

Evaluation of Environmental Impacts of Polycrystalline Silicon Solar Cell by Using LCA Aspect

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Nowadays, many energy resources have been largely consumed despite these fossil fuel products needed long time or million years to be created. As the demand is not balance with the supply, it is surely that sooner or later, the fossil fuel will run out of the world if people still not aware of consuming these non-renewable energy resources. To solve the shortage problem of the fuel is to extend the period of the proved reserves, in the mean time, develop the advanced technology of energy generation and also integrated with environmental policy. The alternative energy such solar cell technology has been developed to relief the problems for a decade. Solar cell has been largely used in developed countries in order to reduce the consumption of electricity and lessen the release of green house gases emission from combustion of fossil fuels at the power plants.

Although, there are many advantages of using solar cell systems but it is not clearly defined that the solar cell systems are friendly to the environment from the life cycle assessment point of view. Therefore, in order to understand all of the impacts that happen in every phase of solar cell system, Life Cycle Assessment (LCA) is studied and applied for being a comparative case study with the conventional energy. The polycrystalline silicon type of solar cell is selected to be our priority case study due to its popular use recently and the data available in Thailand. The numerical Eco-Load Total Standards (*NETS*) model is used to evaluate and calculate the environmental impacts of each LCA stage of the solar cell systems.

As the result, the Life Cycle Inventory (LCI) data of the solar cell systems with polycrystalline silicon type is developed and the data could be measure and collected from the sites in Thailand. It is obviously seen that the impacts is highly happened at the production stage about 98%. And the major impact is the natural resources depletion, the most serious problem is the material acquisition of aluminum and copper, those two materials are rare of proved reserves. There should be the attempts to develop replaceable materials or the recycling policy as a closed-loop supply chain should be emphasized to strict and limit the number of rare material consumption.

It could be concluded that LCA-*NET* is one of powerful life cycle impact assessment tools which can be used to diagnose the environmental problems and find the suitable method to improve the PV system. Life cycle inventory data of each type of PV should be more developed for more clarify and comparable. PV system will pay more important role in the future because of its ecological advantages. The new type of PV should be applied for Thailand in the future to minimize the emission and maximize the efficiency of the solar cell system for our sustainable society.