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## Framework for Optimizing the Solar Incentive from the Perspectives of Residents and Policy Makers

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### Abstract

In spite of the remarkable growth and price reductions of the photovoltaic (PV) market during the past decade, the PV market still needs financial supports and incentives in order to achieve its national target from the long-term perspective. However, due to the financial burden on the government budget, most of the countries are reducing their financial supports and incentives as time goes by. In order to sustain the growth of the PV market, it is crucial to determine the optimal solar incentive design by minimizing the government budget while maximizing the resident's benefit. Towards this end, this study aims to propose a framework for optimizing the solar incentive from the perspective of residents and policy makers. The proposed framework consists of five steps: (i) establishment of database; (ii) generation of incentive scenarios; (iii) calculation of the electricity generation; (iii) Life Cycle Cost (LCC) analysis; and (v) Multi-objective optimization using Pareto optimal solutions. The proposed framework could help both residents and policy makers in several ways by developing a multi-objective optimization model in the future study: (i) minimize the government budget; (ii) maximize the resident's benefit; (iii) determine an optimal solar incentive design which can satisfy both residents and policy makers. Application of the proposed framework could be extended to any other country or sector in the global environment.

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**Keywords:** Solar Policies; Solar Incentives; Photovoltaic (PV) System; Government Budget; Life Cycle Cost (LCC)

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## Nomenclature

NRE	New Renewable Energy
GHG	Greenhouse Gas
PV	Photovoltaic
TC	Tax Credit
TE	Tax Exemption
CBI	Capacity-Based Incentives
PBI	Performance-Based Incentives
FITC	Federal Income Tax Credit
SITC	State Income Tax Credit
PTE	Property Tax Exemption
STE	Sales Tax Exemption
LCC	Life Cycle Cost
NPV	Net Present Value

## 1. Introduction

Due to the lack of energy resources on earth, it is essential to use NRE in order to save energy and reduce GHG emissions. The solar PV, which is considered having the greatest amount of potential among NREs, is clean, inexhaustible, and available everywhere in the world [1-3]. Furthermore, the solar PV market had been continuously growing with price reductions and government support for the past decade. The PV market should be financially supported by various incentive schemes to boost the deployment of the NRE and the growth of solar PV market from a long-term point of view [4-6]. However, most of the countries with the financial burden on the government budget are reducing their financial supports and incentives as time goes by. Accordingly, some previous studies were conducted in order to investigate the influence of solar incentives on the promotion and economic performance of the solar PV system [7-13]. However, there was almost no study on providing a decision support tool for determining an optimal solar incentive design, despite the difficulty and necessity of establishing an appropriate standard of financial support. Therefore, it is critical to determine the optimal solar incentive which can minimize the incentive budget for the government while maximizing the benefits for the residents. Towards this end, this study aims to propose a framework for optimizing the solar incentive from the perspective of residents and policy makers.

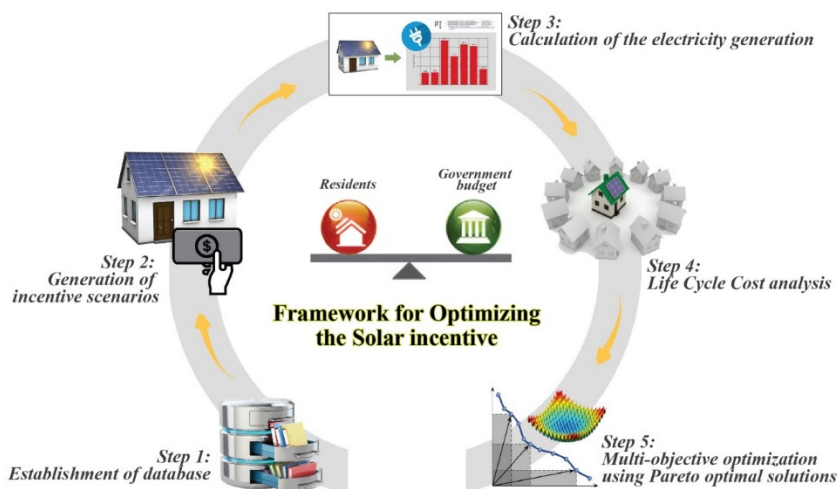


Fig. 1. Research framework

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