

Comments by D Dickinson Henry Jr., HotZero, LLC on DOER's draft

225 CMR 16.00: ALTERNATIVE ENERGY PORTFOLIO STANDARD (APS)

HotZero commends the staff of DOER for its revised regulations regarding the alternative energy portfolio standard (APS). Our principal comments are related to item 1605 (1) (a) 6 a ii.:

- We believe the language in this section is somewhat ambiguous as to the definition of groundwater, water source heat pumps,
- we would like to see the cooling prohibition removed for water to water heat pumps, and
- we think the *naturally occurring temperature differences in ground, air, or water* is unnecessarily restrictive.

In all cases we support the concept that all technology must be able to prove that it can provide meaningful net annual reductions in conventional energy use.

Current language in section 1605 (1) (a) 6 a ii about water source heat pumps is a bit ambiguous. “*Ground and Water Source Heat Pump. A ground or water source heat pump...*” It seems to indicate that there is a difference between a ground source heat pump and a water source heat pump. The purpose here appears to us to merely contrast a water source heat pump in this section to an air source heat pump in the previous section.

Our second point is water source heat pumps should not be limited to “*the ambient underground or water environment source... or naturally occurring temperature difference(s) in ground air or water.*” We believe that as long as a transfer of *useful thermal energy* is being made from a water source, without an adverse environmental impact, then a water source heat pump should qualify.

Perhaps the original intent was to limit water source heat pumps to just heat extraction from ground water but this seems too proscriptive to us and misses many opportunities to produce useful energy with a zero or near zero carbon footprint. There are many sources of waste heat which currently are being squandered and the use of water to water heat pumps allows for an excellent method to harvest this heat and ramp it up to levels which will provide “useful thermal energy”.

Many sources of industrial thermal energy are currently being dumped into both air and water sources with adverse environmental impacts. If these sources can be put to use before being discharged to the environment their reuse than has a minimal carbon footprint, and low to zero environmental impact (the carbon has already been counted in the initial use so their secondary use has a zero or low carbon footprint. Their remaining carbon input is the electricity to operate a water to water heat pump with usually high COPs). In fact better use of these waste energy sources can have a beneficial impact on the environment. A recent Massachusetts example is the Veolia use of waste heat, (Green Steam) which eliminated the previous practice of dumping heat from cooling their steam turbines into the Charles River. Granted this was not a heat pump example but still makes the point of wise use of currently wasteful thermal energy discharges.

It would seem counter productive in these cases to release the energy to the environment and then try to retrieve it now that it could meet the “*naturally occurring temperature difference*” definition of the regulation.

For example would sewerage be considered a ‘*naturally occurring temperature difference(s) in ground, air or water*’? The City of Vancouver is currently harvesting useful thermal energy from sewage flows in the city. City sewerage usually maintains a fairly steady year round temperature of 60° F. In Vancouver during the winter this energy is used for heating purposes and in the summer this energy is used for cooling purposes by reversing the cycle of the same water to water heat pumps. In the case of cooling, water to water heat pumps can reduce or eliminate the use of water to air cooling towers which are common in most commercial and industrial roof top units (RTUs). These units disperse a great deal of heat in the form of water vapor to the air and contribute significantly to a city’s heat island effect. Water vapor itself is a significant greenhouse gas (GHG).

Water to water heat pumps can provide the same cooling while dispersing the heat to sewer lines without adversely affecting treatment plant operation. Volumes of sewerage are so large that these thermal contributions are well within seasonal variation of plant operation. But the resulting diminishment of thermal and water vapor discharge to the atmosphere particularly at peak summer loads will have significant reductions in electric use and demand charges needed to run roof top chillers. The combination of reduced evaporative cooling at peak summer temperatures, the savings in electric generation, demand, and transmission, and the relatively high COPs of water to water heat pumps makes cooling a cost effective and environmentally beneficial opportunity for water to water heat pumps.

Our third point remove the cooling prohibition for water to water heat pumps. For the above reasons we believe thermal energy from water to water heat pumps should be used for both heating and cooling as long as the environmental impact is minimal, neutral, or beneficial. This intent seems to be anticipated in the definition of Useful Thermal Energy in the definition section of the regulation:

Useful Thermal Energy. Energy (a) in the form of direct heat, steam, hot water, or other thermal form that is used in production and beneficial measures for heating, cooling, humidity control, process use, or other valid thermal end use energy requirements and (b) for which either fuel or electricity would otherwise be consumed.

We suggest the following rewrite of the Water Source Heat Pump section 1605 (1) (a) 6 a ii.

~~Ground and~~ Water-Source Heat Pump. A ~~ground or~~ water-source heat pump unit uses compression and evaporation to transfer thermal energy from ~~the ambient underground or a~~ water ~~environment source~~ to a thermal load as Useful Thermal Energy. The unit must receive all applicable permits, approvals, and registrations from the Mass DEP. An applicant must demonstrate to the satisfaction of the Department that it meets the design criteria, including the ability to operate at or above a threshold Coefficient of Performance at design conditions, as provided in the Department’s *Renewable Thermal Technology Guideline*. ~~Ground or w~~Water-source heat pumps are provided APS

Alternative Energy Attributes ~~only when operating in a heating mode; that is, when transferring thermal energy from the ambient underground or a water environment source~~ to a thermal load without significant adverse environmental impact.

Thank you for this opportunity to comment on 225 CMR 16.00: ALTERNATIVE ENERGY PORTFOLIO STANDARD (APS). If I can be of any further help please do not hesitate to contact me.

Sincerely

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