844-348-9168
jfinkam@myiaire.com
2100 Consulate Drive, Suite 102
Orlando, FL 32837

iAIRE SOLAR HVAC TEST DATA RESULTS
3-26-23

iAIRE has been working on testing the Solar HVAC in several different locations around the country. iAIRE has hired the University of Cincinnati to perform testing on Solar HVAC. The testing is occurring on a 3-ton residential heat pump split system. The test is being conducted at the University of Cincinnati HVAC lab. Professor Nabil Nassif, PHD, PE is the associate Professor in the Department of Civil and Architectural Engineering. Professor Nabil is monitoring the testing and will be putting together a final report and paper once all the testing is complete.

iAIRE would like to be able to utilize AHRI to test iAIRE equipment. This cannot be done. All the AHRI testing is done indoors in a controlled lab. There would be no sun ever on the solar panel. This is done so that during AHRI testing, they can control the temperature going through the evaporator as well as the temperature at the condenser. Because this is always done inside, this test would not yield results demonstrating what the solar panel would be capable of adding to the system. Because of this limitation, the only way that iAIRE can show the benefits of solar HVAC is to either install two (2) units on a building at the same time in the same place (one with solar and one without) and compare the results or run the data from the solar unit and compare the date to the base unit data with no solar added. In either of these cases, iAIRE cannot calculate a SEER rating for the units. The only comparison that can be drawn is comparison of the average EER or COP data between the solar and non-solar unit over a period of time.

This paper will discuss testing results thus far of units in 3 locations listed below:

1. 5-ton packaged unit in Orlando Florida being compared to another 5-ton packaged unit without solar on the same location.
2. 5-ton residential split system being tested in a home in Carmel Indiana in the heating mode
3. 2-ton residential unit in Jupiter Florida in the cooling mode

In all 3 of these tests, iAIRE plumbed the solar panel between the condensing unit and the TXV prior to the evaporator. iAIRE is using the following equipment to obtain the data:

- Entering Air temperature and enthalpy sensor (Greystone Model DWDTBV)
- Leaving air temperature and enthalpy sensor (Greystone Model DWDTBV)
- Watt meter measuring both voltage and amperage (Temco Model SPM1-50-AC)
- Outside weather data was taken online from the city where the unit was located

Unit wattage was calculated using voltage multiplied by amperage
Total BTUs were calculated using (entering air enthalpy – leaving air enthalpy) * cfm *4.5
Sensible BTUs were calculated using entering air temperature – leaving air temperature * cfm * 1.08
Latent BTUs were calculated using Total BTUs – Sensible BTUs
EER cooling = BTU / Watts
COP heating = (BTU * 0.293) / Watts

1: Orlando, FL. Unit

The equipment being tested at Orlando is the following:

Trane Model TSC060G3E0A000. This unit has the iAIRE Solar HVAC package added to it.

This system is a 14 SEER system.

Trane Model TSC060A1E0A1C0. This unit does not have the iAIRE Solar HVAC package on it.

Both units are on the same office building in Orlando, FL. This building has four (4) total package units serving the entire office building. The building is normally occupied Monday through Friday during normal business hours. The units were being operated with the fan in auto mode. This would have the fan running only with a call for cooling.

Since this is a commercial building, the fan running continuously would be required to ensure that the proper amount of outside air was being brought into the space. iAIRE ran tests with the thermostat in both Auto and in the On Positions.

To date, the following results have been what is determined:

With the fan in the Auto Position:

Solar Unit average EER	10.30
Standard Unit average EER	6.04

The Solar Unit is 70.5% higher EER than the standard unit.

With the fan in the On Position:

Solar Unit average EER	19.83
Standard Unit average EER	4.06

The Solar unit is 388% higher average EER than the standard unit.

iAIRE did check out the average wattage of just the fans running on these two units.

Solar HVAC	4.74 amps	203.2 V	963.35 Watts
Standard HVAC	5.00 amps	204.02 V	1019.91 Watts

The Solar HVAC units fan is about 5.9% more efficient than the standard unit fan. This difference would increase the above Solar HVAC unit Efficiency over the standard by 5.9%.

2: Carmel IN. Unit

The equipment being tested in Carmel, is the following:

Carrier Model 25HCE460AP050 5-ton condensing unit

This system is a 14 SEER system.

This unit is installed in a 5,400 square foot home in Carmel, In. The unit is providing the heating and cooling for this house. This system is installed on a 2-zone system. The 2nd floor of the house has a separate thermostat and zone damper. The main floor and the basement are on a separate thermostat and zone damper. If only 1 zone of the house is operating, there is a bypass damper that opens to ensure enough air is moving through the system at all times. This unit is brought on and off by the thermostat to maintain temperature inside the house, so the unit is only operating when there is a call for heating. The fan runs continuously in the house as there is an ionization air cleaner installed in the system.

- Solar Unit average COP 6.20
- Maximum BTU output of the solar unit 85,889
- Maximum BTU output of standard unit 66,935

Since the solar unit is not operating at full capacity all the time, it cannot be compared to the published data to determine a standard unit COP.

The solar unit is producing 18,954 BTUs more than the standard unit which is 28.3% higher BTUs.

3: Jupiter FL. Unit

The equipment being tested in Jupiter, FL. is the following:
iAIRE model SHRPZ-24LH00A00-A 2-ton condensing unit

There are two (2) total systems in the house. There is a 3-ton system that provides heating and air conditioning to the 2nd floor. The 2-ton solar system is providing the cooling for the main floor of the house.

Each unit operates on their own thermostat and the units turn on and off with the call for cooling from the thermostats. These units provide comfort cooling for the house.

- Solar Unit average EER 15.63
- Maximum EER of solar unit 24.9
- Maximum BTU output of the solar unit 35,824
- Maximum BTU output of standard unit 28,380

The solar unit is running at a very high average EER.

The solar unit is producing 7,444 BTUs more than the standard unit which is 26.2% higher BTUs.

SUMMARY

In all three test sites, **the Solar HVAC units are performing at a higher efficiency than the standard units. In the direct comparison of the 5-ton packaged units, the Solar HVAC is performing approximately 70% better. In the residential systems, by approximately 25%.** Current testing is showing that the solar unit is performing better in both the cooling and heating mode.