Understand how to ensure air is purged from the hydronic system, verify flow rates, and confirm glycol concentration.
Commissioning	Be able to confirm water side operation including appropriate performance of heat exchanger and pump operations.
Wiring and Communication Protocols	Be able to incorporate additional wiring needed for pump and mixing valve.
Electrical-Panel Assessment	Same as air-to-air considerations.
Valves, Tubes, Switches, and Gauges	Be able to ensure proper operation of hydronic system valves and pressure gauges.
Condensate Management and Drains	Same as air-to-air considerations.
Compressor Types and Operation	Same as air-to-air considerations.
Supply Fans	Not applicable
Accumulator	Same as air-to-air considerations.
Heat/Cool Relay	Same as air-to-air considerations.
Defrost Cycle Control and Testing	Same as air-to-air considerations.
Liquid-Line Bi-Flow and Suction-Line Filter Driers	Same as air-to-air considerations.
Refrigerant Pressure	Same as air-to-air considerations.
Compressor Efficiency Testing	Same as air-to-air considerations.
Common Installation/Start-Up Failures	Same as air-to-air considerations.
Troubleshooting	Same as air-to-air considerations.

Module 4: Soft Skills, Rebates & Customer Engagement

Learning Objective: Trainees can effectively communicate with customers, leverage rebate programs, and apply best practices for business growth and customer satisfaction.

Topic	Air-to-water Heat Pump Systems
Utility Rebates	Understand where rebates for air-to-water systems are available and performance requirements. While Xcel Energy doesn't currently offer air-to-water heat pump rebates, the possibility of future rebates for this technology is under review.
State and Federal Incentives	N/A
Customer Messaging	Be able to explain the pros and cons of an air-to-water system as compared to an air-to-air system for the customer's home and how it might perform differently than the existing system.
Common Questions	Be able to address customer concerns about compatibility with existing systems and hot water performance for combined systems.
Business Development	Understand how to position your business as a highly skilled team able to retrofit older homes without ductwork.



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