

## Chapter 2

# Productive Use of Renewable Energy (PURE) for Economic Development in Developing Countries

**Phillip Olla**

*Madonna University, USA*

**Nkemdilim Onwudinjo**

*Madonna University, USA*

### ABSTRACT

*There has been an increase in the deployments of renewable energy technologies such as solar, wind, geothermal, and biomass energy due to the concerns regarding global warming. This growth in renewable energy projects along with the technological innovations is leading to lowering costs, which is making available an array of renewable energy options to developing nations to address the Millennium Development Goals (MDGs). Although Africa's main discussions on renewable energy have been focused on large scale grid-connected power systems, this chapter presents the arguments that several renewable energy technologies are well-suited to providing modern energy services for low-income people. The article presents a comprehensive framework that highlights how to scale up a broad portfolio of micro-renewable energy solutions that can make a major contribution to achieving the MDGs.*

### INTRODUCTION

A report released by the UN Secretary-General's Advisory Group on Energy and Climate Change is demanding a concerted action on two ambitious but achievable goals: Ensure universal access

to modern energy services by 2030, and reduce global energy intensity by 40 percent by 2030. Just as the developing world is being impacted by the introduction of mobile technology, there is a strong consensus that renewable energy will have a similar impact (AGECC, 2010). There are now a wide variety of economical applications for renewable energy in developing countries that have

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been identified and demonstrated which provides strong evidence that renewable energy can have a significant impact on poverty alleviation and achievement of the United Nations Millennium Development Goals (MDGs).

There are 2.4 billion people worldwide depend on traditional biomass for cooking while 1.6 billion people do not have access to electricity. As stated by UN-Energy report, this energy can divide people instead of connecting people *“entrenches poverty, constrains the delivery of social services, limits opportunities for women, and erodes environmental sustainability at the local, national, and global levels. Much greater access to energy services is essential to address this situation and to support the achievement of the Millennium Development Goals”* (AGECC, 2010).

This chapter will discuss a framework called Consumer Generated Energy (CoGE). The framework identifies five levels of components that must be considered to successfully deploy renewable energy projects. The framework would be beneficial to a variety of users such as: policy makers (level 1), academic institution considering educational courses such as energy modeling or entrepreneurial studies (level 2, 4), and investors (level 3) and developers (level 5). Although the chapter will discuss large scale renewable projects the focus is on the small scales energy projects and how to successfully replicate the energy generation in different scenarios by modeling energy requirements using a decision support tool called Retscreen.

Energy is at the heart of most critical economic, environmental and developmental issues facing the world today. Clean, efficient, affordable, and reliable energy services are indispensable for global prosperity. Emerging countries in particular need to expand access to reliable and modern energy services if they are to reduce poverty and improve the health of its citizens, at the same time increasing productivity, enhancing competitiveness and promoting economic growth. Current energy systems are inadequate to meet the needs of the world's poor and are jeopardizing the achieve-

ment of the Millennium Development Goals (MDGs). For instance, in the absence of reliable energy services, neither health clinics nor schools can function properly. Access to clean water and sanitation is constrained without effective pumping capacity. Food security is adversely affected, often with devastating impact on vulnerable inhabitants. The “energy-poor” suffer the health consequences of inefficient combustion of solid fuels in poorly ventilated buildings, as well as the economic repercussions of insufficient power for productive income-generating behaviors and for other basic services such as health and education. In particular, women and girls in the Emerging world are unduly affected in this regard as highlighted by the UNDP/World Bank Energy Sector Management Assistance Program.

Renewable energy technologies implemented on any scale are prone to obstacles in developing countries. Obstacles include the lack of research and development into the technology in developing countries, the need for large upfront investments, there are also lack of government subsidized infrastructure support, the policies that are in existence typically support conventional energy sources. The introduction of new policies for renewable energy can have an immense impact on the pace of introduction of renewable energy, as several developed countries have demonstrated. A recent example from Ontario Canada highlights the importance of a renewable energy policy. Ontario is now considered one the renewable hot-spots for innovation research and deployment. Ontario's Feed-In Tariff (FIT) is now considered to be North America's first comprehensive guaranteed pricing structure for renewable electricity production. It provides stable prices under long-term contracts for energy generated from renewable sources. The FIT Program was enabled by the Green Energy and Green Economy Act, 2009, which was passed into law on May 14, 2009. The Ontario Power Authority is responsible for implementing the program. Experience from countries like Germany shows that as the scale of use increases,

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