CHAPTER VII

CONCLUSIONS & FUTURE WORK

In conclusion, the dynamic performance of a " typical " fully-air-conditioned solar house and the effect of total solar collector size on the performance were investigated using 4 months of actual meteorological data in 1979 for Bangkok, Thailand. Next an analysis of the economic feasibility of the proposed solar house was carried out based on the obtained performance data.

Principal Conclusions

The principal conclusions of the present work are as follows:

1. The total solar flux incident on a horizontal plane for the 4 months of March through June 1979 in Bangkok was 2.46×10^6 kJ/m^2. (Daily average = 2.02×10^4 kJ/m^2)

2. The total solar flux incident on a collector plate tilted 13° to the horizontal plane for the 4 months of March through June 1979 in Bangkok was 2.41×10^6 kJ/m^2. (Daily average = 1.98×10^4 kJ/m^2)

3. The total amounts of heat collection by the water

flowing through the collector plates were 8.35×10^7, 7.12×10^7 and 9.32×10^7 kJ for Cases 1, 2 and 3, respectively. In other words, the larger the collector size, the more solar energy collected.

4. Case 2 gave a highest collector plate efficiency of 38.67 % while Case 3 gave a lowest value of 36.12 % because of the reasons explained on page 87. In other words, the smaller the collector size, the higher the collector plate efficiency.

5. The daily average working hours of the collector pump was about 7 hours. Furthermore, as explained on page 96, the larger the collector size, the longer the operating time of the collector pump.

6. The 4-month total cooling loads of the house were essentially the same at 4.48×10^7 kJ.

7. The daily average working hours of the absorption air-conditioner was about 14 hours during the 4-month period.

8. The efficiency of the absorption air-conditioner averaged out to be around 62 % because the inlet water temperature was always higher than 85°C and usually not much higher than 88°C.

9. The larger the collector size, the lower the amount of supplemental energy supplied by the main heater.

10. For the particular solar system, no auxiliary heater need be provided at all to raise the service hot water above 60°C.

11. Economically speaking, Case 2 was the most attractive mainly because of its lowest initial investment cost. However, it could not always meet the cooling loads of the house.

12. From the point of view of performance only, Case 3 was the most attractive because it needed the lowest amount of supplemental energy, and it could best meet the cooling loads of the house.

13. Even at present a solar system might be cheaper than an electric one if the whole house were air-conditioned 24 hours a day. In other words, the higher the air-conditioning loads the more economical a solar system becomes compared to an electric system and vice versa.

14. The steeper the rate of electricity price increase, the more economical a solar system becomes.

Limitations & Future Work

Although it is quite risky to have based our economical feasibility on just 4 months of 1979, this could not have been avoided because of the restriction on computer time. The extrapolation of our results to represent a whole year was somewhat justified by the fact that it was relatively hot throughout 1979 in Bangkok. Nevertheless, appropriate caution should be exercised regarding the feasibility results reported in this work, since the average cooling load from March through June would be expected to be higher than that for a whole year.

It should also be pointed out that the house in this study was fully air-conditioned 24 hours a day which may not be the case for most houses in Bangkok. Naturally, the resulting exceptionally high cooling loads tended to favor the feasibility of our solar system.

As for future work, it would be interesting to apply the same technique to study the performance and economic feasibility of a solar air-conditioned office building or hotel in Bangkok. In that process, it might also be necessary to extend the capability of MOSTPROSIT.