

The case for wind energy on water security

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Introduction:

With the current interest to push forward more fossil fuel energy sources, the need to articulate the impact of expanding these energy sources on precious water reserves becomes imperative. Up to now, the debate about the negative footprint of traditional energy sources, including nuclear, natural gas, coal and petroleum has basically concentrated on the concerns about pollution and depletion; however, a major problem has been usually ignored: the misuse of water to produce energy. Nearly 50 percent of US water is employed for cooling of power plants in the United States — translating to about 350 trillion gallons of water per year. Such dependence on Water for Energy threatens the use of water for other critical needs such as: drinking water, food security, and hygiene – three things that in fact define people's way of life.

Mining extensive data available from a wide range of sources, such as the U.S. Geological Survey (USGS), the U.S. Energy Information Administration (EIA), the National Aeronautics and Space Administration (NASA), and the U.S. Bureau of Labor Statistics (BLS), we employ advanced statistical methods to uncover key findings about the way we Americans use water under various scenarios. For example, natural gas, coal, and nuclear energies combined produced 84 percent of the electricity in the United States and used 30 trillion gallons of water in 2016 alone. In contrast, we demonstrate that renewable energy sources like wind and solar are excellent ways to achieve strong economic growth and a sustainable future.

Contrary to collective consciousness, fresh water on Earth is rather scarce. Although water covers approximately 75 percent of the surface, it is mainly distributed in the Earth's crust. Unfortunately, about 97.5 percent of all that water is saline and just 2.5 percent is fresh water. Only 0.8 percent of the water on Earth constitutes freshwater reserves that can be tapped for human consumption. Currently, the water withdrawal in the United States totals 355 billion gallons a day (130 trillion gallons a year), of which at least 72 percent constitute fresh water. These amounts are mainly destined to several purposes, including production of energy, irrigation, public and domestic distribution, industry, mining, etc. From the total US water withdrawal, a staggering 45.3 percent is used by a single type of consumer—electric power plants. Finally, almost all the water (30 trillion gallons per year) diverted to produce electricity goes to power plants fueled by natural gas, coal, and nuclear, and yet combined they do not even come close to creating the number of jobs created by solar and wind— we show that the ratio of jobs per GWh in solar/wind to jobs per GWh in gas/coal/nuclear for the production of electricity in 2016 was about 24 to 1.

We show that wind energy provides the ultimate solution to energy problems in a sustainable way in the sense of food security and economic potential. First, wind is the only renewable that is both abundant and currently cost competitive against the fossil fuels alternatives. Second, wind energy consumes virtually no water, thus protecting the increasingly strategic water reserves. Third, it is environmentally friendly, with no chemicals expelled into the environment, including greenhouse gases. And finally, the creation of a national infrastructure of wind farms will generate myriad qualified jobs.

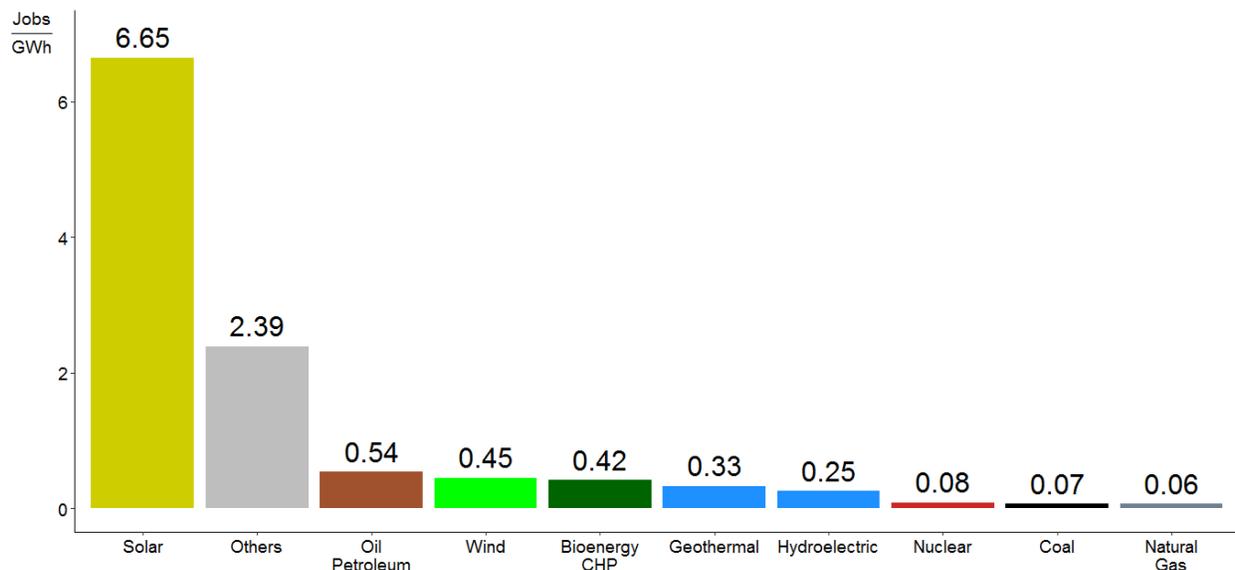


Figure 1. Jobs created in 2016 per GWh for each energy source.

Competition for our natural resources of course is a wicked problem and some may argue that fossil fuel based energy sources support jobs. Indeed, an examination of the jobs created by different energy sources must be considered. Indeed, we demonstrate how different energy sectors actually contribute to job creation and economic opportunities in the near future. A major outcome in this study is that solar energy creates more jobs for each gigawatt hour (GWh) than natural gas—in the proportion of 105 to 1. Also, biofuels and nuclear energy are both water-intensive technologies and do not produce the number of jobs close to solar. Even worse, biopower often takes away food and water both to capture energy. In 2008, The National Academy of Engineering identified the limited availability of water as one of the grand challenges for engineering in the 21st century. We show that increasing the use of fossil fuel energy sources will exacerbate this grand challenge and cries for urgent reconsideration.

This presentation provides a compelling view of the urgency to move away from fossil fuels. We present a comprehensive case for the wind/solar energy, in which the preservation of water resources takes a central stand, along with the economic feasibility and food security, beyond the typical environmental concern. Although studies by Webber showed the connection between food, energy, and water [1] [2] [3][4], a much stronger focus on fresh water is presented. These ideas are remarkably important today, in our opinion, when policymakers, scientists, and people in all walks of life hold heated debates about the right composition of the energy matrix and the potential for job creation.

References

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