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MITIGATING CLIMATE CHANGE ON A TRIBAL LEVEL

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Abstract

Climate change is occurring on a global level and affects both humans and the environment. Since the 18th century, humans began burning fossil fuels and deforesting lands to provide energy needs, which have changed the composition of the Earth's atmosphere, resulting in a changing climate. Native American tribes are extremely vulnerable to changes in the Earth's climate because their culture and sustenance are dependent on the natural environment. About 14.2% of Native American households are still living without electricity compared to 1.4% of all U.S. households. Therefore, my research paper focuses on national energy use and the effects of climate change on humans and the environment. My paper discusses the renewable energy potential and provides examples of renewable energy installations and LEED buildings on Tribal

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lands. Finally, my paper discusses the importance of renewable energy development and energy efficiency as a means for mitigating climate change on a Tribal level.

Introduction

The major energy sources in the United States include petroleum, coal, natural gas, nuclear power, and renewable energy and the major energy consumers include residential/commercial buildings, industry, transportation, and electric power generation. [1] Figure 1 provides a visual representation of U.S. energy consumption in 2010 where 37% of energy consumed was from petroleum and 8% was from renewable energy. Since the late 1950s, the energy consumption in the U.S. began to outpace energy production, so the country imported energy to meet its needs. In the year 2010, 95% of the imported energy was petroleum.

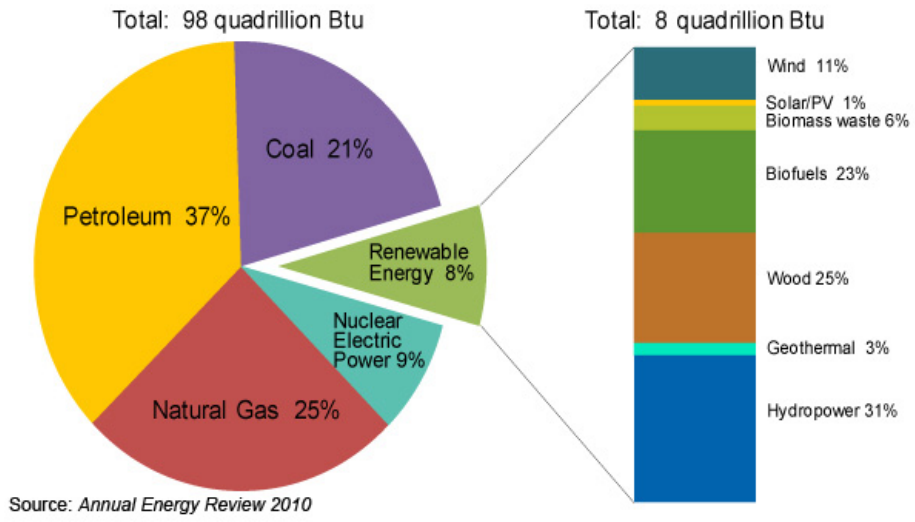

Figure 1. Total U.S. energy consumption for 2010

Electricity is a major source of daily energy use in the U.S. and is generated from coal (42%), natural gas (25%), nuclear (19%), renewables (13%) and petroleum (<1%). [2] Of these sources, petroleum, coal, and natural gas are considered fossil fuels, meaning it is a non-renewable source and contributes to climate change by adding greenhouse gas (GHG) emissions

[2] U.S. Energy Information Administration, 2012. Accessed 19 Jul 2012. http://www.eia.gov/

into the atmosphere.[2] Combined, the production and consumption of energy accounts for more than 80% of GHG emissions in the U.S. The production and consumption of energy has and continues to affect the environment in many ways including changes in temperatures, precipitation, sea level, and severity of extreme events to occur and will continue to occur in the future.[3] Due to these changes in the environment, humans are now strategizing ways to mitigate and adapt to the changing climate. The Intergovernmental Panel on Climate Change (IPCC) describes *mitigation* as "an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases." [4] The IPCC explains *adaptation* as "the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities." [4] Development of renewable energy can help promote adaptation and mitigation of climate change impacts.

Renewable energy sources are naturally replenished and these sources include hydropower, geothermal, solar, wind, biomass, biofuels and wood.[2] These sources can provide ways to meet current and future human energy needs. Over the past decade, the production of renewable energy has significantly increased. The Southwestern U.S. is one the best locations for solar development due to its high solar resource potential of 6.5 kWh/m^2/day. [4] If just 2.5% of this solar potential was converted to electricity, it would meet current U.S. energy consumption. [5]

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[3] Environmental Protection Agency (EPA): Energy Impacts & Adaptation. Accessed 19 Jul 2012. http://www.epa.gov/climatechange/impacts-adaptation/energy.html

[4] Global Greenhouse Warming, 2012. Climate Change and Mitigation: Defining Climate Mitigation and Adaptation. Accessed 27 Jul 2012. http://www.global-greenhouse-warming.com/climate-mitigation-and-adaptation.html

[5] Fthenakis, V., Mason, J.E., and Zweibel, K., 2009. The technical, geographical, and economic feasibility for solar energy to supply the energy needs of the US, *Energy Policy,* 37 (2):387-399.

Lovich, J.E., and Ennen, J.R., 2011. Wildlife Conservation and Solar Energy Development in the Desert Southwest, United States. *Bioscience,* 61 (12):982-992.

Mehos, M., 2008. Concentrating Solar Power, *American Institute of Physics: Physics of Sustainable Energy*, 1044:331-339.

In addition, Tribal lands have significant renewable energy potential, but are most vulnerable to the effects of climate change.

Tribes and Climate Change

The largest source of air pollution in the U.S. comes from conventional electricity generation through the combustion of fossil fuels (coal, petroleum and natural gas).[6] This pollution is the largest contributor to global warming in the nation and tribes are directly affected by the by-products of this generation.[6] Tribes are more vulnerable to changes in the Earth's climate because their culture and sustenance are dependent on the natural environment.[7] Although most electricity generation is done off or near Tribal lands, the surrounding areas have become targets for nuclear waste dumps, abandoned mines, and contaminated waterways.[6]

In 1998, the participants of a workshop on "Native Peoples-Native Homelands on Climate Change," created a final report on the discussions surrounding climate change impacts on Native homelands. A section on "*Native Peoples as Stakeholders*" provided several statements on views on the environment and climate issues and there was a general consensus that, "It is important that the non-Native participants realize that the perspectives from which Native peoples view issues related to environment and climate are markedly different from those of the broader non-Native society. Our Native peoples, in turn are trying to better understand non-Native approaches to these issues."[8] Another statement noted, "There is a shared understanding among Native American tribes that humans are a part of nature and not apart from nature; we are not separate from the sacredness of the natural world in which we live."[8] These

[6] Dreveskracht, R.D., 2011 Economic Development, Native Nations, and Solar Projects: *The Journal of Energy and Deployment,* 34 (1-2): 141-158.

[7] Purtill, C., 2006. The Arizona Republic: Tribes see effect of climate changes. Accessed on 27 Jul 2012. http://www.azcentral.com/arizonarepublic/local/articles/1207tribal-climate1207.html?&wired

[8] Maynard, N.G., 1998. Final Report: Native Peoples-Native Homelands Climate Change Workshop. Albuquerque, NM. 377pp.

statements demonstrate how and why tribes are most vulnerable to climate change due to their perspectives of nature and their ways of living. The next two sections describe the renewable energy potential on tribal lands and provide some examples of tribes progressing with renewable energy development.

Tribal Renewable Energy Potential

Indian lands comprise only five percent of total land in the U.S., yet it contains ten percent of all energy resources in the U.S.[9] The renewable energy potential in Indian country is very significant and the National Renewable Energy Laboratory (NREL) estimates the wind energy potential is 535 billion kWh/year in the lower 48 states.[9] This is equivalent to 14 percent of current U.S. annual energy generation. NREL also estimates that the solar energy potential is 17,600 billion kWh/year on Indian lands, which was equivalent to 4.5 times the total U.S. electric generation in 2004.[9] Solar energy is considered 10 times less carbon intensive than conventional energy and solar light systems are 100 times more efficient than kerosene.[10] Due to the increasing demand for solar energy in the U.S and because PV technology is extremely viable in Indian country; tribes will likely continue to have a large role in the government's plan to reduce greenhouse gases.[10] Not only is solar energy a viable option for reducing greenhouse gas emissions, it is also an economic development tool for tribes. Therefore, there is a high potential to continue solar energy development on Tribal lands along with other renewable energy technologies.

[9] MacCourt, D.C., 2010. Renewable Energy Development in Indian Country: A Handbook for Tribes. Ater Wynne LLP, Subcontract Report: NREL/SR-7A4-48078, 95pp.

[10] Dreveskracht, R.D., 2011 Economic Development, Native Nations, and Solar Projects: *The Journal of Energy and Deployment,* 34 (1-2): 141-158.

Tribal Renewable Energy

Augustine Band of Cahuilla Mission Indians

In 2009, the Augustine Band of Cahuilla Mission Indians of Coachella Valley in Southern California completed a 1.1 Megawatt thin film photovoltaic (PV) solar array on 5 acres of land.[11] The solar array consists of 15,000 solar modules and produces about 1,900 Megawatt-hours (MWh) of renewable energy annually, which is equivalent to providing electricity for 185 homes.[12] This is the first PV project that was approved by the Bureau of Indian Affairs in Southern California and provides 25% of energy needs to the tribe's casino. The tribe was awarded a grant through the Department of Energy's First Steps program, which enabled the tribe to develop energy conservation policies and a strategy for alternative energy resource development.[12] In addition, the tribe obtained $2.6 million in rebates from the Imperial Irrigation District (IID). IID is a community-own utility that provide electricity and irrigation water to the lower southeastern part of California.[13]

Augustine Band's 1.1 MW solar PV array in Southern California
Photo source: www.epa.gov

Campo Band of Kumeyaay tribe

In 2005, the only large-scale 50 Megawatt wind farm located on Indian land was installed on the Campo Band of Kumeyaay reservation near San Diego, California. The wind farm

[11] Stewart, C., 2010. *Tribal Solar Energy Projects: Navigating Solar Energy Project Development Tribal Solar Project Case Studies* [PowerPoint slides]: Greener Homes National Summit, Sept. 9, 2010, Reno, NV.

[12] U.S. Department of Energy, 2008. Augustine Band of Cahuilla Mission Indians – 2006 Project. http://apps1.eere.energy.gov/tribalenergy/projects_detail.cfm/project_id=103

[13] Imperial Irrigation District (IID), 2012. Accessed 19 Jul 2012. http://www.iid.com/

consists of 25 turbines and provides electricity for up to 35,000 homes in San Diego County. [14] The Campo band does not own this wind farm, they just lease the land. They are currently discussing a future wind project that would be three times larger than the size of the current wind farm and would provide more revenue to the tribe.

Rincon Band of Luiseno Indians

In March 2010, the Rincon Band of Luiseno Indians in California partnered with the California Center for Sustainable Energy, San Diego Gas & Electric, and TRANE to develop a 1.14 Megwatt PV solar system to offset a quarter of the Harrah's Rincon Casino total energy consumption.[15] The solar plant consists of 3,936 PV modules, which provides enough power for 90% of the casino's HVAC (heat, ventilation, and air conditioning) system. This is equivalent to powering 2,200 homes. [16] The project was funded by the casino and although the tribe was not able to take advantage of the federal tax credits, they obtained $4.2 million in rebates from the California Solar Initiative (CSI) over a 5-year period.[16] CSI has a solar rebate program for customers of investor-owned utilities (i.e. San Diego Gas & Electric) in California.[17] In addition, the CSI rebate program provides customers with different incentive levels based on the performance of their solar panels.

Fort McDowell Yavapai Nation

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[14] Standen, A., 2010. Tribal Lands Struggle to Bring Clean Power Online. Accessed 18 Jul 2012. http://www.npr.org/2010/08/20/129303545/tribal-lands-struggle-to-bring-clean-power-online

[15] California Solar Initiative (CSI), 2010. Accessed 19 Jul 2012. http://energy.csielectric.com/

Environmental Protection Agency (EPA), Region 9: Clean Energy & Climate Change – Tribes. Accessed 19 Jul 2012. http://www.epa.gov/region9/climatechange/tribes.html

[16] Environmental Protection Agency (EPA), Region 9: Clean Energy & Climate Change – Tribes. Accessed 19 Jul 2012. http://www.epa.gov/region9/climatechange/tribes.html

[17] Go Solar California, 2012. About the California Solar Initiative (CSI). Accessed 3 Aug 2012. http://www.gosolarcalifornia.ca.gov/about/csi.php

In March 2010, the Fort McDowell Yavapai tribe of central Arizona completed a 12 kilowatt (kW) demonstration PV solar project, which was placed on the roof of a tribal government building. [16] The system consists of 54 fixed solar panels, generates more than 25 MWh of renewable energy annually, and provides about 15-20% of the building's energy needs. This project was funded by the Clean Air Act and the tribe obtained rebates from the Salt River Project (SRP), which is a local utility provider of Arizona. SRP's commercial solar energy program provides rebates of $1.35/watt for installation of solar electric systems.[18]

These are just some of the many examples of the progress of renewable energy development on Tribal lands in the Southwestern U.S. These tribes are leading the way by using clean energy to offset carbon emissions, obtaining incentives, and providing power for their casinos. On the other hand, the Navajo Nation is progressing with energy efficiency through LEED practices and below are two examples of LEED-certified buildings.

LEED

LEED refers to "Leadership in Energy and Environmental Design" and is a third-party, internationally recognized program that provides building owners with a framework for identifying and implementing practical green building design, construction, operations and maintenance solutions.[19] LEED promotes and ensures that a building is sustainable through the following key areas: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Indoor Environmental Quality, and Materials and Resources.[19] Two additional categories are Innovation in Design and Regional Priority. LEED is based on a point-based system from the seven categories listed above where a building earns points for meeting the specific green building criteria. There is a possible total of 100 points and the LEED certification is available in four

[18] Salt River Project (SRP), 2012. Accessed 30 Jul 2012. http://www.srpnet.com/environment/earthwise/solarbiz/default.aspx
[19] U.S. Green Building Council, LEED, 2011. Accessed 1 Aug. 2012. http://www.usgbc.org/DisplayPage.aspx?CategoryID=19

progressive levels; 1) Certified: 40-49 pts; 2) Silver: 50-59 pts; 3) Gold: 60-79 pts; and 4) Platinum: 80 points and above. LEED buildings can provide ways to help reduce environmental impact through energy/water efficiency measures and in turn contribute to mitigating climate change for Tribes across the country.

Chinle NTUA District Office

In August 2011, the first LEED gold-certified building on the Navajo Nation was built in Chinle, AZ as the new NTUA (Navajo Tribal Utility Authority) district office.[20] The building is the first of its kind and they are leading by example for others around the country. NTUA was awarded one of 422 energy efficiency grants in Indian Country and as a utility, NTUA sees green technology as something they want to demonstrate to other government agencies, private companies, and homeowners.[20] To help meet 30% of the building's energy needs, two tracking solar arrays were installed next to the building to produce 60 kilowatts of electricity. The rest of the energy's needs are supplied by the NTUA grid.

Crownpoint NTUA sub-office

In July 2012, the new Crownpoint NTUA sub-office on the Navajo Nation was completed and certified as LEED-platinum. The Department of Energy funded part of the building's construction through the Energy Efficiency and Conservation Block Grant, which requires an EE/RE (Energy Efficiency and Renewable Energy) strategy. To follow the EE/RE strategy, the Crownpoint building incorporates design elements to help reduce the power load required to operate the building including high R-values, thermal water, passive lighting and heating, and optimizing air flow. These factors reduce the building's load and lower the cost of powering the building. Therefore, with the reduced building load, a 69 kW solar array system provides a percentage of energy needs to power the building. Terry Battiest, the Renewable

[20] Yurth, C., 2011. Navajo Times, LEEDing by example: NTUA goes green with the new Chinle facility. Accessed 1 Aug. 2012. http://navajotimes.com/news/2011/0711/072311green.php

Engineer for NTUA states, "The new Crowpoint building is not only a beautiful structure, but also an example of energy efficient design and renewable energy generation in practice."[21]

Importance of LEED

The two examples of LEED buildings progressing on the Navajo Nation are in line with NTUA's objective "to design buildings that provide safe work environments, to incorporate design elements that assure a comfortable environment for customers and employees, to protect and preserve the original habitat of the region within the site, and to provide a structure that the community can be proud of and that strengthens the efforts of a progressive community."[21] With all the elements of NTUA's objectives and with the views and Native perspectives of climate that was mentioned before, LEED can provide a way for Tribes to move toward a sustainable economy and be an example for others around the country. LEED also provides an innovative approach to carbon management and climate change where owners and developing can take voluntary action to reduce carbon emissions.[22] In addition, the benefits of using LEED in new building construction has shown that LEED buildings consume 25% less energy and 33% reduction in greenhouse gas emissions compared to an average commercial building.[22]

Conclusion

There is significant renewable energy potential on Tribal lands that can lead to economic benefits for the tribe, carbon offsets, additional funding sources, and reducing environmental impact. While some tribes are taking advantage of rebates and grants, other tribes are leading by example with construction of LEED-certified buildings. These tribes are providing examples for other tribes to move toward a "green" economy by developing renewable energy and LEED

[21] Interview with Terry Battiest, NTUA's Renewable Energy Engineer. Dedication Ceremony of Crownpoint's NTUA sub-office and solar array. 24 Jul. 2012.
[22] Porcaro, J., 2011. The Alternative Energy eMagazine. LEED Standards and the Global Carbon Market. Accessed 5 Aug 2012. http://altenergymag.com/emagazine/2011/10/leed-standards-and-the-global-carbon-market/1803

buildings. Further, the development of renewable energy and LEED buildings is curbing the way of mitigating climate change now and in the future.