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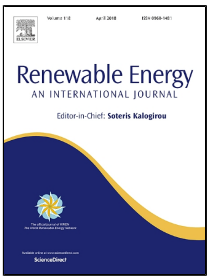


Assessing the growth of residential PV exports with energy efficiency and the opportunity for local generation network credits

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# Assessing the growth of residential PV exports with energy efficiency and the opportunity for local generation network credits

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## Abstract

An unprecedented expansion of household photovoltaic (PV) systems coincided with a marked decline in household electricity demand in several jurisdictions around the world. This was driven by falling PV prices and the installation of more energy efficient residential appliances (EE). However, existing net metering arrangements value self-consumption of PV far more than PV exports to the grid. As a result, energy savings from EE that considerably reduce household PV self-consumption could also reduce the value of PV systems. Since PV exports generally utilise only part of the distribution grid, 'local generation network credits' (LGNCs) have been proposed to increase the value of PV exports. LGNCs also have the potential to improve the combined value of PV and EE. Given the large variability of the household PV generation and load and the time-varying structure of LGNCs, an empirical probabilistic method is proposed in this paper in order to assess the combined PV-EE value with the LGNC arrangements. The results show how simplistic feed-in tariffs have an adverse impact on the combined PV-EE value and how LGNCs can assist in removing barriers to the combined uptake of these two key clean energy technologies.

Keywords: Distributed photovoltaics; energy efficiency; feed-in tariffs

## 1. Introduction

A dramatic fall in photovoltaic system (PV) prices [1], combined with strong government support in many jurisdictions, drove a remarkable deployment of PV systems in the last decade [2]. PV world capacity grew from 40 GW in 2010 to 227 GW in 2015 [3]. This deployment created significant benefits in many electricity industries [4] and made an important contribution towards mitigating the risks of catastrophic climate change damage [5]. A significant proportion of this world PV capacity was installed in the form of distributed energy - that is, energy technologies installed and financed by disperse electricity customers, outside any centralised operation or planning [6].

The most widely implemented commercial arrangement for this distributed PV deployment was Net Metering (NM). By the end of 2015, more than 50 countries had implemented some form of NM arrangement [3]. Under NM, customers with PV first self-consume the electricity they generate and any excess generation is exported to the electricity grid. The value of the PV generation which is self-consumed is the retail electricity tariff, in the form of avoided electricity consumption costs. The value of PV exports – that is, the generation which is exported to the grid – is typically set at a flat payment per kWh known as a feed-in tariff (FiT).

With NM arrangements, PV exports are typically assigned to the PV customer's electricity retailer who then on-sells the PV generation to other nearby electricity customers. PV exports[1] are on-sold at the full

[1] In practice, different proportions of the PV exports are consumed by different nearby customers and can be on-sold by different electricity retailers.