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Insights from the Experience with Solar Photovoltaic Systems in Australia and Indonesia

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Abstract

In the last five years, Australia has experienced a rapid deployment of household rooftop PV systems, to the extent that around 1.25 million households (15 % of all households) now have rooftop PV systems. Experience from this "social experiment" may provide useful insights for other countries considering similar scenarios. Indonesia has deployed PV systems since the 1970's with a hiatus caused by the Asian Financial Crisis in 1997. Significant deployment of PV systems recommenced after the turn of the century for both off-grid and grid-connected applications, with the grid-connected PV systems being connected to isolated diesel power systems on the smaller islands of the Indonesian archipelago. This paper discusses the nature of the Australian and Indonesian experiences with PV systems from technical, social, economic and policy perspectives, with the intention of providing insights to other countries contemplating similar scenarios. A key recommendation is to adopt a carefully planned and implemented strategy that avoids triggering a divisive cultural contest.

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1. Introduction

In the last five years, Australia has experienced a rapid deployment of grid-connected household rooftop photovoltaic (PV) systems, to the extent that around 1.25 million households (around 15 % of all households) now have rooftop solar PV systems. Prior to that, PV systems in Australia had mainly been deployed in off-grid applications.

Indonesia has deployed PV systems since the 1970's with a hiatus caused by the Asian Financial Crisis in 1997. Significant deployment of PV systems recommenced after the turn of the century for both off-grid and grid—connected applications, with the grid-connected PV systems being connected to isolated diesel power systems on the smaller islands of the Indonesian archipelago.

The aims of this paper are to review experience with solar PV systems in the Australia and Indonesia, to identify the positive and negative aspects of that experience and to develop insights that may be useful to other countries that are contemplating similar initiatives. The main focus of this paper is on grid-connected PV systems. Experience with small-scale renewable energy supply in remote Indonesian communities is discussed in [1].

2. Experience with grid-connected solar PV systems in Australia

Solar energy research and development effectively started in Australia in the 1950's with an initial emphasis on solar thermal conversion processes [2]. Solar photovoltaic (PV) research and development commenced in the 1970's and from then on small, off-grid PV battery systems were then being deployed for isolated residential and commercial use [2]. The installed capacity of off-grid residential and commercial installations exceeded 7 MW by the early 1990's and 130 MW by the end of 2013 [3].

The first grid-connected PV systems were installed in Australia in the early 1990's with rapid uptake from 2009. Total grid-connected PV system capacity exceeded 3 GW by the end of 2013, with all but 24 MW being small, distributed PV systems [3] with an average size of about 3 kW. The average rating of new distributed PV systems now exceeds 4 KW but the rate of installation appears to be slowing [4]. Five large grid-connected PV systems, of 102 MW, 53 MW, 20 MW, 13 MW and 10 MW respectively are currently under construction in Australia and are scheduled to commence operation in 2015 [3].

Table 1, based on Table 3 of [3], shows cumulative PV system capacity in Australia since 2005, illustrating the rapid growth of grid-connected distributed PV systems in the last five years. Table 3 in [3] extends this data back to 1992. The definition of "distributed" used in [3] includes PV systems installed at end-user premises and some other PV systems connected to an electricity distribution network (an illustrative example is given of a PV system installed on a motorway sound barrier).

Table 1. Cumulative installed PV systems in Australia (MW), 2005-2013 (based on [3])

Sub-market	2005	2006	2007	2008	2009	2010	2011	2012	2013
Off-grid residential	20	24	28	33	41	44	55	65	74
Off-grid other	33	37	39	41	43	44	47	53	58
Grid-distributed	7	9	15	30	101	480	1268	2276	3070
Grid-central	0.8	0.8	1	1.3	2.5	4	7	22	24
Total	61	70	82	105	187	571	1377	2415	3225

A number of factors have contributed to the rapid uptake of distributed grid-connected PV systems in Australia over the last five years, including:

- Rising residential electricity tariffs primarily resulting from increased distribution network tariffs and climate change mitigation policies
- Falling purchase prices for distributed PV systems and growing public acceptance of the technology
- Emergence of many small businesses engaged in PV system design and installation
- Government policy measures that supported the uptake of distributed PV systems