Spotlight on Climate

The Winds of Change: Transitioning to Clean Energy

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The great paradigm shift of our time is our societies' transition away from fossil-based, carbon-emitting energy to clean, renewable energy like wind, solar, hydro, marine, and geothermal. For electricity generation, wind and solar energy are the two most rapidly growing sources. Our largest electric utilities in Arizona have each adopted aggressive emissions reduction goals, a dramatic shift from only a decade ago. Why is that? I see four main reasons. First, the evidence for human-driven climate change is clear and climate disasters are now everyday events all over the world. We need to kick the carbon habit. Second, people want clean energy. Most people want to leave the planet a better place than we found it. Third, a series of tax credits spurred development of utility-scale wind and solar power plants, providing utilities, developers, and regulators with invaluable operating experience. We now know renewable energy works. And fourth, renewable energy is less expensive. Due to significant investments in R&D beginning in the 90's and continuing through today, the cost of renewable energy has dramatically decreased.

My favorite resource to compare the cost of electricity generation from renewable and fossil sources is the Lazard Levelized Cost of Energy Report. Lazard compares the unsubsidized cost of electricity generation from solar, wind, and geothermal to old-school sources like natural gas (combined cycle and peaking), coal, and nuclear. Their findings show that electricity from new wind and solar plants is less expensive than electricity from any new fossil fuel or nuclear power plant, and in most cases, substantially so. In fact, the cost of wind and solar is so inexpensive that it is directly competitive with power from already existing, paid-for fossil power plants. All together, these four reasons plus local benefits derived from local development present an obvious choice for evolving our energy systems right now and for the decades to come: let's use renewable energy.

Of course, not all regions have enough wind. In Arizona, we have about 100,000 square kilometers (= 38,610 square miles) with sufficient wind to generate economically competitive electricity (U.S. Department of Energy's WINDExchange website). Good examples of successful wind power plants in Northern Arizona are the 99 MW Perrin Ranch Wind Farm and the 127 MW Dry Lake Wind Power Project. The 161 MW Wind Project plus 60-80 MW solar being put in by Babbitt Ranches will soon join this list. The 477 MW wind power plant at Chevelon Butte near Winslow begins construction soon and Babbitt Ranches plan an additional 480 MW solar power plant to be developed by 2024. All together these power plants will produce enough electricity to power about 420,000 homes.

Energy development is not all roses, even for renewable energy. Though the impacts of wind and solar are much less than coal, gas, or nuclear, there are some potential impacts. For wind power, the main undesirable impacts are related to viewshed (some people don't like to look at turbines) and impacts on birds and bats. For my part, I would rather see 700-foot wind turbines than see and smell a coal fired plant with 775-foot-tall smokestacks. Far more birds and bats die each year

due to building strikes, cats, and lead poisoning than due to wind turbines. Unfortunately, the birds killed by turbines are often raptors. Therefore, wind power plants must be sited away from migration corridors and critical raptor habitat. Bird detections systems using thermal imaging, doppler radar, and AI can identify incoming birds and shut down turbine blades in their path. When compared to the effects of climate change, wind energy is the clear champion.

So, what happens to your electricity supply when the wind isn't blowing, or the sun isn't shining? Fortunately, new developments in energy storage and grid management are addressing these challenges. Batteries, pumped hydro, molten salt heat storage, generating H_2, dynamic building loads, and other techniques are good examples. If you're interested in learning more about the answer to this question, I recommend the Renewable Electricity Futures Study by the National Renewable Energy Laboratory. Their study showed that we can make this transition. If we wish to avoid the worst outcomes of climate change, it's time to punch the accelerator on renewable energy.

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