DISTRIBUTED RENEWABLE GENERATION

WHY IT SHOULD BE THE CENTERPIECE OF U.S. ENERGY POLICY

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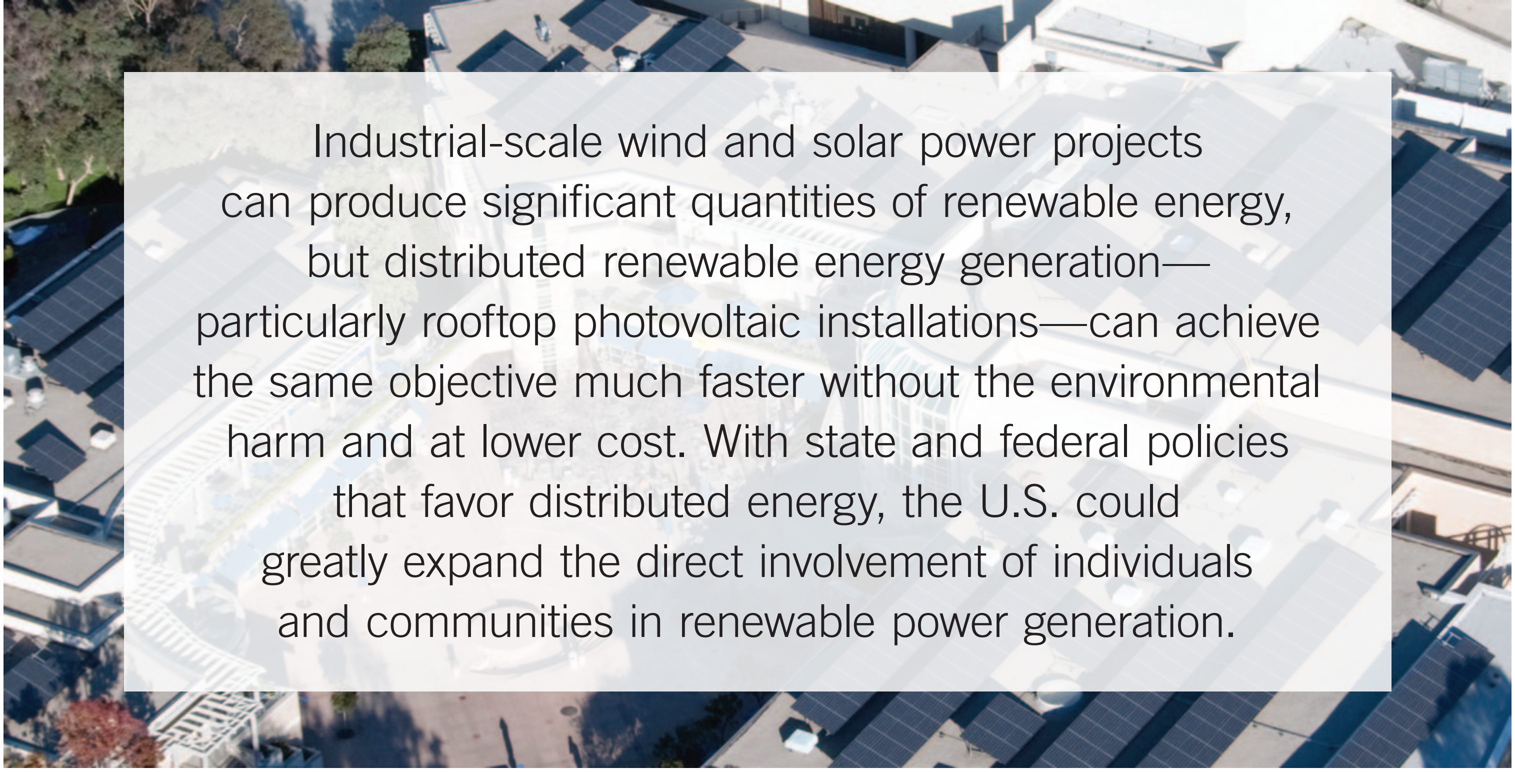

Industrial-scale wind and solar power projects can produce significant quantities of renewable energy, but distributed renewable energy generation—particularly rooftop photovoltaic installations—can achieve the same objective much faster without the environmental harm and at lower cost. With state and federal policies that favor distributed energy, the U.S. could greatly expand the direct involvement of individuals and communities in renewable power generation.

Distributed electricity generation (local, decentralized energy production) has the potential to radically alter America's energy landscape. Our current energy mix is dominated by large, remote, centralized power facilities such as nuclear, gas, and coal-fired power plants, as well as massive wind farms and transmission infrastructure. Today, improved technologies, environmental and economic concerns, and a recognition of the vulnerabilities in large centralized power production make distributed generation coupled with efficiency upgrades a viable and, in fact, preferable alternative. Every properly situated building, parking lot, and brownfield (disused, contaminated land) in our communities can potentially become a producer of energy.

Distributed generation most commonly involves solar photovoltaic (PV), but can also include small hydroelectric, small-scale biomass facilities, and micro-wind. There are several advantages to distributed generation when good policies are implemented. Foremost is that the bulk of the economic benefits of widely distributed, locally controlled, and locally produced clean energy can go directly to ratepayer-generators and property owners through mechanisms such as the feed-in tariff, a generous per-kilowatt-hour payment made to ratepayers who generate clean power on their homes and businesses. Additionally, distributed energy generators often enjoy substantial improvements in property values, according to the Appraisal Institute.

Remote, centralized power production and its associated transmission are substantially more vulnerable to major electrical shutdowns from earthquakes, hurricanes, fires, wind, ice, human error, cyber attack, or terrorism than distributed generation (which connects to the local power grid). Because of local redundancies and geographic diversity, a well-designed local grid with distributed power production and adequate storage can reliably provide critical energy in times of storms or emergencies with less disruption and pollution than conventional solutions. Perhaps most importantly, millions of acres of healthy, intact ecosystems are left undisturbed when generation is sited within the built environment.

With the proper incentives and policies (such as a German style feed-in tariff) distributed energy can be built much more quickly than large centralized power facilities and their attendant transmission infrastructure. For instance, German residents installed 7,400 megawatts (MW) of local, rooftop solar PV in 2010 alone, at an installed cost substantially lower than the projected installed cost of utility-scale solar thermal or PV power plants sited in U.S. deserts or arid grasslands (not one of which came online in 2010 or 2011). And the pace of such installation is accelerating; in just one month (December 2011) 3,000 MW of solar PV was added to Germany's energy portfolio.

Distributed energy production also makes multiple uses of urban and suburban landscapes, including rooftops, and can provide incentives to remediate brownfields that would otherwise blight neighborhoods for decades. Solar photovoltaic sited within the built environment, as well as properly sited micro-wind power, can be deployed without disrupting natural communities; without government using its powers of eminent domain; without depleting scarce groundwater; without destroying viewsheds and recreation areas; and without the waste and destruction that has become the hallmark of the energy industry.

Because distributed energy can be locally produced, locally owned, and locally consumed—bringing both economic benefits and jobs to communities—there is typically less local opposition to implementing distributed energy projects than to building (and financing) centralized, large-scale power projects. Large-scale renewable energy projects—such as most proposed solar power plants and industrial wind generation sited in remote locations—represent a continuation of the old paradigm of large-scale industrial development, owned and controlled by monopoly interests which externalize the majority of their costs onto ratepayers, taxpayers, and the environment while privatizing the profits. In contrast, small-scale projects are often strongly supported by local communities. San Francisco recently pledged to procure 100 percent of its electricity from local renewable energy, as has a growing collection of European towns.

Finally, distributed energy is already technologically feasible, even more so when coupled with efficiency upgrades and passive heating/cooling systems for buildings. Energy consulting giant KEMA recently reported that the California grid is capable of very substantial increases in local solar generation without expensive grid upgrades.

DISTRIBUTED SOLAR POWER: RUNNING THE NUMBERS

When all costs are factored in—including new transmission infrastructure and line/heat losses—local, distributed solar PV is comparable in efficiency, faster to bring online, less destructive, and less expensive than remote utility-scale solar plants.

Net energy output of rooftop solar is comparable to utility-scale desert solar.

"Higher solar insolation," meaning higher solar radiant energy, is the most common reason touted for siting utility-scale solar projects in locations like the Mojave Desert. However, transmission losses largely negate the benefits of such remote projects compared to the slightly lower solar insolation of ratepayer regions like Los Angeles, Riverside, and San Diego (which are required to purchase the solar power). Power transmission losses average 7.5–14 percent in California[1], but the difference in solar insolation between the Mojave and Southern California urban centers is approximately 10 percent.[2] This means there is no substantial difference in the net electric power delivered to customers from remote utility-scale solar plants in remote Mojave Desert locations and rooftop PV installations in Riverside or Los Angeles, for projects with the same rated capacity.[3] Urban rooftop solar has another distinct advantage: Desert solar production drops precipitously at higher temperatures, when power is needed most, because both PV and air-cooling are less effective at high temperatures.

Rooftop solar is faster to implement.

Large-scale remote solar projects and related transmission lines take many years to permit and complete. In contrast, distributed PV can be brought online very quickly. Germany, using a simple and effective feed-in tariff contract structure to spur cost-effective development of distributed PV, installed 7,400 MW of distributed PV in 2010 alone, 80 percent of it locally owned and sited within the built environment—a 75 percent increase from 2009. These results are consistent with previous years, and compare very favorably to the less than 900 MW of PV installed in the United States in 2010, a country with a population roughly three and a half times as large.

Rooftop solar is a more economically sound investment.

California's Renewable Energy Transmission Initiative reported that, in comparing May 2010 prices for solar thermal and PV, the latter had a cheaper cost per megawatt-hour of electricity production. Solar photovoltaic prices have dropped substantially since then, while solar thermal costs have risen or remained static. This reality is reflected in the shift, en masse, by utility-scale solar developers away from thermal projects and toward PV, the exact technology that is used for distributed generation.

In late 2011 the residential rooftop solar consolidator 1 Block Off the Grid reported actual installed costs (prior to any rebates, tax credits, or other incentives) at $4.18 per watt in New Jersey. Installed PV system costs in other areas of the country, from Massachusetts to California, are less than $5 per watt, and both the California Energy Commission and the Department of Energy project that solar PV prices will drop by half between 2010 and 2020, while solar thermal prices are projected to decline much more gradually, if at all.[4] A study done by the Los Angeles Business Council and the University of California–Los Angeles estimated that there may be enough rooftops in Los Angeles County suitable for solar to produce roughly 19,000 MW. It also found that there is at least 3,300 MW of rooftop solar currently "economically available" for German-style feed-in tariffs for the City of Los Angeles alone, and it estimated that their proposed 600 MW feed-in tariff program would create more than 11,000 local jobs.[5] The feed-in tariffs required to provide a fair return on investment for ratepayer-generators would cost ratepayers very little. The study projected an average monthly additional cost of only $0.48 per month for households and $9.37 per month for businesses for the first ten years of the program, after which point ratepayers would enjoy *lower* electricity bills than if they had remained with conventional energy.

New transmission infrastructure needed to carry utility-scale solar-generated energy from remote locations to urban demand centers also entails substantial costs that distributed generation does not. These costs are ultimately borne by ratepayers, with actual costs for new California transmission lines currently running from approximately $11 million to $24 million per mile.[6] In addition, rooftop solar creates local, well-paid, long-term jobs; substantially improves property values; encourages energy conservation; and, when supported by common-sense mechanisms such as feed-in tariffs, slows the outflow of cash to utilities, keeping money in communities.

Industrial solar enjoys enormous subsidies and externalized costs.

Large-scale remote solar projects enjoy a number of direct and indirect subsidies that are not available to the ratepayer-generator, putting the latter at an enormous disadvantage. These often include federal cash grants and very low-interest loans and loan guarantees; exclusive use of public lands, water, and resources otherwise designated for multiple uses; waivers of millions of dollars in application fees; extremely high Power Purchase Agreement (PPA) prices; and externalization of many types of costs onto local communities, ratepayers, and ecosystems.

Rooftop solar reduces greenhouse gas emissions faster and more effectively.

Unlike energy systems in the "concrete jungle" ecosystem, large, remote solar projects permanently reduce natural uptake of carbon by the ecosystems cleared for development, while also releasing the carbon dioxide that had been sequestered by them. Researchers at the University of Nevada–Las Vegas have been monitoring carbon uptake in Mojave Desert ecosystems for several years and have consistently found substantial sequestration of carbon.[7] Likewise, wetland and grassland ecosystems such as those found in Colorado's San Luis Valley (targeted for industrial solar development) are well-known for their ability to uptake and store carbon dioxide.[8] More study is needed to determine how much carbon uptake will be lost when hundreds of thousands of acres of natural desert cover are converted to scraped earth and covered with solar collectors, but it is safe to assume that it is more than "none" which is the case with distributed generation.

JUMP-STARTING SOLAR PV

Distributed generation, supported through feed-in tariffs, Property Assessed Clean Energy (PACE) loan financing, and greatly expanded net metering would be more effective than remote utility-scale solar in producing reliable, affordable, nondestructive renewable energy and addressing the climate crisis. Feed-in tariffs are proven to work quickly, economically, and reliably; they provide a simple contract mechanism for individual homeowners and business owners to profitably install as much solar PV as their buildings/properties will allow, maximizing the potential of rooftops, parking areas, and brownfields in urban and suburban environments. Even as its solar PV tariffs shrink, Germany continues to increase the amount of PV installed—largely because of the rapid decline in the cost of PV systems, which is built into the design of the feed-in tariffs. Thanks to these effective cost-reduction policies, it is currently less expensive, on a per-watt-installed basis, to install a custom, small, rooftop solar system in Germany than it is to install a giant, ground-mounted desert solar installation in the United States, despite economies of scale.

PACE loans, which allow ratepayers to amortize the costs of rooftop solar and efficiency upgrades over many years and repay them along with property tax payments, have proven very popular where offered. There is no cost to taxpayers or other ratepayers, and virtually no risk to lenders or borrowers. Unfortunately, the Federal Housing Finance Agency has suggested that because property tax assessments take the first lien on an applicable property, PACE loans will pose a threat to the supremacy of mortgages held by their agencies.[9] This has effectively crushed residential PACE lending. Restoring this critical tool would boost democratically owned clean energy considerably.

CONCLUSION

A growing body of research and analysis favorably demonstrates the economic, environmental, and community benefits of local distributed energy compared to remote utility-scale energy of all types. With policies that favor distributed clean energy generation and efficiency, the United States could avoid the elevated economic and ecological costs of remote utility-scale power development, preserve critical wildlife habitat, reduce greenhouse gas emissions, create jobs, and gain significant economic benefits for local residents, businesses, and communities.

ENDNOTES

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ENERGY

Overdevelopment and the Delusion of Endless Growth

Edited by Tom Butler and George Wuerthner

We have reached a point of crisis with regard to energy… The essential problem is not just that we are tapping the wrong energy sources (though we are), or that we are wasteful and inefficient (though we are), but that we are overpowered, and we are overpowering nature.
— from the Introduction, by Richard Heinberg

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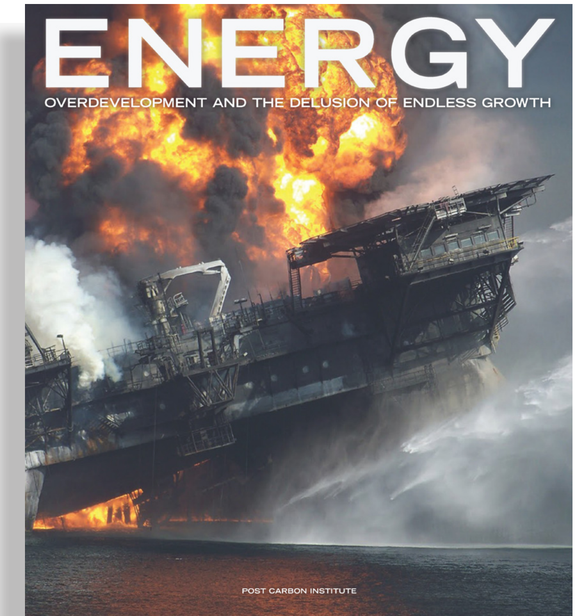
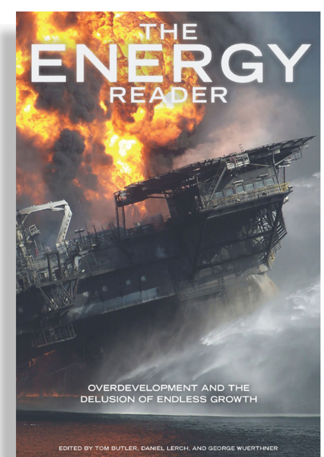


The ENERGY Reader

Edited by Tom Butler, Daniel Lerch, and George Wuerthner



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