

IMPACTS OF THE PROMOTION OF RENEWABLE ENERGY IN THE WORLD'S ELECTRIC SECTOR

Britt Bollinger

Independent Consultant in Energy Markets, Los Angeles, CA

Keywords: Alternative energy, electricity generation, electricity market, electric power, environmentalism, hydropower, hydroelectric power

Contents:

1. Introduction
2. North American Renewable Energy Overview
 - 2.1 United States Renewable Energy Overview
 - 2.1.1 A Brief U.S. History
 - 2.1.2 U.S. State Action
 - 2.1.3 Suppliers Providing Green Energy in the U.S.
 - 2.1.4 National Energy Plan
 - 2.2 Canada: Renewable Energy Overview
 - 2.2.1 Canadian Federal Government Support
 - 2.2.2 Private Development of Wind Resources
 - 2.2.3 Other Renewable Resources
 - 2.3 Mexico: Renewable Energy Overview
- 3 European Renewable Energy Requirements
 - 3.1 The European Union: Renewable Energy Overview
 - 3.1.1 European Union's *Altener II*
 - 3.1.2 UK Renewable Portfolio Standards (Renewables Obligation)
 - 3.2 Western Europe: Renewable Energy Overview
 - 3.3 Eastern Europe: Renewable Energy Overview
4. Asian Renewable Energy Policies
 - 4.1 India: Renewable Energy Overview
 - 4.2 China: Renewable Energy Overview
 - 4.3 Japan, Australia, and New Zealand: Renewable Energy Overview
5. Central and South American Renewable Energy Policies
6. Africa and Middle East Renewable Energy Policies
7. Conclusions
- Bibliography
- Biographical Sketch

Summary

“Renewable energy” is broadly defined as energy derived from sources including water, wind, solar, geothermal, landfill gas, municipal solid waste and biomass. However, some reputable sources broaden the definition to include tidal power and other similar resources, or narrow the definition to exclude municipal solid waste and landfill gas. This article reviews a bit of historical background predicating interest in renewable

electric power, various country and regional plans to support renewables, mechanisms being implemented or discussed to provide support, issues specific to individual renewable energy resources or technologies, and, finally, a discussion of impact and the future course of renewable resources.

1. Introduction

The promotion of renewable energy around the world is seen as the clearest technique to providing for a sustainable energy future, however economics, politics, and regulation all impose barriers in renewable development. Regardless of the environmental benefits associated with not burning fossil fuels, the depletion of nonrenewable resources can be slowed or stopped with the continued development of renewable energy sources power production.

The Kyoto Protocol of 1997 provided added incentive for many countries to begin to plan and diversify their energy portfolio resources (The Kyoto Treaty was opened for signature beginning in 1998 and requires fifty-five countries, accounting for fifty-five percent of world emissions, ratify in order to be in force. The United Nations' produced Protocol sets out to reduce greenhouse gas emissions by "harnessing the forces of the global marketplace to protect the environment." The U.S. would be required to reduce emissions to seven percent below 1990 levels, the E.U. to eight percent below 1990 levels, and Japan to six percent below E.U. levels). As concerns of global climate change began to find support in the scientific community, the United Nations Framework Convention on Climate Change held in Kyoto, Japan brought about a historic plan to reduce the world's emissions. As such, many countries have begun to actively plan and develop resource strategies that allow for the trade of emissions credits in order to reach target levels (*see European Union below*).

"Renewable energy" is broadly defined as energy derived from sources including water, wind, solar, geothermal, landfill gas, municipal solid waste and biomass. However, some reputable sources broaden the definition to include tidal power and other similar resources, or narrow the definition to exclude municipal solid waste and landfill gas. This article reviews a bit of historical background predicated interest in renewable electric power, various country and regional plans to support renewables, mechanisms being implemented or discussed to provide support, issues specific to individual renewable energy resources or technologies, and, finally, a discussion of impact and the future course of renewable resources.

2. North American Renewable Energy Overview

Both the U.S. and Canada have active renewable energy programs and funding for continued research and development. In recent years, however, the change in U.S. federal government policy has slowed the implementation of many projects with a decline in funding and a focus on established fossil fuel technologies. Canada has taken an aggressive approach to implementing greater wind capacity with the active backing of the provincial and federal governments. Mexico has lacked widespread commitment to renewable growth given its abundant natural gas resources, but has established the potential for future wind energy projects.

2.1 United States: Renewable Energy Overview

Over the years, U.S. state and federal public policies favoring renewable energy have included tax, financial, and guaranteed power purchase contract incentives to support the development of renewable energy. The aims of these policies have primarily been to develop a sustainable energy future, reduce dependence on foreign oil, and lower the environmental impacts of fossil fuel based electricity generation. Other economic benefits that have been touted are job creation and risk management, due to the diversification of energy resource options. While more costly than traditional fossil fuel sources, the renewable energy promise was thought to be more important as a means of sustaining an energy supply to meet the US' increasing energy demand. The restructuring of the U.S. electric power industry has refocused attention on renewables and renewable energy policies. The crucial factor in promoting renewable energy seems not to be what policymakers define as renewable, but what consumers perceive as renewable. Consumer perception is the key to the promotion of renewable energy. This perception varies broadly, based on the location of the consumer and the information available or provided to the end-user. The onset of competition in electricity markets necessitates a reevaluation of renewable energy policies. Concerns about the use of renewable energy sources in a competitive environment can be outlined as follows. Competition in the electric power industry will encourage utilities to become more efficient and reduce costs in order to lower electricity prices. This will create a premium on short-term cost minimization. Renewable energy sources will be challenged to continue to penetrate electric power markets because they are generally higher-cost options for producing electricity. Proponents of renewable energy fear that renewables could be an inadvertent casualty in the transition to a competitive electric marketplace.

2.1.1 A Brief U.S. History

The 1973 oil embargo spurred the adoption of the National Energy Act of 1978, which restructured the US energy market. A primary objective of the Act was to reduce U.S. dependence on foreign oil, as the country was perceived to be vulnerable to interruptions in oil supply. This reduction in dependence, it was thought, could be accomplished in part through the development of renewable and alternative energy sources. A statute in the National Energy Act directed the development of commercial markets for renewable energy and passed into law the Public Utility Regulatory Policies Act of 1978 (PURPA). PURPA encouraged the development of "non-utility" cogeneration and small-scale renewable energy fueled power plants designated as "qualifying facilities" (QFs). Utilities were required to purchase electricity from certain QFs at the utilities' avoided costs under PURPA. In other words, they were required to buy electricity generated at the price the utility would have paid to generate it or to purchase the power from a commercial supplier. State policies promoting renewable energy were a second major factor influencing the development of renewable energy. California promoted renewable energy strongly in the 1980s with renewable energy tax credits. However, by the late 1980s California's renewable tax credits for wind energy ended and competition and pricing policies evolved. To further enhance renewable energy development the US government provided several tax incentives. By 1982, most renewable energy projects were eligible for a ten percent investment tax credit, a fifteen

percent business renewable energy investment tax credit, a forty percent residential tax credit for renewable fuel investment, and a five year accelerated depreciation schedule. With these incentive packages, private industry responded by producing and researching new renewable energy technologies and applications. Federal research and development budget appropriations, increased from the mid to late seventies, stabilized for 2 years, then dropped drastically in 1982 and continued to decrease each year through 1990, finally rebounding in 1991. This inconsistent funding by the US government created an uncertain investment environment for renewable energy projects.

2.1.2 U.S. State Action

Many different renewable energy policies have been contemplated in the United States, especially with the onset of retail electric competition. While there are voluntary programs and private utility contributions that might also be discussed at fair length, the policies discussed here are more centered on newer regulatory and market driven efforts to penetrate competitive markets. In an increasingly competitive U.S. electricity market, some regulators and legislators at both the state and federal levels are dedicated to stimulating the development of generating capacity in renewable energy resources. One approach that has received considerable attention is the imposition of a renewable portfolio standard (RPS), which would promote the use of renewables by establishing a minimum annual share of electricity generation (or sales) that must come from specified types of renewable facilities. Owners or operators of qualifying renewable facilities would receive credits for each kilowatt-hour (kWh) generated over the standard, and the credits could be used in the current year, held for future use (banked) or sold to others to ensure that their mix of power (portfolio) contained a specified share of renewable generation.

States with renewable portfolio standards are Arizona, Connecticut, Maine, Massachusetts, Minnesota, Nevada, New Jersey, Pennsylvania, Texas and Wisconsin. The programs vary widely state to state, however, the following are a few examples of some geographically diverse renewable action plans and their implementation timelines.

Arizona: The state has a Solar Portfolio Standard (“SPS”), a slight twist on the RPS. The solar portfolio percentage increases from point four percent in 2001 to one percent in 2005 and thereafter. Analysis of a number of solar portfolio scenarios showed that the SPS will provide significant employment in the state as well as increased income for the state. It is also the state’s hope that an SPS standard may develop a renewables manufacturing industry in Arizona.

Connecticut: The RPS program in Connecticut is one of “growth and maintenance”. The division is by a Class I and Class II set of renewables. Class I (the “growth” class) are the up and coming technologies like: solar, wind, new sustainable biomass, landfill gas, and fuel cells (any fuel type). Class II is the “maintenance” class, including licensed hydro, municipal solid waste, and other biomass sources. The Class I implementation timeline is point five percent by 2000 up to one percent in 2002 and finally growing to six percent in 2009 and beyond. Under the Class II timeline, either Class I or II technologies may be applied. By 2000 – five point five percent; 2005 – six

percent; and by 2009 and beyond – seven percent. However, in Connecticut compliance is not particularly adhered to. There is little retail competition in the state due in part to the low standard offer price (difference in wholesale and mandated retail price delivered to the end use customer). Suppliers can apply for a two-year delay in compliance and the penalties are vague thereby undermining the incentive to comply or contract for renewable supplies. RPS began in July 2000 with negligible effect to date. It is expected that when the mandated standard offer price is lifted in 2004 there may be more of an impact.

Maine: Has a program of “partial” maintenance. As a condition of licensing, a supplier must agree to thirty percent of retail sales from 2000 on generated from the following sources; fuel cells, tidal, solar, wind, geothermal, hydro, biomass, and municipal solid waste (“MSW” under 100 MW); and any size high efficiency fossil cogeneration. The historic mix has been about forty percent from these sources.

This program appears to be a bit too broad. The eligible supply far exceeds the standard, so there is not a real threshold being met. The verification method is extremely rigorous at this time, requiring contract-path verification that is costly. It is anticipated, however, that this will be changed to the Independent System Operator – New England (“ISO-NE”) certification system once it has been further developed and that the supplier verification cost will decrease.

As well, The Maine Public Utility Commission is to revisit the standard in five years to determine if any changes are needed. This adds to the uncertainty of suppliers entering the marketplace today. The RPS took effect in Maine in March 2000. There has been little impact in maintaining and no impact in increasing the renewable supply to date. The high transaction costs for suppliers increase the rates to the end user and do not benefit renewables. The PUC is in favor of dropping the RPS for a renewables fund that would direct funding more concretely. Net metering refers to the concept that a facility is permitted to sell any excess power it generates over its load requirement back to the electrical grid to offset consumption. In competitive markets, many different suppliers will offer a diverse menu of energy products and services with different pricing and billing plans. Consumers will have the option of choosing suppliers on the basis of their generation mix, including paying a premium for "green power" or renewable energy generated. To ensure consumers that they are purchasing green power it has been proposed that all electricity suppliers to disclose reliable and easy-to-read information on prices, generation sources, and other information to enable consumers to make informed choices among various offers.

-
-
-

TO ACCESS ALL THE 15 PAGES OF THIS CHAPTER,
Visit: <http://www.eolss.net/Eolss-sampleAllChapter.aspx>

Bibliography

Altener Programme at www.agores.org/General/Altenerhome.htm

www.anes.org (website for the National Association of Solar Energy in Mexico)

Commission Implementing Measures, Report On Harmonization, European Communities, 1995-2000 from <http://europa.eu.int/scadplus/leg/en/lvb/127005.htm>

Department of Trade and Industry, UK. New And Renewable Energy Prospects for the 21st Century, The Renewables. Obligation Statutory Consultation. www.dti.gov.uk/renewable/

Energy Information Administration, World Energy Outlook – Canada, 2001. International Energy Outlook, 2001. www.about.com

Environment.about.com (Website about China's renewable energy policy), Energy Information Administration, IEO2001.

www.eren.doe.gov/repis/download.html (A database of renewable energy power plants (through mid-1999) on the U.S. Department of Energy's Energy Efficiency and Renewable Energy Network)

Goodale, Raplh. (Minister of Natural Resources of Canada) Speech given to the Canadian Wind Energy Association, October 29, 2001, Ottawa, Canada.

Grace, Robert. Sustainable Energy Advantage, LLC, Renewable Portfolio Standards, March 23, 2001

Green Mountain Energy at www.greenmountain.com

www.london-electricity.co.uk/energy/majorbusiness/renewables.html (website of one of London's electricity suppliers)

Mooe, Curtis, and Ihle, Jack. Renewable Energy Policy Project, Issue Brief No. 14, Renewable Energy Policy Outside the United States, October 1999.

US Department of Energy. International Energy Outlook, 2001 www.eia.doe.gov

Singh, Virinder. Renewable Energy Policy Project, Issue Brief, No. 12, Clean Government: Options for Governments to Buy Renewable Energy”, April 1999.

Biographical Sketch

Britt Bollinger is an independent energy markets consultant with a diverse background in natural gas pipeline due diligence, wholesale electric generation markets and retail energy marketing. Most recently, Mrs. Bollinger has completed various new market opportunities for the U.S. distribution side of the electric business, including a review of renewable energy policies in the deregulated U.S. market. Additionally, Mrs. Bollinger has done retail energy consulting on residential structured wiring, state demand response programs, community-based aggregation, Internet protocol metering, and distributed generation.

Prior to this work, Mrs. Bollinger provided due diligence assessments for gas-fired generation and storage project lenders, reviewing and considering the terms of natural gas agreements for projects primarily in New England, the Midwest and the lower South Atlantic. Mrs. Bollinger has also completed assessments of power projects in Canada, Bolivia, and Morocco including detailed reviews of contractual fuel obligations. Mrs. Bollinger has written pieces on the status of ISO formation in the United States, stranded costs vs. stranded benefits, securitization as a policy, the outlook of utility mergers and acquisitions, and edited a guide to energy resources.

Her academic background includes: international trade and regulatory policy; energy and environmental economics; and applied statistical regression analysis. Mrs. Bollinger holds a Master of Public Policy from Georgetown University and a B.A. in Economics and Political Science.

UNESCO – EOLSS
SAMPLE CHAPTERS