PHOTOVOLTAICS:
Its Feasibility and Applications in the Singapore’s Context

by

Chua Soo Hoon
HD982520W

Submitted to School of Architecture
In Partial Fulfillment of the
Requirements for the Degree of
Master of Architecture

ABSTRACT

Solar radiation, converted directly into electricity offers a clean and almost inexhaustible power source. Singapore, a tropical country which is highly built-up and with no known natural energy resources, with a relatively high average radiation, would be a suitable place to tap upon this inexhaustible solar energy as compared to the other forms of renewable energy. Thus, this study looks into the current technology of photovoltaics, analyses its feasibility in terms of its economical value, its impact on the environment, and its possible integration in buildings in Singapore.

Chapter 2 gives a brief understanding of the history and mechanisms behind the working of a solar panel. This includes the study of solar radiation and its availability in Singapore.

Chapter 3 deals with the sizing of photovoltaics and provides a rule of thumb that will aid an architect to design a photovoltaic-integrated building in Singapore, according to its orientation. This table will give an approximate estimation of the energy generated with respect to the design of the building.

People have often wondered about the economics of photovoltaic installation. In Chapter 4, comparative study will be done between the cost of current building materials and photovoltaic systems. The environmental impact of photovoltaics, especially during the production stage has often caused doubts to arise in environmentalists of its feasibility, would also be discussed.

A case study of such an integration of photovoltaics into buildings in Singapore by Ministry of Defence (Mindef) will be presented in Chapter 5. This will also include an imaginary hypothesis of converting the whole of Singapore into a place with full-scale integration and studying its corresponding energy production.

Finally, the current barriers to the widespread dissemination of photovoltaics will be discussed, followed by a look at the present available technologies for building-integrated photovoltaic systems and their future.

Dissertation Supervisor: S. P. Rao
Title: Associate Professor