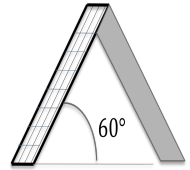


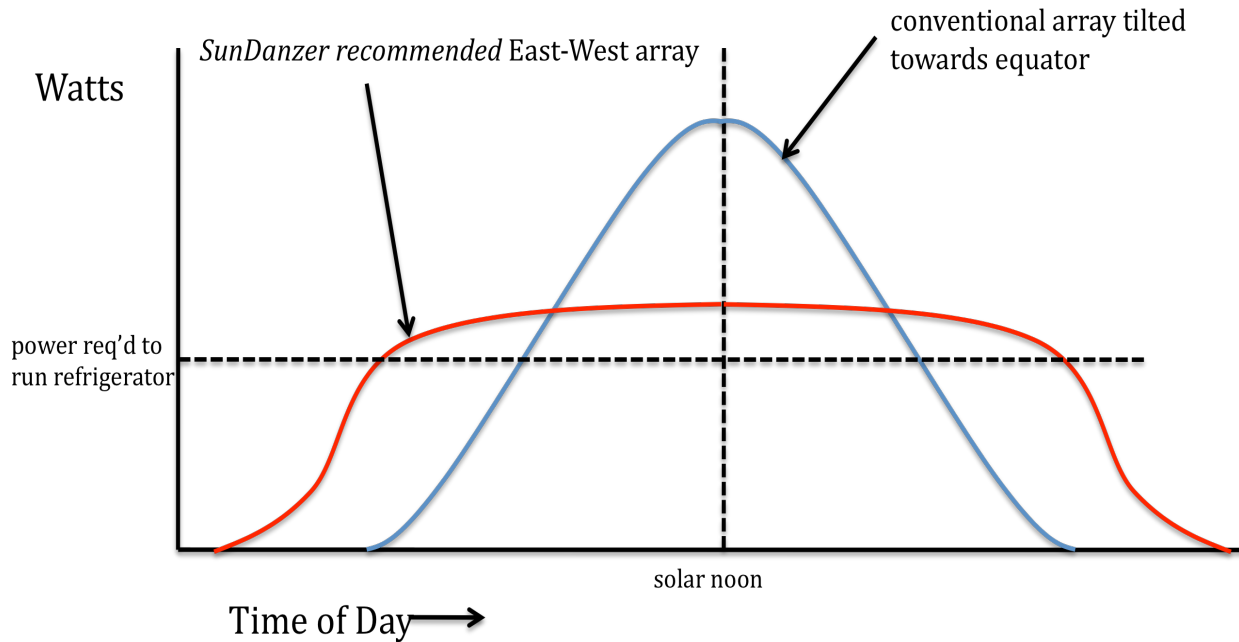
Rationale for the SunDanzer-Recommended East -West Array



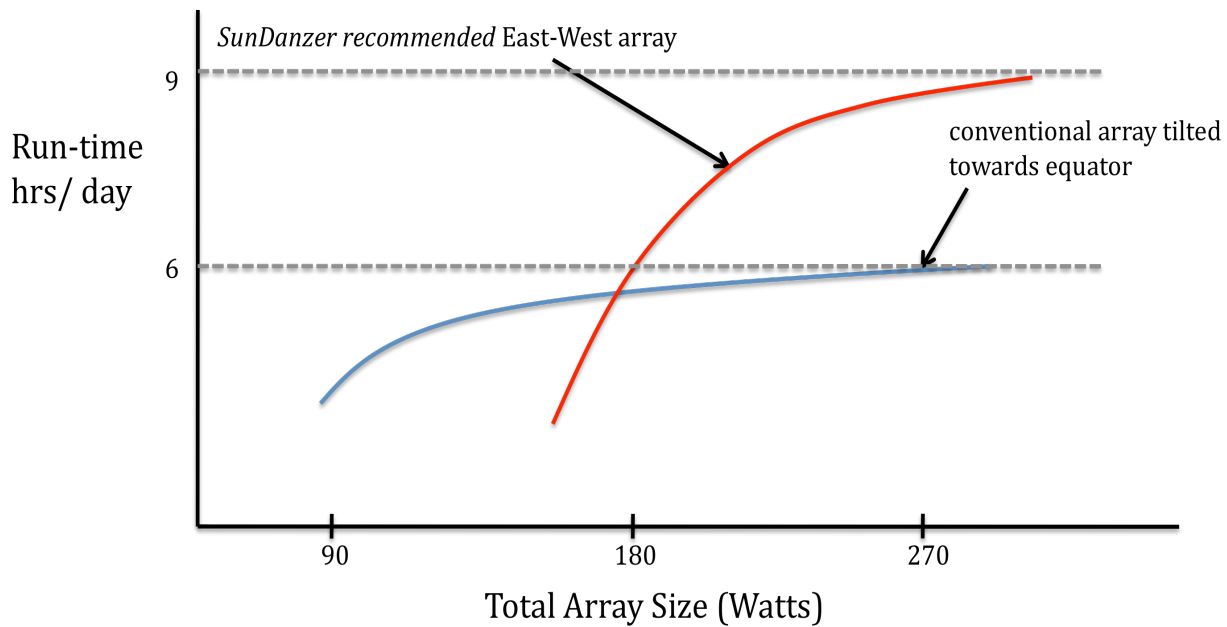
The SunDanzer BFRV55 Vaccine unit uses Direct-Drive technology- it runs directly from the power generated by the solar panel. This creates some challenges that are different than conventional battery-driven solar applications. Primarily, anytime the array produces *less* power than that required by the refrigerator's compressor to run, the power will not be used and is wasted. Furthermore, whenever the array produces *more* power than the compressor needs to run, the excess power is wasted. Since there is no battery, there is no way to capture the excess power. The useable power is constrained by the needs of the compressor and fans in the vaccine refrigerator.

Thus, the traditional power profile leaves a lot of wasted power. As shown on the chart below, if the dotted horizontal line represents the power consumed by the refrigerator, all the area inside the traditional curve but above the dashed line is unused. The East-West configuration provides a flatter and longer profile allowing the refrigerator more runtime during the day with less wasted power.

Another way of thinking about the East-West array is as a poor man's tracker. If an array were placed on a tracker, the power profile would look more like the East-West array. But as we know, trackers are expensive and a maintenance worry; the East-West configuration produces a similar outcome.



Another way to see the tradeoff is shown next. This graph shows the total runtime of the refrigerator against the array size using both configurations. The actual numbers vary by location so cannot be used to size the array for a particular application, but nonetheless provides a good illustration.



This graph shows that the conventional array tilted towards the equator will provide about 6 hours of run-time per day no matter how big the array size. The East-West array, however, can provide as much as 9 hours of run-time per day for the same size array. This shows that the East-West array can provide more run-time given the same amount of PV. And for the SunDanzer BFRV55 direct-drive vaccine unit, more run-time means better overall performance. In many places of the world, there may be clouds during the middle of the day or afternoon; by extending the solar day, the refrigerator stands a better chance of getting the power it needs before the sun goes down.