

Biomass energy in Malaysia: Current state and prospects

S. Mekhilef^{a,*}, R. Saidur^b, A. Safari^a, W.E.S.B. Mustaffa^a

^a Department of Electrical Engineering, University of Malaya, 50603 Kuala Lumpur, Malaysia

^b Department of Mechanical Engineering, University of Malaya, 50603 Kuala Lumpur, Malaysia

ARTICLE INFO

Article history:

Received 10 December 2010

Accepted 5 April 2011

Keywords:

Renewable energy

Biomass

Biofuel

Biopower

Malaysia

ABSTRACT

Today, energy crisis turn out to be a serious threat towards sustainability for developing countries since their energy demand is growing more rapidly than developed countries. On the other hand, fossil fuels cannot sustain anymore in the near future because of environmental impacts and depletion of the reserves. Malaysia is experiencing drastic growth in population and economy and requires exploring alternative energy sources to support its population and commercial energy demand. Biomass as the fourth largest energy resource in the world is abundant in the country. Malaysia is blessed with tropical and humid climate all year round which is a magnificent opportunity for fully exploiting agriculture and tropical forests potential. Since late 1990, the concept of waste-to-wealth had been promoted and became popular widely. This concept is based on unwanted wastes which are converted into valuable energy while reducing waste generated and increase the economy-efficiency mainly used for cooking, space heating and power generation. Currently, concerted efforts and various biomass energy programs are supporting by the government for development, demonstration and commercialization. This paper intent to present the current state and prospects of biomass utilization and strategies promoted for future developments in Malaysia.

© 2011 Elsevier Ltd. All rights reserved.

Contents

1. Introduction.....	3360
1.1. Energy and biomass	3361
1.1.1. Energy status in Malaysia	3361
1.1.2. Segregation in energy sector.....	3363
1.2. Biomass categorization.....	3363
2. Biomass energy utilization in Malaysia.....	3363
2.1. Agricultural wastes.....	3363
2.2. Forest residues.....	3364
2.3. Municipal solid wastes (MSW).....	3365
2.3.1. Clean Development Mechanism (CDM)	3366
2.4. Bio-fuels	3367
2.5. Bio-power	3368
3. Plan and strategies to promote biomass use in Malaysia	3368
4. Conclusion.....	3370
References	3370

1. Introduction

Energy crisis has become a serious threat towards sustainability mostly for developing countries and communities in the last decades. During 1990–2000, developing countries of the Asia

Pacific region met 27% increase in conventional energy consumption while the world energy consumption was 11% [1]. Increasing in the energy demand is expected to continue in the future. Fossil fuels have been the main source of energy since first sparks of technology appeared in mankind lives, however, depletion of fossil fuel reserves as well as significant environmental impacts, leads the governments and authorities to focus on renewable energy resources. In most recent years, demand for petroleum-derived fuels is increasing as a result of grow in population and economy

* Corresponding author. Tel.: +60 3 7967 6851; fax: +60 3 7967 5316.

E-mail address: saad@um.edu.my (S. Mekhilef).

Nomenclature

FDP	Fuel Diversification Policy
GDP	Gross Domestic Product
EC	Energy Commission
TNB	Tenaga Nasional Berhad
SESB	Sabah Electricity Sdn. Bhd.
SESCO	Sarawak Energy Supply Corporation
DoE	Department of Environment
EFB	Empty fruit bunches
MF	Mesocarp fiber
MOP	Molded oil palm
MSW	Municipal solid waste
LFG	Landfill gas
GHG	Greenhouse gases
UN Agenda 21	United Nations Agenda 21
SD	Statistic Department
GWP	Global Warming Potential
CDM	Clean Development Mechanism
Jl	Joint Implementation
COP7	Conference of the Parties the 7th Session
CER	Certified Emission Reductions
PTM	Malaysia Energy Centre
PKE	Palm kernel expeller
NG	Natural gas
BTG	Biomass Technology Group
MPOB	Malaysian Palm Oil Board
FPISB	Felda Palm Industries Sdn. Bhd.
CPO	Crude palm oil
SREP	Small Renewable Energy Power
REPPA	Renewable Energy Power Purchase Agreement
SCORE	Special Committee on Renewable Energy
BioGen	Biomass-based Power Generation and Co-generation
UNDP	United Nations Development Program
USD	United State Dollar
GEF	Global Environment Facility
FiT	Feed in Tariff
TSHRB	TSH Bio-Energy
UKM	University Kebangsaan Malaysia
USM	University Science Malaysia
UPM	University Putra Malaysia
UM	University Malaya
UTM	University Technology Malaysia
UTP	University Technology Petronas
IUU	International Islamic University
POME	Palm Oil Mill Effluent
RE	Renewable energy

Subscripts

ktonnes	kilotonnes
km ²	square kilometre
ha	hectares
%	percentage
boe	barrels of oil equivalent
m ³	cubic metre
CH ₄	methane
CO ₂	carbon dioxide
N ₂ O	nitrous oxide
SF ₆	sulphur hexafluoride
HFC	hydrofluorocarbon
PFC	perfluorocarbon
kg	kilogram
B5	biodiesel fuel blend

MW	megawatt
C ₅	pentoses
C ₆	hexoses
kWh	kilowatt hour
RM	Ringgit Malaysia
°C	degree Celsius
g	gram

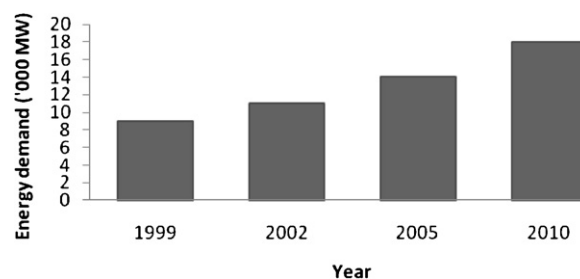


Fig. 1. Predictions of energy demand in Malaysia [4].

[2]. As economy grow, energy demand increases and brings along some changes in the energy consumption pattern which in turn varies with the source and availability, conversion loss and end use efficiency [3].

Fig. 1 illustrates the energy demand for Malaysia has been predicted in. It can be seen that the energy demand in Malaysia increases almost 20% between 1999 and 2002. And the energy demand is estimated to increase to 18,000 MW by 2010 [4].

Conventional fuels are limited and will not be able to sustain for another 100 years [5]. Therefore, somehow, other renewable petroleum-derived should be revealed as a backup energy and the most similar to the petroleum-derived is biomass energy. Global warming issues, environmental impacts and depletion of fossil fuel resources play important roles to improve the prospects of biomass energy technologies and consumption in the future. Biomass energy is the preeminent substitute to petroleum-derived energy and is suitable as a backup energy for sustainable energy development.

1.1. Energy and biomass

1.1.1. Energy status in Malaysia

Malaysia is well endowed with both fossil and renewable energy sources and has successfully controlled the country's demand for energy [6]. Table 1 presents types of the renewable energy resources in Malaysia, and energy value in Ringgit.

As it shows, renewable energy sources are widely available in the country. Despite its wide use already, there is still much to be done to optimize the utilization of renewable energy in Malaysia.

Table 1

Types of renewable energy in Malaysia and its energy value [7].

Renewable energy source	Energy value in RM million (annual)
Forest residues	11,984
Oil palm biomass	6379
Solar thermal	3023
Mill residues	836
Hydro	506
Solar PV	378
Municipal waste	190
Rice husk	77
Landfill gas	4

Download English Version:

<https://daneshyari.com/en/article/1751481>

Download Persian Version:

<https://daneshyari.com/article/1751481>

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