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Renewable energy readiness assessment for North African countries

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ABSTRACT

Energy is an important input for national socio-economic development. The current trends of energy supply and demand are not sustainable because of the expected huge gap between demand and supply in the future. The fossil fuels resources are limited and use of these fuels has a negative impact in the environment. Holding energy at a secure level and global climate at a safe level require integration of renewable energy technologies (RETs) in the energy supply-mix. Development of RETs in a country depends on its renewable energy readiness (RE-Readiness) that indicates the gaps and strengths of their development. In light of the various initiatives proposed to turn North Africa into a renewable energy producer and extend its electricity supply to its neighboring European counties, it demands to assess the RE-Readiness. The main object of this paper is to develop and disseminate an assessment framework to find North African countries RE-Readiness for deployment of RETs. This framework is adopted in which the paper applies a consistent methodology across all the North African countries' to assess the present state of infrastructure, institutions and human capital factors to adopt and deploy RETs. Each of the factors is assigned a weight and a score between 1 and 7, with 1 being the lowest and 7 the highest score. From this developed assessment framework, it is found Morocco received the highest RE-Readiness score means that the country is more ready to invest in RETs than the other countries in North Africa. This assessment identifies the gaps and strengths for the deployment of RETs in these countries and serves as a first step towards proposing renewable energy diffusion strategies that will contribute to their environmental, social and economic development.

Contents

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1. Introduction

The North African countries are mostly endowed with rich hydrocarbon resources at the exception of Morocco and Tunisia. Renewable energy adoption is driven by environmental concerns, enhanced energy security, and European proposition to install large-scale solar power plants and wind parks and establish an intercontinental power grid in order to transport the electricity to Europe. The Desertec Industrial Initiative (DII), constituted by German companies in October 2009, proposes an investment of €400 billion into the construction of future North African solar power plants and their connection to the European grid through submarine cables. The Mediterranean Solar Plan (MSP) aims to develop additional 20 GW by 2020 along with the necessary electricity transmission capacity, including international interconnections. These initiatives have been endorsed by the European countries through the formation of the Union for the Mediterranean, a political instrument of dialog and cooperation between the European Union (EU) and states of the southern and eastern Mediterranean. These initiatives seem to be feasible and promising according to the generalist technical economic studies that principally represent the European outlook on these projects. These initiatives proposed to turn North Africa into a renewable energy producer and extend its electricity supply to its neighboring European countries. However, the study on renewable energy readiness (RE-Readiness) assessment in these countries is lacking. This paper indicates the critical success factors that are important for the deployment of RETs and assesses RE-Readiness to promote RETs in different North African states namely Algeria, Egypt, Libya, Morocco, and Tunisia. A map to improve geographical understanding of North African countries is shown in Fig. 1 [1].

1.1. Renewable energy readiness

International Renewable Energy Agency (IRENA) defines RE-Readiness as "when actors are able to deploy renewables where they are the best option, accounting for all economic, social and environmental criteria". The readiness conducts its assessments by looking at "the current state of national readiness, across the project lifecycle, from national energy strategy and policy, to building, operation and maintenance, with capacity-building cutting across all these items" [2].

On a national level, RE-Readiness is an indication of the country's realization of the need for renewable energy and its ability to introduce and support renewable energy projects. In this report, RE-Readiness is defined as the level of development of a county's infrastructure, institutions and human capital factors that influence the attractiveness of investing in renewable energy projects and play a role in enhancing the reliability of RETs to ensure their sustainable deployment [3].

1.2. Methodology

The RE-Readiness for each country will be determined by evaluating their readiness to adopt RETs by assessing the enabling factors to deploy of RETs in terms of three pillars namely infrastructure, institution and human capital. Name of the factors and sub-factors of these pillars are given in Table 1. The Global Competitiveness Report (GCR) 2011–2012 developed by the World Economic Forum [4] was used to obtain scores for many factors and indices in this paper. The GCR measures countries competitiveness levels by assessing the competitiveness factors and giving them a score between 1 and 7. Similarly, the RE-Readiness Index is a score between 1 and 7, with 1 being the lowest and 7 the highest.

The scoring criteria for some factors and sub-factors can be initially assessed from a qualitative range of "poor" to "very good" and then translated into a score from 1 for "poor" to 4 for "very

Fig. 1. A map of North African countries.