



Thank you for the opportunity for Armada Power to participate in the Michigan Power Grid working group, as well as the opportunity to provide comments to the final report. In our comments below, we want to ensure all statements are accurate to best represent the capabilities of the technology and assessments. However, in Section 7.2.5, the following statement contains some inaccuracies which should be corrected:

“Outside of carbon reductions, heat pump water heaters can allow utilities to shift and shed loads due to their grid connectivity. Given that heat pump water heaters use about half as much energy as electric resistance water heaters, they can support substantial energy and greenhouse gas emissions reductions, while also providing flexible control for the utility (Gold et al., 2021).”

The first sentence of the statement above should state “smart” or “controlled” water heaters in this case defined as “grid connected” water heaters. Only a grid connected Heat Pump Water Heater (“HPW”) would have the capability to shift or shed loads however not all HPW are by default grid connected. Further, because a HPW runs a much longer duty cycle than traditional water heaters, this load shifting functionality is extremely limited in both response time and frequency. Once shifted, a HPW will require a recovery period over a few hours to recharge, reducing the probability to use the load shift or shed for purposes of firming to a grid or circuit as renewables are integrated. Renewables generation firming also often requires fast responses in the seconds or even milliseconds to absorb fast changes in output. HPW are typically operating a compressor, which have required run times before cycling on and off.

A distinction of control for demand purposes rather than traditional overall energy reduction should be made clear. There are multiple technologies and controls which make electric water heaters in general a good demand option for the grid. HPW, while reducing some energy consumption will generally add to base load, however as the generation mix includes larger percentages of renewable sources, high speed control will be needed to absorb the lowest carbon producing sources in real time. The as written paragraph implies load shifting and shed functionality from solely the heat pump water heater technology without distinction.