What is S.E.E.R.?

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by maury tiernan

We have heard it, used it, and in some cases do not know what it is, but when talking HVAC, we need to understand what S.E.E.R. means to be able to provide energy saving systems to our customers.

S.E.E.R. is an efficiency rating, much like how miles per gallon (MPG) is used to rate automobile efficiency. We all understand that if you drive 300 miles and consume exactly 20 gallons of gas, then your vehicle's fuel efficiency (MPG) is 15 miles per gallon (300 miles divided by 20 gallons). A vehicle that gets 18 MPG would be more efficient (less costly) to operate, and a 12 MPG vehicle is less efficient (more costly) to operate. For HVAC, S.E.E.R. follows the same rationale.

In 1975, there was no universal standard of measurement for HVAC energy efficiency. The Air Conditioning & Refrigeration Institute (ARI) introduced the E.E.R. (Energy Efficiency Ratio) for the purpose of rating the cooling efficiency of HVAC units. E.E.R. equaled the rated cooling output of an HVAC unit in BTU's per hour divided by the rated input of energy in watts of electricity, at specific humidity, and temperature input/output conditions.

The formal definition of Energy Efficiency Ratio is a steady state efficiency measurement of BTUH cooling output versus power (watts) input or BTUH/WATT at a specific set of indoor and outdoor dry bulb and wet bulb temperature conditions.

The ARI rating point has been at 80 db./67 wb. indoor and 95 db./75 wb. outdoor temperatures.

While this sounds logical, no seasonality was taken into consideration. The climate zones across the U.S. vary, as do seasonal conditions from one zone to another. For example, Florida and Arizona have different summer conditions, which affect the performance and resulting cooling energy savings for the user of the HVAC unit. This means the seasonal conditions affect the value and must be weighed when interpreting an HVAC unit's E.E.R. rating.

Thus, in 1978 the US Congress passed a law requiring labeling of certain "appliances" (HVAC units under 65,000 btuh cooling) with an efficiency rating that took into consideration how certain variables (seasonality) affect cooling BTUH output, watts input, and an average cost of operation for the cooling side of a residential HVAC unit.

The new rating, S.E.E.R. (Seasonal Energy Efficiency Ratio), was born as an alternative to the original E.E.R., and to better approximate the actual cooling cost of operation of an "appliance" based on the installed climate zone. S.E.E.R. is a different efficiency rating than E.E.R. and is based on *residential* air conditioner usage patterns. S.E.E.R. includes a rating at a different temperature than E.E.R. and also includes performances such as conditions of cycling (off/on) thus includes cycling losses.

Currently all HVAC unit specification sheets are required to show only S.E.E.R. ratings.

E.E.R. and S.E.E.R. are two ways to determine the cost of operation of an HVAC unit. A 6 E.E.R. was the typical unit efficiency in 1974, and approximately 8 S.E.E.R. was predominant in the mid 80's. 10 S.E.E.R. became the first federally mandated minimum efficiency in 1992 for residential split systems and 9.7 S.E.E.R. for single package systems in 1993. Prior to 1992, individual states were free to establish their own individual minimum efficiency standards for air conditioners as well as other types of appliances. The new federal efficiency standards preempt any state standards and therefore we now have uniform efficiency standards for

the entire country as opposed to a various array of different individual state standards. The minimum efficiency will increase to 12 S.E.E.R. in the US effective on Jan 23, 2006.

The higher the S.E.E.R. or E.E.R. the greater btu/h cooling delivered for the watts of electricity consumed (better miles per gallon, so to speak). You may find the chart below useful when talking with your customers about the energy savings associated with upgrading to a more efficient HVAC unit.

This "Cooling Operational Cost Savings (%) Matrix" shows that the operational percentage savings of replacing a 6 E.E.R. unit with a (currently required) 10 S.E.E.R. unit would be 32%. Replace older HVAC units with higher S.E.E.R. (i.e. 12 S.E.E.R.) units and the customer can expect to see terrific operational savings. Include the below information when bidding new projects to inform your customers of the cost savings they can expect by upgrading to a 12 S.E.E.R. unit now.

To sum it up, the important difference is that E.E.R. is at a single rating point and more represents peak load rating while S.E.E.R. is a seasonal rating most typifying average residential usage in the US. E.E.R. is more like the highway rating of MPG on a car and S.E.E.R. is more like the city driving MPG rating of a car.

We just looked at the cooling side of HVAC efficiency. In a future issue of *The Comfort Zone*, we will discuss the heating side rating of a heat pump called H.S.P.F.

Keep cool and watch your energy efficiency until the next time we meet in . . . *The Comfort Zone*.

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Cooling Operational Cost Savings (%) Matrix

If an existing unit is:	And replaced with the following, the savings will be:		
	8 S.E.E.R	10 S.E.E.R.	12 S.E.E.R
6 E.E.R. (~6.8 S.E.E.R.) pre-1978 units	15%	32%	43%
8 S.E.E.R. pre-1993 units		20%	33%
10 S.E.E.R. post-1993 units			17%