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A Bright, Shining Disappointment

Solar Photovoltaic's Failure in the Southwest

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In the 1970s, activist Richard Munson called for "a solar revolution to replace oil, coal and nuclear power with the sun and to end the energy crisis." But 45 years later, the data cannot be ignored. Sunshine makes a negligible contribution to America's energy needs. And no region of the country demonstrates solar's failure better than the Southwest.

This paper, in its entirety, can be found at **https://southwestpolicy.com/sppi01**

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Southwest Public Policy Institute | ***Better living through better policy***

SOUTHWEST PUBLIC POLICY INSTITUTE

The Southwest Public Policy Institute (SPPI) is a research institute built to explore and build on sound, data-driven policies regarding education, crime, and economics that will encourage positive change in the American Southwest.

Many think tanks have fallen victim to the mentality of communicating only to the echo chamber: they only target individuals that agree with partisan messaging. SPPI's approach enables us to reach new audiences by micro-targeting constituents on issues like finance, energy, education, or public safety.

With SPPI's data-first approach and the inclusion of every state in the American Southwest in our efforts, there is tremendous potential for reinvigorating traditional American values with one motto: WE AGREE. By removing the stigma from conversations with constituents and addressing issues with solutions to solve problems, we truly believe that we can help move the American Southwest in a positive direction and set an example for the entire region to follow.

Our focus includes fostering innovative policy alternatives at the regional, state, and community levels to enhance individual initiative and entrepreneurship, broadening the role of volunteerism in confronting public problems and the sense of community among the public, government, and business.

The division in America comes from the unwillingness to communicate with one another and to discuss the problems and the issues in front of us. By working together, exchanging ideas, and bringing solutions to problems we face, we can accomplish what public servants are meant to do: deliver ***better living through better policy***.

INTRODUCTION

On November 30, 1977, organizers gathered in Washington, D.C. to announce a celebration for the following spring: Sun Day. A "coalition of unionists, small businesspeople, farmers, environmentalists, consumer activists and public officials" set the date for May 3, with activist Richard Munson calling for "a solar revolution to replace oil, coal and nuclear power with the sun and to end the energy crisis."[1]

Five months later, Sun Day arrived, and events were held from coast to coast. The president issued a proclamation declaring "the sun … an inexhaustible source of clean energy."[2] A joint resolution of Congress predicted that "the development of solar technologies will provide an abundant, economical, safe, and environmentally compatible energy supply."[3] Standing at the Lincoln Memorial, biologist and eco-apocalyptist Barry Commoner claimed solar energy was "as deep and as fundamental as the question of slavery," and at the United Nations, actor Robert Redford swooned that "the sun will always work" and "never increase its price on a heating bill."[4]

Hopes were high that a near-miraculous source of energy had been identified, and that great things were on the horizon for solar. But 45 years later, the data cannot be ignored. Sunshine makes a negligible contribution to America's energy needs. And no region of the country demonstrates solar's failure better than the Southwest.

OUTLOOK: GLOOMY

In the 1970s, both policy and cultural shifts radically altered Americans' attitudes toward energy. The spark came in October 1973, when "Arab members of the Organization of Petroleum Exporting Countries … imposed an embargo against the United States in retaliation for the U.S. decision to re-supply the Israeli military [during the Yom Kippur War] and to gain leverage in the post-war peace negotiations."[5] The passage of time has shown that the embargo was a flop:

> *U.S. crude oil imports actually increased from 1.7 million barrels per day (mbd) in 1971 to 2.2 mbd in 1972, 3.2 mbd in 1973, and 3.5 mbd in 1974. Instead of buying from Arab members of OPEC, the United States bought from non-Arab oil producers. The customers that were displaced by the United States bought from Arab members of OPEC. Beyond the modest increase in transportation costs that followed from this game of musical*

chairs, the embargo had no impact on the United States.[6]

But domestic red tape did have an impact. To this day, the truth is unknown to most Americans, but as economist Benjamin Zycher noted, a "price and allocation regulatory apparatus" constructed and operated during the Nixon, Ford, and Carter administrations grew "increasingly complex, ad hoc, and receptive to goals and pressures having little to do with pricing and allocation of fuel."[7] When Washington's command-and-control approach to the petroleum market went away, so did gasoline lines.

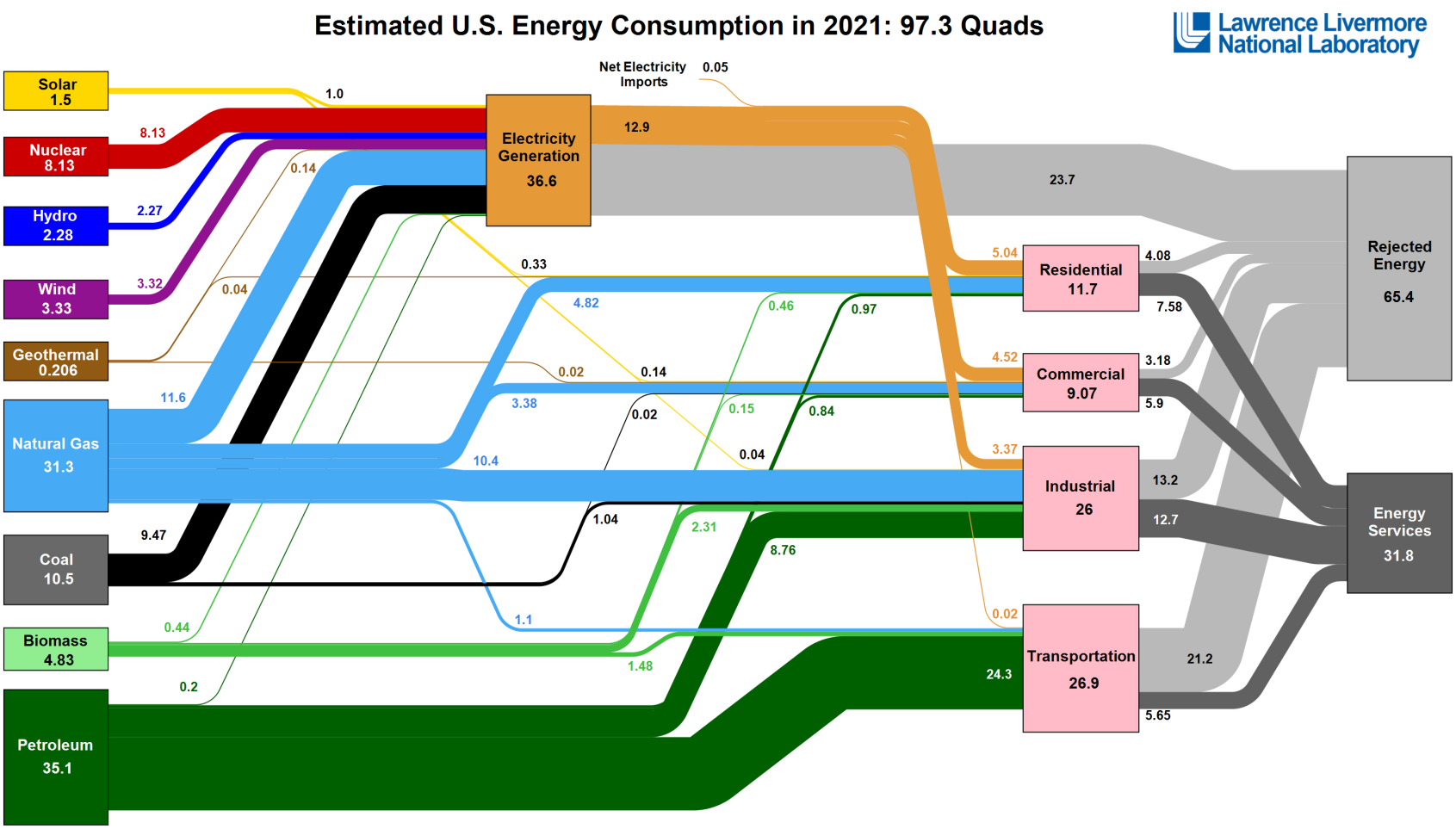
In addition to panic about "foreign oil" and the belief in the omniscience of federal regulators, the decade of the 1970s was also the high-water mark for depletionists – many of them in powerful positions in governments and media throughout the world – who convinced themselves that "natural" resources would soon run out. Scientist John Maddox described the "spaceship earth" ideology as the belief that "the world is a self-contained living space, a closed place, provided with a certain stock of supplies," and "once the available resources have been consumed, life will be at an end."[8] Such pessimism melded with a trendy assault on "bigness" of all kinds. It became fashionable to critique what scholar Vaclav Smil called the "[m]ainstream, business-as-usual strategy of U.S. energy policy, which stressed centralized conversions aimed at increasing the overall supply of energy, and particularly the generation of electricity."[9]

OUTLOOK: SUNNY

Conditions were perfect for a wholesale embrace of solar. Space heating, water heating, photovoltaic (i.e., direct conversion to electricity), "passive" – sunshine was judged (often by people with little knowledge of economics and/or engineering) to be an almost heaven-sent source of energy. It didn't pollute. It was free. No one abroad controlled it. And it empowered homeowners to get off the grid, and say goodbye to utility bills forever.

Politicians seized the opportunity. For photovoltaic research and development alone, from "less than $1 million a year in fiscal 1972 and 1973, federal appropriations … grew to $150 million in fiscal 1980."[10] By 1982, the Worldwatch Institute was downright giddy about the future:

> *Solar photovoltaics may become one of the most rapidly expanding energy sources – and one of the biggest growth industries – of the late twentieth century. Photovoltaics production has increased at a rate of*



Source: Lawrence Livermore National Laboratory

more than 50 percent annually for the last five years, and a steady stream of companies is entering the solar electricity business. Many governments have dramatically boosted their support of photovoltaics and international competition is growing. Amid steep declines in the use of oil, recent abandonment of synthetic fuel projects, and financial troubles in the nuclear power industry, photovoltaics is a striking exception, a healthy "sunrise" industry in a sea of economic and energy troubles.[11]

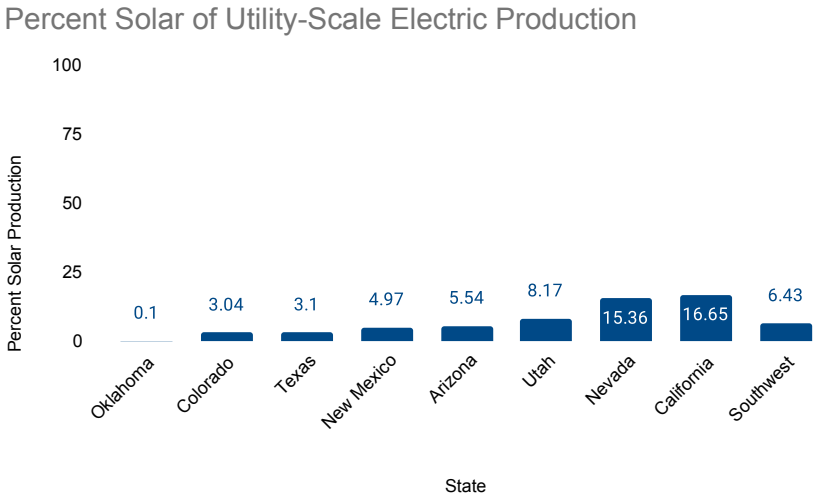
FALLING STAR

Over the next several decades, taxpayer "support" for solar intensified. For example, a 2012 audit by the Government Accountability Office found that federal agencies oversaw hundreds of "initiatives that support solar energy across the four key federal roles" of R&D, "fleets and facilities," "commercialization and deployment," and "regulation, permitting, and compliance."[12] Wildly generous tax credits were made available at the federal and state levels. And in the late 1990s, states began to impose renewable portfolio standards, which require "that a specified percentage of the electricity utilities sell comes from renewable resources."[13]

WHAT ABOUT THE ROOFTOPS?

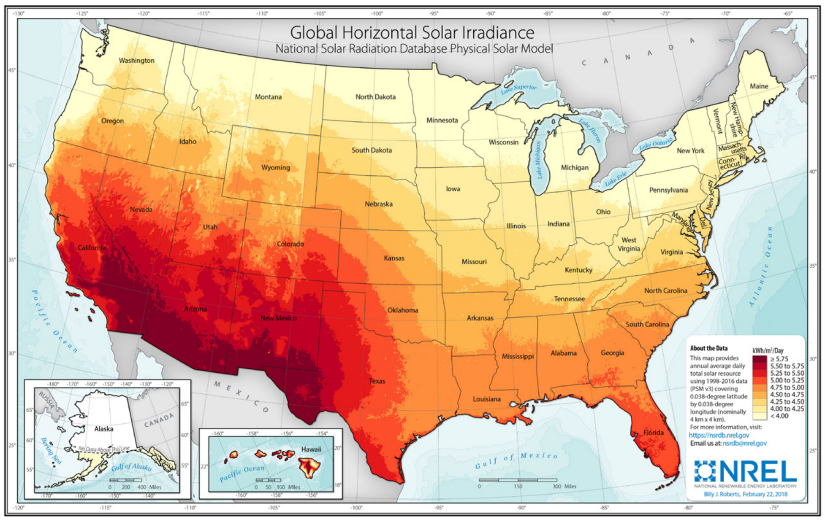
While utility-scale photovoltaic facilities are relatively new, homeowners and businesses have had the option of solar panels since the 1970s. But rooftop photovoltaic's sizable "head start" hasn't been much of an advantage. The U.S. Energy Information Administration considers small-scale arrays to have an output of less than one megawatt.[28] In the Southwest, these producers' electricity represented a mere 42.85 percent of utility-scale generation.[29]

Yet the solar revolution never arrived, and "fossil" fuels enjoyed something of a renaissance once the 1970s ended. Lawrence Livermore National Laboratory issues a yearly flowchart that illustrates "how much energy the U.S. used… where it came from and where it went."[14] Solar did not appear in the facility's analysis until 2003. And last year, despite five decades of government giveaways – as well as unchecked hysteria over carbon-dioxide emissions from the burning of coal, oil, and natural gas[15] – all forms of solar contributed just 5.1 quadrillion British thermal units to the nation's total energy consumption of 97.3 quadrillion British thermal units.



The United States is a big place, of course. When it comes to sunshine, Caribou, Maine and Green Bay, Wisconsin have little in common with Las Cruces, New Mexico and Laughlin, Nevada. In order to assess the role solar plays in the region we study, the Southwest Public Policy Institute probed the data for utility-scale photovoltaic generation in the states of Texas, Oklahoma, Colorado, New Mexico, Utah, Arizona, Nevada, and California.

Our curiosity stemmed from the Southwest's impressive solar resource base. The map below depicts "global horizontal irradiance," which is "the amount of terrestrial irradiance falling on a surface horizontal to the surface of the earth."[16] No region of the country has better solar potential than the Southwest.



Source: National Renewable Energy Laboratory

Yet in 2021, photovoltaic cells' contribution to the Southwest's generation of utility-scale electricity was just 6.43 percent. In Colorado, the share was 3.04 percent. In Texas, 3.10 percent. In Arizona, 5.54 percent. Only in California and Nevada did the photovoltaic shares exceed, albeit barely, 15 percent.[17]

WHY IT FAILS

Given that its fuel is "free," the federal government offers it rich subsidies, and six of eight state governments (the exceptions are Oklahoma and Utah) mandate the purchase of its product, why is the solar industry such an insignificant player in the Southwest's electricity system?

The problems are, essentially, fundamental. Sunlight is "relatively weak because it must first pass through the atmosphere, which protects the Earth from the sun's intensity."[18] As a 2015 study by the Massachusetts Institute of Technology put it, the solar radiation that reaches us suffers from "low energy density."[19] (And is thus "no match for coal, oil, and natural gas."[20]) In addition, the "percentage of the solar energy shining on a [photovoltaic] device that is converted into usable electricity"[21] is very far from 100 percent.

Intermittency, in energy journalist Robert Bryce's opinion, is another "killer drawback" for solar: "Lower power output on cloudy days and during the winter – and zero output at night – means that solar power facilities must be paired with expensive batteries or conventional power plants in order to prevent blackouts or brownouts."[22] While battery technology is improving, energy expert Mark P. Mills believes that three "basic constraints" pose substantial obstacles:

> *First, there's the time it takes to conquer the inevitable engineering challenges in building anything new at industrial scales. Second, there's the scale issue itself and the deeply naïve reluctance to consider the utterly staggering quantity of batteries that would be required to keep society powered if most electricity is supplied at nature's convenience. And finally, directly derived from the scale issues, are the difficulties involved in obtaining sufficient primary minerals to build as many batteries as the green dreamers want.*[23]

Finally, solar facilities are often planned for communities that do not want them – and do not want the transmission lines that frequently must be built to ship electricity to customers. In the Southwest alone, examples are commonplace:

- New Mexico's Roswell-Chaves County Extraterritorial Commission recently "voted against three proposed [solar] projects after hearing objections from county residents." Issues raised included fencing that "will deter from scenic views and hurt property values," the creation of "a 'heat island effect' that could raise temperatures by as

much as 60 degrees Fahrenheit," "electric and magnetic fields," and "concerns that the panels contain hazardous substances."[24]

- In Nye County, Nevada, "locals and conservationists" oppose a "solar farm … planned for more than 2,000 acres of public desert lands in Pahrump," fearing that "construction and maintenance of the massive panels … could destroy thousands of miles of untouched land."[25]

- Residents near Hesperus, Colorado have banded together to fight a 1,900-acre photovoltaic project, citing its potential impact on winter habitat for elk and concerns about water runoff.[26]

CONCLUSION

If solar truly offered a limitless source of clean, cheap, and consistent electricity, the American Southwest's power should be supplied, to a dominating degree, by photovoltaic arrays. It isn't.

As Mills observed in a 1999 paper, photovoltaic technology is "based on the scientific phenomenon whose discovery yielded Einstein a Nobel Prize, and led to the first solar-electric cell being demonstrated in 1925. We have had more than ample time … for this technology to follow long-standing commercialization trajectories were it going to do so."[27]

Solar is inefficient, unreliable, and – when all costs are considered – expensive. Absent government meddling, it is likely that utility-scale photovoltaic facilities would not produce any electricity in America. As is the case with all other forms of energy, subsidies to solar should end, with consumers permitted to seize the blessings of a competitive marketplace that generates affordable and reliable power.

Solar is a bust, even in the sun-drenched Southwest. If it can't make it here, it can't make it anywhere.

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