Optimizing solar thermal resource

ASSIGN BUSTER

Daniel Mutiso Topic: Optimizing solar thermal resource. Solar energy is defined as radiant energy which is produced by sun (Coffey) and includes light and thermal energy. It is a renewable energy and is used in many different ways such as in heating, cooling and in lighting when harnessed through use of photovoltatic panels. In plants it is converted to chemical energy through photosynthesis. Compared to HVAC energy, it is better as HVAC energy can cause death or shock, heart failure when one comes into conduct with it. There are also explosion hazardous associated with HVAC energy (High voltage). There are many cities in U. S. A that use solar energy and other renewable energy. Such cities includes; Oakland 17%, San Franscisco 12% and Porland 10% (Ten top cities in U. S. A for renewable energy) .

In his paper (Cleveland) explains how solar energy can be optimized. This paper represents a method of analyzing the financial costs and benefits of solar systems in commercial buildings using a model building. Assumption made are; the house is 30% below ASHRAE 90. 1 standards, the owner is interested in investing on thermal technology and wanted to build the most efficient building possible, consideration of natural gases and electricity escalations as alternatives to solar energy. The model house was 50, 000 sq feet and cost of building such a house in Calorina is $500, 000 to 750, 000 with fully installed HVAC system. Energy plus was used to map the building. The inputs for the energy plus simulation included, Raleigh, NC location, u-shaped office building of 50, 000 sq , 30% energy savings among others and this led to projection output of heating system capacity 641 kBtu/hr (includes hot water usage), 87 tons of cooling capacity required, annual HVAC electricity use and annual natural gas use, hot water cooling. The model

house was used to run 2 cooling scenarios one with traditional HVAC as control building and the other one with traditional cooling system and solar heating and cooling system (solar building). The sizing of thermal loads of absorption chiller was based on information sourced from energy plus and this ensured that it had that same output as HVAC system. The amount of solar thermal energy supplied to heating water, heating space and cooling the space was calculated using RET screen which is able to estimate energy production, savings , cost, viability and risks of various renewable energy and energy efficient techniques. In order to determine the comparative value of solar heating and cooling system and traditional HVAC system, net present value (NPV) of each system type was used. A sensitivity analysis test was used to assess the effects various fractions on the economic feasibility of each system.

In economic analysis, the results from this study shown that, in 10 years, solar system NPV was $678, 713 while that of HVAC was & $661, 185. In, 20 years the NPV for solar system was $688, 952 while HVAC was $714, 809. Lastly, in 30 years time the solar system showed NPV of $700, 117 while the HVAC system was $763, 085. 3 . Three variables were used in HVAC to calculate NPV while in solar energy additional variables such as number of panels, thermal REC, prices, cost of solar system per ton of chiller capacity were used. This results indicates that solar system is advantageous in the long run.

However, there are limitations in this study. For instance, it investigated specific systems for comparison reasons and it did not consider other alternative systems which perhaps could produce different results. Again, the system pricing data which was used in economic analysis cannot be

considered as representative of formal quotes as it was based on estimates from contractors. Other factors that could affect the model but were not considered includes, changes of building incentives in different regions, labor and transportation as market factors and tax legislation.

Conclusion

Though this technology is not widely used, this study shows that solar cooling is a financially feasibility investment. It has long run benefits in these times of energy escalations.

References

1. Cleveland, T., Thomas, P., Henry, T and Laurel, V. " Optimizing solar thermal resource use at commercial buildings." (2010). Web. 3rd Nov. 2011

2. Coffey, Jerry. Solar energy. 15 Sep. 2010. 3 Nov. 2011 .

3. High voltage. Web. 3 Nov. 2011 .

4. Ten top cities in U. S. A for renewable energy. Web. 3rd Nov. 2011.