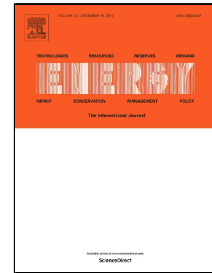


Accepted Manuscript

A Thorough Investigation on Hybrid Application of Biomass Gasifier and PV Resources to meet Energy Needs for a Northern Rural off-grid Region of Bangladesh: A Potential Solution to Replicate in Rural off-grid Areas or not?



Md Shahinur Islam, Ruma Akhter, Mohammad Ashifur Rahman

PII: S0360-5442(17)32168-0
DOI: 10.1016/j.energy.2017.12.125
Reference: EGY 12074
To appear in: *Energy*
Received Date: 26 August 2017
Revised Date: 06 December 2017
Accepted Date: 24 December 2017

Please cite this article as: Md Shahinur Islam, Ruma Akhter, Mohammad Ashifur Rahman, A Thorough Investigation on Hybrid Application of Biomass Gasifier and PV Resources to meet Energy Needs for a Northern Rural off-grid Region of Bangladesh: A Potential Solution to Replicate in Rural off-grid Areas or not?, *Energy* (2017), doi: 10.1016/j.energy.2017.12.125

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1 **A Thorough Investigation on Hybrid Application of Biomass Gasifier and PV**
2 **Resources to meet Energy Needs for a Northern Rural off-grid Region of**
3 **Bangladesh: A Potential Solution to Replicate in Rural off-grid Areas or not?**

4 Md Shahinur Islam ^{a*}

5 ^a School of Electrical Engineering, Royal Institute of Technology (KTH), 100 44 Stockholm, Sweden

6 Email: msislam4@kth.se

7

8 Ruma Akhter ^b

9 ^b Postgraduate Program in Renewable Energy, Institute of Physics, University of Oldenburg, 26111 Oldenburg,

10 Germany

11 Email: ruma.akhter@uni-oldenburg.de

12

13 Mohammad Ashifur Rahman^c

14 ^cElectrical Energy Systems (EES), Eindhoven University of Technology, 5612 AZ Eindhoven, The Netherlands

15 Email: m.a.rahman@alumnus.tue.nl

16

17

18 **Abstract:** Rural electrification is a critical global challenge specifically in developing countries and
19 Bangladesh is no exception. Most of the people live in the rural areas of the country and having no access
20 to grid electricity hindering the development of these areas and the overall progress of the country's
21 economy severely. In this regard, renewable energy based hybrid mini-grid can be a viable solution to
22 ensure access to electricity for all. This paper presents a case study of supplying electricity through hybrid
23 mini-grid to the rural unelectrified areas of the northern region of Bangladesh, and provides an analysis
24 of its business creation, operation and related challenges. The study involves modelling of three
25 alternative configurations for electricity generation with the different combination of solar energy,
26 biomass generator, diesel generator and battery storage resources. Hybrid Optimization Model for
27 Electric Renewable (HOMER) software is used to carry out the techno-economic analysis and identify the
28 optimal off-grid system configuration. The analysis exposed that the per unit cost of electricity from the
29 optimum off-grid supply configuration is much higher than the regulated tariff for grid connected
30 residential consumers and cannot reach grid parity even with the full capital subsidy. However, the cost
31 of off-grid supply is economical than the diesel-only supply option or the cost of owning a solar home
32 system. The analysis further considered different electricity selling tariff to obtain a practical and
33 reasonable payback period to make the proposed hybrid mini-grid system economically worthwhile. From
34 the emission analysis, it is found that the proposed hybrid system would produce 75% lower CO₂ than the
35 existing methods of fulfilling energy needs in the study area.

36

37 **Keywords:** Bangladesh; Hybrid mini-grid; Rural electrification; Solar Photovoltaic; Biomass; Electricity
38 access

39

40

41

42 *Corresponding Author, Tel.: +49 176 301 460 43

43 Email address: msislam4@kth.se

Download English Version:

<https://daneshyari.com/en/article/8072206>

Download Persian Version:

<https://daneshyari.com/article/8072206>

[Daneshyari.com](https://daneshyari.com)