

Results of Electronic Ballot of RESNET Board of Directors on the Adoption of the Amendment “Auxiliary Electric Energy of Ground Source Heat Pumps” August 18, 2011

On the initial ballot Eurihea Speciale voted no. His reasons for voting no were:

"I am uncomfortable passing this amendment without gaining any significant feedback from any members of the energy efficiency or ground source heat pump industries. Although it is unfortunate that there were no comments submitted, I believe it is important that we put it back out there to allow more time for comment and that we illicit a review and response from organizations that may be unaware of the review process for this amendment, but may be able to provide useful feedback. I think it is imperative that this amendment and any like it have been fully vetted and reviewed, so we stop making mistakes on the first attempt at an amendment and not on subsequent iterations. I would like to encourage the other members of the Board to vote NO on this measure until such time the amendment has been reviewed and commented on by technical experts by at least 2 or 3 organizations in the ground source heat pump industry such as AHRI, ACCA or IGHSPA (International Ground Source Heat Pump Association). "

Following RESNET electronic ballot procedures the no vote and the reasons behind it were sent to all of the board members that voted to adopt the amendment and they were given an opportunity to reconsider their votes.

Brett Dillon, chairman of the RESNET Technical Committee provided the following response to the no argument:

"To provide you some background on how this amendment was developed, in 2009 Dan Ellis (then Chair of the AHRI Applied Packaged System Section & ISO TC 86/SC6 Testing & Rating of Heat Pumps and Air Conditioners, also President of ClimateMaster, Inc.) approached RESNET's Technical Committee regarding some flaws in the way our Standard calculated pump and fan energy. Our Rating System double counted the auxiliary energy needed to overcome the internal static pressure of the GSHP. Dan asked if the Technical Committee would address this and volunteered to provide his considerable expertise to assist. Bruce Harley, Chair of the Technical Committee at the time, agreed and started working on this amendment along with other members of the Technical Committee.

When I took over as Chair of the Technical Committee in 2010, I inherited this proposed amendment and we made it a priority for the HVAC subcommittee, chaired by Dennis

Stroer, to complete. Since April 2010, this subcommittee has been working with Dan Ellis and others in the Ground Source Heat Pump community to craft the amendment recently sent to the Board for approval. The members of the HVAC subcommittee that have worked on this include Jerry Lyle (HERS Provider), Pat Murphy (NATE), Wes Davis (ACCA), Michael Lubliner (Washington State University). Additionally, Rob Salcido (Architectural Energy) and Iain Walker (Lawrence Berkeley National Laboratory) worked with the HVAC subcommittee, producing the amendment which went to the full Technical Committee for vetting and a vote before being submitted to the Board.

This amendment has been created through a consensus process involving GSHP industry, ACCA, NATE, and the considerable expertise of the members of our HVAC subcommittee and Technical Committee. It has taken nearly two years to get it right- and all of it started in response to a request from IGSHPA Advisory Council member Dan Ellis.”

The following are the results of the reconsideration ballot:

Shall the RESNET Board of Directors adopt the RESNET Technical Committee's proposed amendment on Auxiliary Electric Energy of Ground Source Heat Pumps (Attachment A)?

Yes (15)	No (1)	Abstain (0)	Not Voting (2)
Ben Adams	Eurihea Speciale		Charles Eley
Dave Bell			Greg Thomas
Steve Byers			
Dennis Creech			
Brett Dillon			
Philip Fairey			
David Goldstein			
Andy Gordon			
Mark Jansen			
Lee O'Neal			
Bill Prindle			
Javier Ruiz			
Orlo Stitt			
Daran Wastchak			
Barb Yankie			

The amendment was adopted.

Attachment A

Amendment: Auxiliary Electric Energy of Ground Source Heat Pumps

Proponent:
RESNET Technical Committee

Applies to:
2006 Mortgage Industry National Home Energy Rating Systems Standards

Section 303.5 Operating Condition Assumptions
Section 303.7 Minimum Rated Features

Proposed Amendment

Insert the following, and renumber subsequent sections as necessary:

303.5.1.7 For residential ground-loop and ground-water water-to-air heat pumps that are shipped with an integral blower fan and without a fluid circulating pump heat pumps, the Auxiliary Electric Consumption Power shall be determined as follows:

$$\text{GSHP Auxiliary Electric Consumption Power (kWh/yr - Watts)} = \text{GSHP}_{\text{pump}} - \text{GSHP}_{\text{intp}} + \text{GSHP}_{\text{fanESP}}$$

Where:

$\text{GSHP}_{\text{pump}}$ in watts is the observed pump nameplate data (Volts * Amps), shall be added for all hours-periods of heat pump operation. Amps may be taken from nameplate as Run Load Amps (RLA) or Full Load Amps (FLA). Alternatively, pumping energy that is measured on-site with a watt-hour meter, or using measured V*A may be substituted. Such measured pumping energy may be further adjusted for on-site measured duty cycle during heat pump operation, when pumping is intermittent during continuous heat pump operation.

$\text{GSHP}_{\text{intp}}$ in watts is the estimated pump power required to overcome the internal resistance of the ground-water heat exchanger under AHRI test conditions. $\text{GSHP}_{\text{intp}} = \text{W/ton} * \text{rated cooling btu/h} / 12,000$. W/ton shall be 30 for ground loop (closed loop) systems and 15 for ground water (open loop) heat pump systems.

$\text{GSHP}_{\text{fanESP}}$: If ducts are attached to the system to deliver heating or cooling, the external fan energy in watts, $\text{GSHP}_{\text{fanESP}} = (\text{air flow in CFM} * 0.25 \text{ Watts/CFM})$, shall be added for all hours-periods of heat pump operation. If the design airflow is unknown, the default air flow in CFM shall be $(360 * \text{rated cooling btu/h} / 12,000)$, where 360 is the air flow in CFM per nominal ton (12 kbtu/h) of capacity. Note that for the purposes of calculating an adjusted equipment efficiency, $\text{GSHP}_{\text{fanESP}}$ shall also be added to the rated heating capacity, and subtracted from the rated cooling capacity of the equipment. For that adjustment, $\text{GSHP}_{\text{fanESP}}$ shall be converted into Btu/h by $\text{Btu/h} = \text{GSHP}_{\text{fanESP}} * 3.412$.

For the purpose of a projected rating only, if $\text{GSHP}_{\text{pump}}$ can not be determined, the following adjustments may be made to the rated efficiency of the GSHP: $\text{Adjusted EER (closed loop)} = 0.0000315 * \text{EER}^3 - 0.0111 * \text{EER}^2 + 0.959 * \text{EER}$

$$\text{Adjusted EER (open loop)} = 0.00005 * \text{EER}^3 - 0.0145 * \text{EER}^2 + 0.93 * \text{EER}$$

$$\text{Adjusted COP (closed loop)} = 0.000416 * \text{COP}^3 - 0.041 * \text{COP}^2 + 1.0086 * \text{COP}$$

$$\text{Adjusted COP (open loop)} = 0.00067 * \text{COP}^3 - 0.0531 * \text{COP}^2 + 0.976 * \text{COP}$$

Table 303.7.1(1) Minimum Rated Features

12. Heating Equipment	Equipment type, location, efficiency (AFUE, HSPF), auxiliary electric (Eae); power consumption rating of ground fluid circulating pump(s) for ground-loop and ground-water heat pumps.
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Background/Rationale:

There were errors in the original amendment on Auxiliary Electric Energy of Ground Source Heat Pumps. First, the AHRI/ISO 13256 standard rating process includes an allowance for fan internal static pressure, which was double-counted in the original proposal. This amendment corrects the value from 0.5 W/CFM to 0.2 W/CFM, to reflect only fan external static pressure. Second, the AHRI/ISO 13256 standard rating process includes an allowance for pump internal static pressure, which was double-counted in the original proposal. This amendment corrects the added pump energy by subtracting a reasonable allowance for the rated pump energy under test conditions, before adding the actual pump energy as installed. Third, this amendment adds an efficiency adjustment that may be used for projected ratings in the absence of detailed pre-construction information about the pump. Finally, this amendment states explicitly that, for calculating adjusted equipment efficiency, the additional external fan energy $\text{GSHP}_{\text{fanESP}}$ must also be added to the rated heating capacity and subtracted from the rated cooling capacity.

