User Controls

During the summer the user needs to inject approximately the same amount of heat as will be needed to heat the home in the winter. Since the injection is controlled directly it can accurately be monitored by
measuring the rate of fluid flow and the temperature difference between the entrance and exit lines. The injection process is interrupted whenever the air temperature falls below the measured ground temperature and it shuts off when sufficient heat has been injected. There is no need to inject a surplus of heat, which would in the long run only give rise to an extra expenditure of energy to run the pump and fan.

If it turns out that too little heat has been injected then the system will draw the extra heat that is needed from the ground, acting like a conventional ground source heat pump. The amount of extra heat that is available amounts to approximately half the normal heat load so the available surplus is very large. Unless the estimate for the annual heat demand was incorrect (in which case it should be corrected for the following year) there is no need to take corrective action for either a particularly cold winter or an abnormally warm one. The natural heat flow in the ground will average out such variances and ensure that the system neither adds or subtracts heat from the ground on an averaged basis.

The prototype system incorporates the ability to extract heat from the two injection boreholes during the coldest period of the winter. That increases the heat extraction capacity by 50% by adding two more lines and it also draws heat from ground that is relatively warm, so there is potentially a substantial boost in the power capacity. However, the heat flowing into the four outer holes is much more substantial than the heat flow for a conventional GSHP as a consequence of the ground heat flow design. The heat pump can only handle its maximum design power so it remains to be seen whether this extra capacity will be required for a normal AE system. For the prototype is is nice to have this boost capability to ensure that the system will never be starved for sufficient ground heat, and for future systems it provides insurance for the event that the ground storage capacity is inadequate.