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Moving beyond LCOE: impact of various financing methods on PV profitability for SIDS

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HIGHLIGHTS

- LCOE estimates do not accurately represent financial viability for project developers
- Access to low cost financing is critical for solar proliferation in SIDS
- Fluctuations in electricity tariffs is the main source of risk for solar PV developers in SIDS, which could be mitigated by PPA arrangements
- Access to grid, high corporate tax rates, and lack of information transparency are key barriers for solar PV developers

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ABSTRACT

Small island developing states (SIDS) have some of the highest electricity tariffs globally. Renewable energy (RE) technologies could thus have reached grid parity in various SIDS. Furthermore, the abundance of resources such as solar and wind provides ample potential for SIDS to switch from high cost diesel generators to renewables. Despite favourable conditions, RE remains a largely underinvested sector in these regions. This paper aims to undercover the reasons why grid parity does not necessary translate into private sector investments in RE. With a focus on SIDS, this paper presents an evidence that achieving grid parity based on LCOE estimates is an incomplete benchmark for decision making in the power generation industry. In particular, LCOE and grid parity do not take into account financing constraints of RE projects which are often more pronounced compared to conventional forms of power generation. This paper thus presents the business perspective of RE projects, by employing a discounted cashflow model that includes various profitability metrics and effects of taxation and depreciation. The study shows that financing conditions exert strong influence on the economic feasibility of solar projects, both in LCOE terms and profitability terms. Thus, key policies should be targeted at improving financing conditions to ensure mobilization of private sector finances in solar PV.

1. Introduction

Today, small islands developing states (SIDS)[1] have among the most ambitious renewable energy targets worldwide (Dornan, 2015). This is not a coincidence as the energy sectors in SIDS are limited due to natural and economic factors and face tremendous development challenges. Due to their remote locations, SIDS depend highly on imported fossil fuels, while the access to alternative forms of energy remains limited. The dominance of fossil fuel in their energy mix exposes SIDS to volatile oil prices and constrains the security of the fuel supply. Small geographic size, remoteness and low demand for energy products cause further problems in terms of high fuel transport costs. In view of the above, opting for renewable energy (RE) technologies is a viable alternative to the prevailing model of conventional power generation in SIDS. Continuously decreasing costs of solar photovoltaic (PV) and wind technologies as well as the extended period of high oil prices have increased the cost-competitiveness of renewables compared to conventional power sources. Further advantages of RE to SIDS include suitability for small off-grid communities where standalone systems are preferred to grid extension (Dornan, 2014). Finally, integrating low carbon forms of energy can help SIDS strengthen their positions in international climate change negotiations and attract more funding through major

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[1] This paper adheres to the definition of small islands developing states (SIDS) provided by the United Nations Educational, Scientific and Cultural Organization (UNESCO). Associate members of SIDS are not included for this study.

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development agencies and motivated private investors.

When evaluating national energy policies, policymakers typically use the terms "levelized cost of electricity" (LCOE) and "grid parity" to assess the cost competitiveness of RE vis-a-vis the prevailing power generation mix. LCOE of an energy source is calculated as the lifetime generation cost divided by the total electricity generated, adjusted for time preference. Grid parity is achieved when an energy is generated at prices at or below the prevailing electricity tariff, thus indicating potential for profit. Given that SIDS have some of the highest electricity tariffs globally, it can be hypothesized that RE sources like solar PV can achieve grid parity and even reduce the cost of electricity in these regions. However, despite the seemingly competitive nature of RE in SIDS, it remains a largely underinvested sector. This paper seeks to uncover the reasons behind the under-investment in renewable energy compared to conventional power generation technologies and assess the financial viability of solar PV in SIDS. In the process, we also explore the concept of grid parity and highlight the limitations of LCOE in assessing commercial project viability. To accurately portray private sector decision-making, we include commercial project evaluation metrics in addition to LCOE and grid parity when evaluating RE projects. Policymakers responsible for implementing RE targets for SIDS and funding agencies seeking to invest in RE projects in SIDS should find this information relevant.

2. Literature review

2.1. Renewable energy in SIDS

According to the United Nations Department of Economic and Social Affairs (UNESCO) there are 36 small island developing states. These island states are classified into three groups: the Caribbean SIDS, the Pacific SIDS, and the Africa, Indian Ocean, Mediterranean and South China Sea (AIMS) SIDS. Generally, SIDS share similar natural characteristics: limited land mass and natural resources, low altitude and location along the tropical belt. In economic terms, SIDS, however, are a very diverse group. Singapore has the highest GDP among SIDS, with US$222.7 billion while Tuvalu has the lowest GDP of only US$31.4 million. The average GDP for the SIDS is approximately US$13.7 billion, however only 7 countries have a GDP higher than this amount. An estimated 81% of SIDS have a GDP lower than US$13.7 billion, 54% have it even lower than US$1 billion (UN-OHRLLS 2013). SIDS almost entirely depend on imported oil for power generation and have high energy intensity. Cost of energy services are among the highest in the world primarily due to high fuels transportation costs (Fig. 1). World Bank estimated that SIDS spent over US$67 million per day for oil in 2013 (World Bank, 2014).

Despite favourable resource potentials, RE in SIDS remains largely underdeveloped and underinvested. The share of RE excluding traditional biomass is very low in SIDS. For example, only 3% of the energy mix in the Caribbean comes from RE sources (UNEP, 2014). The reasons for the underinvestment have been widely discussed in the literature. Publications by Dornan (2014, 2015), Dornan and Jotzo (2015), Niles and Lloyd (2013), Wade (2005), World Bank (2014) UNEP (2014) and IRENA (2012) highlight the main barriers for the development of alternative energy sources in SIDS. These include lack of appropriate policy measures for RE producers, weak technical capacity in SIDS, difficulties in accessing grid for independent power producers, the conflict of interests between RE producers and state-owned power sector monopolies and absence of low-cost financing. Publications by Dornan (2014, 2015) and Niles and Lloyd (2013) further assert that Pacific and Caribbean SIDS face tremendous challenges in attracting private investment while the domestic budget allocations to the energy sector are largely insufficient. As a result, governments target development aid as a financing channel for energy projects. Some parties may question the use of development finance for RE targets, as they find poverty alleviation to be the main purpose of development aid. However, such concerns may be eased if funded RE projects increase electrification rates and protect consumers from high and volatile electricity prices (Fig. 1). As highlighted in Dornan and Jotso (2015), reducing electricity costs through RE is possible in SIDS where sufficient low-cost RE resources are available.

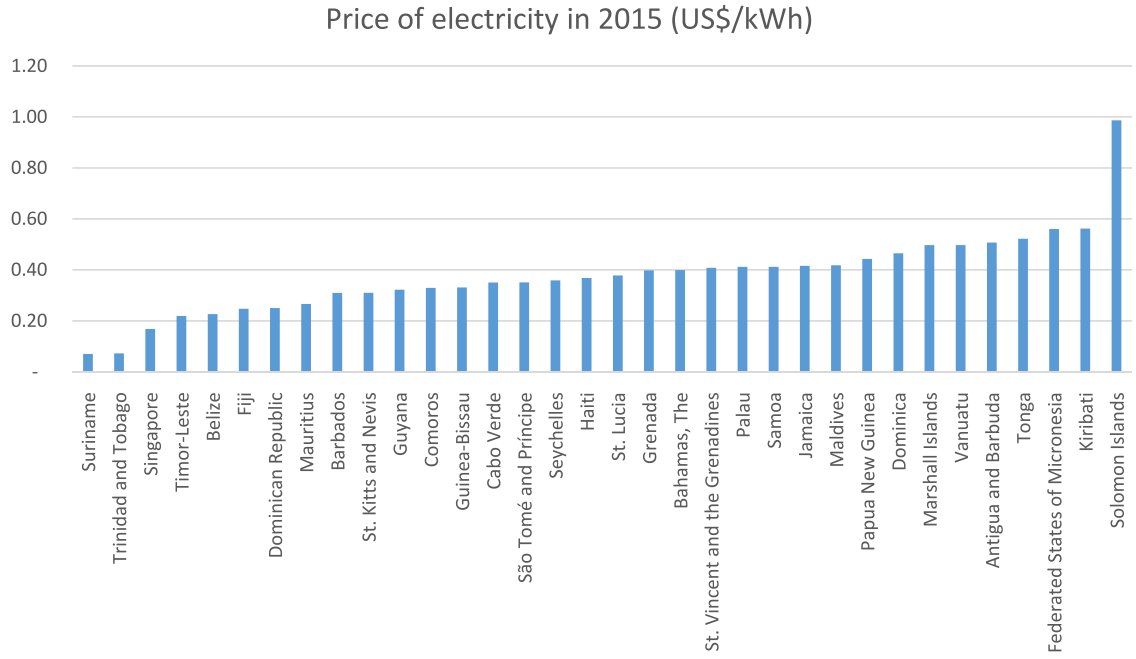

Fig. 1. Electricity tariff graph.
Source: Author's own with data from World Bank (2015).

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