

## Details and Discussion Questions: Draft Recommendations for the PTCS Program Redesign

*These draft recommendations are not final and are pending utility feedback and discussions with the RTF and IT.*

Bonneville Power Administration (BPA) embarked on an effort to redesign the Performance Tested Comfort Systems (PTCS) Program to address utility and technician concerns with the implementation of the PTCS Program and to increase overall measure uptake. This document is meant to supplement the November 21 webinar and provide additional detail to further inform your written feedback to BPA about how to streamline and improve the program.

BPA consulted across an extensive number of experts to understand the current state of the program and ideas for improvement, including but not limited to a group of 23 interested utilities, national experts and other utilities across the country running similar HVAC programs, the ENERGY STAR Verification Installation (ESVI) team, ACCA, heat pump manufacturers and distributors, technicians, and the entire internal team at BPA.

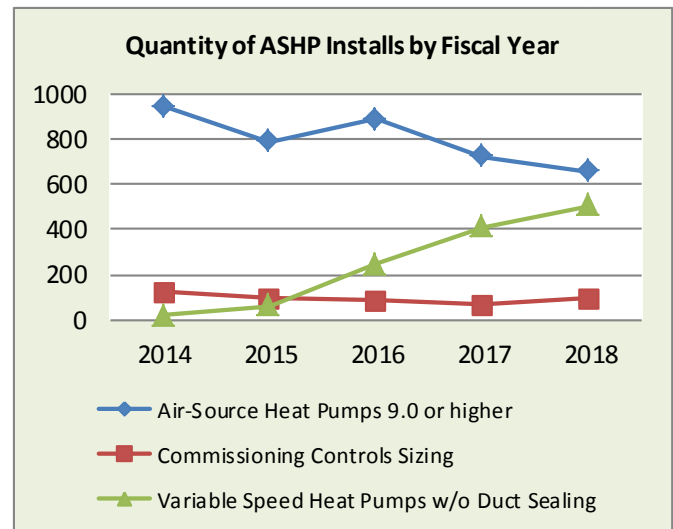
**Please see the end of the document for feedback questions. Responses are requested by December 12<sup>th</sup>.**

### Current Performance Snapshot

There has been a slight downward trend in utility and technician participation year over year since 2014. Over that same period, project completion and savings generally have been declining, with one exception: variable speed heat pump installations have increased greatly. This is illustrated in the graph to the right showing heat pump installation data by fiscal year.

Despite that, there is significant opportunity to grow the program since PTCS commissioning is completed on a relatively small share of heat pumps sold in the region.

Critical data was also gathered through the Heat Pump Field Study, which inspected heat pumps in nearly 100 homes, indicating that there are some specifications that are more common practice today and there is opportunity to improve the influence PTCS commissioning has on regional heat pumps.



### Summary of What We Heard

#### Cost

- Many technicians raise the installation cost for PTCS, from several hundred to several thousands of dollars
- Some technicians drop their prices so they don't have to deal with PTCS
- PTCS can help technicians sell equipment
- The cost of testing equipment is really high
- Duct sealing programs are not flourishing due to such a low incentive compared to the labor cost

#### Technical Specifications

- Some specifications are in conflict when considering comfort vs. savings

- The wide range of allowed flows and refrigerant allows some technicians to be fraudulent, which is only discovered during quality assurance inspections
- The correction factor in the airflow TrueFlow test is confusing for technicians
- Sizing is a hurdle for technicians in the field and the sizing calculator is not mobile friendly
- Overly rigorous specs result in many call-backs
- Airflow is difficult to measure for variable speeds
- Missing CO monitors are frustrating since it is only a safety requirement and is often missing
- Duct design and tightness influence overall efficiency

## Implementation

- The Ductless Heat Pump Program process is streamlined and simple
- Reporting is the biggest obstacle
- Reporting is difficult if the technician doesn't know in real time on-site if the job passed or not
- There is no offline version of the registry
- Paperwork is an obstacle and adds time

- Technician participation is variable: some are very connected and some rarely participate
- Training is valuable, though the class sizes should be smaller
- QA inspections are valuable as well as the ability for utilities to do their own inspections
- It is really hard for smaller utilities to satisfy the requirements to self-inspect
- A duct repair measure is needed

## General Draft Recommendations

- Maintain the current suite of measure offerings for PTCS
- Choose one of two optional paths for updating technical specifications without significant savings impact and maintaining quality
- Improve each of the program implementation areas to improve accessibility and be less time consuming

### Two Optional Paths: Which do you prefer?

Option A: Gold Star Energy Savings	Option B: Contractor Friendly
<ul style="list-style-type: none"> <li>○ Heat Pump airflow test: Allow external static pressure lookup in addition to TrueFlow test without the required correction factor</li> <li>○ Increase focus on proper sizing</li> <li>○ Keep the Registry requirement with many added features</li> <li>○ Likely keep installation costs high</li> <li>○ Adopt all other program changes</li> </ul>	<ul style="list-style-type: none"> <li>○ Heat Pump airflow test: Remove this test entirely</li> <li>○ Increase focus on proper sizing</li> <li>○ Lean up the Registry verification requirements but add streamlining features</li> <li>○ Likely reduce homeowner installation costs</li> <li>○ Adopt all other program changes</li> </ul>

## Technical Specifications

BPA's main technical focus was on improving the heat pump specification. There is very limited quantifiable data on how each specification impacts overall energy savings since there is significant interplay between each of them. See a larger version of the table to the right comparing data across multiple sources. Most of the data were in conflict about the importance and influence of each specification.

ADHP spec	Expert Recommendation	Expert Reasoning	Savings Impact	PTCS Results	Heat Pump Field Study Details	Redesign/Workshop Feedback	Overall Finding	Independent Research Analysis	PTCS QIP Future Best Practice	PTCS QIP Pass Rate (2020)
Sizing	Keep	This might have a high impact on savings. This is because a difficult spec to enforce.	High	PTCS Results: <b>Open/Partial</b>	More non-PTCS were right sized than PTCS, but more non-PTCS were also undersized than PTCS.	Contractors manipulate sizing for the equipment they want to install, not a lot of savings, mostly the driver of savings, and most would be changed to get a BP of 50P.	Not a big driver. Keep at 50P. Monitor from 50P to 60P before going could decrease savings between 20-25%.	High impact on savings	2.0%	98.0%
Airflow	Keep	Airflow that is too low reduces capacity and efficiency. Airflow that is too high is inefficient and may reduce the ability to dehumidify in cooling mode and provide adequate comfort.	High	PTCS Results: <b>Measurable</b>	No measurable difference between PTCS and non-PTCS.	Bad airflow could shorten equipment life, proper airflow makes the home more comfortable, customers would prefer to keep this to maintain the guideline required and airflow that can't meet this should use the non-PTCS measure.	Keep	High impact on savings	6.5%	91.5%
External Static Pressure	Keep	External static pressure is a measure of the resistance of a duct system and is directly connected to airflow and efficiency.	High	PTCS Results: <b>Measurable</b>	No measurable difference between PTCS and non-PTCS.	Good to make the compressor and blower motor last, or correct if a BP that had an out of control static pressure didn't affect it.	Keep	High impact on savings	4.7%	95.5%
Refrigerant Charge	Keep/Modify	Remove the temp/gal option and rely solely on measuring subcooling.	High	PTCS Results: <b>Measurable</b>	No measurable difference between PTCS and non-PTCS.	Save for subcooling not that temp/gal is very accurate and helpful in the winter.	Keep	High impact on savings	6.5%	91.7%
Compressor Lubricant	Remove	This is an outdated spec that should be removed.	No specific technical findings about what controls had	PTCS Results: <b>Measurable</b>	Measurable difference between PTCS and non-PTCS.	No real preference.	High impact on savings	5.1%	94.7%	
Slip Test Lubricant	Keep with additional research suggested	But don't feel much concrete evidence that this was a big driver of savings.	No specific technical findings about what controls had	PTCS Results: <b>Measurable</b>	Measurable difference between PTCS and non-PTCS.	USFEE prioritizes lubricant, important spec.	Keep	High impact on savings	13.8%	86.2%

See end of document for a larger image.

### Air Source Heat Pump Specifications

Cost to the technician is a major consideration since that proves a big barrier for technicians and can factor into the overall higher installation cost to the homeowner. The estimates we have heard for equipment cost are:

TrueFlow Metering System & DG-1000: **\$1,200 - \$2300**

External Static Pressure Probe System: **\$200 - \$400**

- The DG-1000 is best to use with the TrueFlow equipment but may not be necessary if only using a pressure probe. Other digital gauges can be used but the calculations are much more manual.
- Differential pressure gauges can be purchased for much cheaper than a DG-1000 and can work with a pressure tap/probe to measure external static pressure.

Specification	Recommendation and Details	
HSPF/SEER	Keep with no change since the majority of sales are still below 9.0; pending RTF discussions	
Balance Point Sizing	Keep and increase training and enforcement to ensure proper sizing	
Airflow	<b>Option A)</b> Allow ESP Estimate and TrueFlow	<b>Option B)</b> Remove airflow test entirely
External Static Pressure	Keep with no change since this is a significant indicator of air handler performance.	
Refrigerant Charge	Keep and clarify subcooling language; evidence shows potential significant impact to energy savings.	
Compressor Low Ambient Lockout	Remove since the preferred setting is no lockout, especially for cold climate heat pumps. This is also the default on many current thermostats.	
Auxiliary (Strip) Heat Lockout	Keep and increase training and enforcement to ensure strip heat lockout and contractor education about what other installation practices may be causing comfort issues.	

### Duct Sealing (PTCS and Prescriptive)

- Remove all references to sealing new ducts in existing homes
- Move specs to “Best Practices”, which are suggested but not required: asbestos remediation and code compliance
- Remove all programmatic references that reside in the Implementation Manual (IM) to prevent misalignment

### Ground Source Heat Pump

- Combine both the closed loop and open loop specifications into one specification, aligning with the Air Source Heat Pump specification changes wherever possible
- Move specs to “Best Practices”, which are suggested but not required: auxiliary heat sizing & sealing penetrations
- Remove the warranty requirement and any all programmatic references to prevent misalignment with the IM

### Training Process

- Create remote online training videos
  - Narrated webinar available to any technician to take at their own pace
  - Short electronic exam at the end of the training, which will be followed-up with an in-person exam
  - Direct them to sign up for the Online Registry
  - Trainings can be accessed at any time later for a refresher
- On-site visit with field inspector for first project to inspect their work, proctor an exam, and provide support
- A following project will be inspected remotely
- Allow technicians with alternative certifications to participate with a follow-up webinar
- Regional, regular meetings to be held for contractors and utilities to learn about all the residential programs
- Utilities who prefer to host in-person trainings may still do so

### Registry Reporting

If the spec remains as rigorous, the recommendation is to keep the Registry Reporting requirement and simplify interface significantly improve interface so users wouldn't have to access the site unless it was absolutely necessary. Suggested new features (pending IT development approval):

- Offline entry: this would allow technicians to enter data online, even if they don't have internet access; the resources to build an app are not available at this time
- Entering a project without signing in
- Uploading documents, including backup documentation: this feature is pending further discussion with cyber security to ensure the data security

- Automatically email utility users who opt-in all measure details, including backup documentation, and details if any measures are edited
- Suggest appropriate RefNos for each measure
- Improve process for reconciling IS2.0 data so there are more errors identified prior to invoicing

**Documentation: Remove a Requirement**

- Remove requirement to keep the heat pump sizing documentation in the Customer File: heat load/heat loss and balance point calculation and loop design documentation for ground source heat pumps
  - Feedback has been that this is a difficult document to track and interpret for both techs, utilities, and COTRs
- Simplify optional handwritten forms so they are more of a checklist
- Remove the need for techs to calculate the correction factor and corrected flow for the TrueFlow , which is no longer necessary since most heat pumps have ECM motors now
- Remove signature requirements

**Streamline Quality Assurance**

- Allow a combination of remote and in-person inspections, with a focus on remote inspections interfacing
- During the remote inspection, the customer service representative can also enter this job online for them and send all the necessary paperwork to them following the inspection.
- Self-inspecting utilities
  - Request to still perform all inspections in person
  - Requirements to become a certified inspector will be reviewed and made less stringent to eliminate a barrier

**Coordinate Better with Contracting Companies**

- Partner with Manufacturers and Distributors to train and certify technicians
- New companies will agree to terms for any and all PTCS technicians they employ
- Build relationship with the contracting company, if they are interested, to ensure they have all the information they need to support their technicians

**What We Cannot Do at this Time**

- Remove reporting requirement of some form of automated reporting completely
- Remove the training requirement
- Change our payment levels

**Feedback Questions to answer by December 12, 2019**

**Non-Participating Utilities:**

- What recommendations might help you participate?
- What recommendations for removing barriers might not help you participate?

**All Utilities**

- Do you feel these changes will help you all and technicians to increase uptake?
- Do you have any concerns or questions about any recommendations?

**Participating Utilities**

- Which would you prefer: Option A) Gold Star Standard or Option B) Contractor Friendly? Why?
- What feedback do you have about changing the airflow testing specification?

ASHP Specs	Expert Recommendation	Expert Reasoning	Savings Impact	HPFS Results	Heat Pump Field Study Details	CLEAR Result Analysis	PTCS QA Failure Rate (CY2018)	PTCS QA Pass Rate (CY2018)
<b>Sizing</b>	<b>Keep</b>	This might have a high impact on savings. However, this is a difficult spec to enforce. Like-for-like sizing is very common.	High	<b>PTCS Benefit Questionable</b>	More non-PTCS were right-sized than PTCS, but more non-PTCS were also undersized than PTCS.	<b>High Impact on savings.</b> Keep at 30F. Moving from 30F to 35F balance point could decrease savings between 20-25%.	2.0%	98.0%
<b>Airflow</b>	<b>Keep</b>	Airflow that is too low reduces capacity and efficiency. Airflow that is too high is inefficient and may reduce the ability to dehumidify in cooling mode and provide adequate comfort.	High	<b>PTCS Irrelevant</b>	No significant difference between PTCS and non-PTCS.		6.5%	93.5%
<b>External Static Pressure</b>	<b>Keep</b>	External static pressure is a measure of the restrictiveness of a duct system and is directly connected to airflow and efficiency.	High	<b>PTCS Irrelevant</b>	No significant difference between PTCS and non-PTCS.		4.7%	95.3%
<b>Refrigerant Charge</b>	<b>Keep/Modify</b>	Remove the temp split option and rely solely on measuring subcooling.	High	<b>PTCS Irrelevant</b>	No significant difference between PTCS and non-PTCS.		6.3%	93.7%
<b>Compressor Lockout</b>	<b>Remove</b>	This is an outdated spec that should be removed.	No specific technical findings about what impact controls has on savings.	<b>PTCS Made a Difference</b>	Measurable and significant different showing PTCS commissioned heat pumps met this spec more often than non-PTCS heat pumps.		5.3%	94.7%
<b>Strip Heat Lockout</b>	<b>Keep with additional research suggested</b>	But didn't find much concrete evidence that this was a big driver of savings.		<b>PTCS Made a Difference</b>	Measurable and significant different showing PTCS commissioned heat pumps met this spec more often than non-PTCS heat pumps.		13.8%	86.2%