H-Net Reviews
in the Humanities & Social Sciences

James C. Williams. *Energy and the Making of Modern California.* Akron: University of Akron Press, 1997. xviii + 465 pp. $29.95 (paper), ISBN 978-1-884836-16-9; $49.95 (cloth), ISBN 978-1-884836-15-2.

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Published on H-Environment (July, 1998)

Californians rank among the leaders in energy consumption in the United States, a nation whose energy use is among the greatest in the world. James Williams examines the energy history of the nation's most populous state in his comprehensive work, *Energy and the Making of Modern California.* His stated thesis is that the convergence of technology, the natural environment, and population growth–coupled with peoples' values and demands–ultimately determines society's perceptions and uses of energy.

Californians have shared many of the nation's energy characteristics, and one of the most significant and enduring is viewing energy and the environment as commodities. Another important trait common to the energy history of California and the entire United States is the strong tendency to link economic growth with increased energy use. Departures from the national model also have emerged in California, namely in energy production and consumption.

Williams identifies two broad patterns that have characterized California's energy history. The first has been a shift from early energy dependence to independence and then, since World War II, a return to energy dependence. Roughly paralleling that pattern was early experimentation with soft energy that gave way to the hard energy triad of oil, gas, and hydropower that allowed California to become energy independent. Since the 1970s, California has rediscovered the potential of soft energy and now leads the nation in its generation.

From the time that the United States seized control of California into the early years of the twentieth century, the state depended on energy imports. The use of wood for mines and fuel soon resulted in over cutting. To compensate, people imported and planted seeds of the quick growing Gum Eucalyptus. More significantly, Williams notes, coal imports from the Pacific Northwest, Australia, and Great Britain accounted for approximately twenty-five percent of the state's energy consumption by the 1890s. Coal's scarcity and expense led Californians to search for other energy forms as the end of the nineteenth century approached that reflected the belief that economic growth depended on increased energy supplies. Even before coal lost its energy appeal, Californians already had experimented with wind, tidal, and solar energy.

In the early decades of the twentieth century, Californians exploited the state's great natural resources to create the foundation for several decades of energy independence. In perhaps the most convincing chapters of the book, Williams describes the emergence of the energy triad that fueled the state's economic growth: oil, gas, and hydroelectricity. Oil and gas already accounted for half of the state's energy in 1900. Petroleum discoveries in the Los Angeles Basin and the Central Valley allowed Californians to break their dependence on imported coal. Most in California quickly viewed oil, gas, and later electricity as commodities. In urban California the automobile soon became a favorite while farmers began using gasoline-powered tractors quicker than farmers in any other state. Nearly simultaneously, natural gas became popular for industrial use and domestic lighting. With the arrival of electric lighting, natural gas became widely used for heating and cooking. Williams traces the third leg of the energy triad–hydroelectricity–to the gold rush and the state's mining history. The need for wood and flour during the mining era led to the establishment of water-powered mills. High head hydraulic mining further illustrated the potential of water power. Mine owners and operators took advantage of the proximity of their works to water power sites and quickly used new technologies to generate electricity. At the turn of the century, Williams writes, "A statewide effort was already underway . .. to bring mountain-generated hydroelectricity down to valley communities and farther" (p. 177).

During the period of energy independence, California's demand for energy outpaced the rest of the nation. Not only did Californians quickly take to cars and trac-

tors; they also used electricity in greater number than most other Americans. In 1920, for example, 79 percent of Californians lived in houses wired for electricity though some in the utility industry considered the wiring inadequate for full service. Greater use of electricity also occurred among the state's farmers. By the mid-1920s, 24 percent of California farmers used central station electricity compared to a mere 5 percent nationwide. Tapping into the domestic and farm electrical markets allowed utilities to diversify their load, resolving an early concern of utility executives. Not only did Californians use electricity sooner than most Americans; they also used more energy by drawing on the energy triad that allowed the state to enjoy energy independence into World War II.

The state's post-World War II population and economic growth returned California to an energy dependent position. Cold War spending, much of it energy intensive, fueled the state's growth, leading to a post-industrial society by the 1970s. To meet their increased energy needs, Californians reached out to the rest of the American West for oil, gas, and electricity. Foreign oil soon helped power post-World War II California. When demand outstripped available hydropower in California, coal, nuclear, and geothermal energy grew in importance. Electricity from Columbia and Colorado River dams supplemented the state's own hydroelectric sources. None of this went unnoticed, causing many to reevaluate traditional values that associated continued economic growth with increased energy consumption. No one could escape the impact of California's growing population and the associated environmental consequences. Williams examines the state's conservation movement that had long existed before World War II but blossomed in subsequent decades. Two issues gained early attention: air pollution and off-shore oil drilling. Nuclear power soon became part of the controversy that pitted those who continued to advocate a "ubiquitous technocratic idea of progress" against a growing environmental movement (p. 294). By the 1970s, a new set of values had emerged in California that emphasized diverse energy sources and conservation. As part of this paradigm shift, Californians rediscovered old soft-energy paths, such as solar power, and some new ones, such as cogeneration. Population growth continued, but increases in energy use slowed.

Although a change in values was underway, Williams ultimately concludes that revisions in federal and state tax codes and federal regulations helped pave the way for California's return to soft energy and small-scale electrical generators. Tax credits facilitated the growth of solar energy systems. The Public Utility Regulatory Policies Act (PURPA) that President Carter signed into law in 1978 exempted small producers of electricity from many regulations. PURPA also required established utilities to buy the power that the small producers generated, thus guaranteeing them a market. Williams sees PURPA as resulting in both environmental negatives and positives. One negative example is that many small hydroelectric plants suddenly found new life, causing renewed concern about their impact on rivers and streams. The positive aspect of PURPA is that it stimulated the development of soft energy, since the law guaranteed a market for solar, wind, biomass, geothermal, and cogeneration energy that amounted to 41 billion kilowatt hours in 1990. California's turn to soft energy and conservation again marked the state as a national trendsetter, leading Williams to conclude that "California became a laboratory for environmentally astute energy strategies and technologies" (p. 350). Williams presents a convincing argument, although a few shortcomings do exist. Most notably is his use of aggregate level data. Individual level data about energy consumption is difficult to obtain, yet, without it, conclusions about personal or household energy use are tenuous. Although California outpaced the rest of the nation in many types of energy use, that does not necessarily mean automobiles, electric lighting, or household appliances were common place. As noted, many more farmers in California used central station power in the mid-1920s than in any other state, but the majority did not. Another example concerns the number of electrical appliances found in homes with electricity. Table C-18 indicates that most electrified homes had flat irons, but it is unknown what percentage of all California households had a flat iron.

These are minor concerns. Williams provides an authoritative and well-researched history of California energy production and consumption. In lucid prose, he explores the connection between energy and the environment and the forces that have shaped that relationship. He skillfully weaves the importance of California's energy history to the nation's energy history throughout the book. Maps, illustrations, and photographs supplement the text. Historians interested in the environment, energy, technology, the West, and California will find a great amount of information and analysis in *Energy and the Making of Modern California*.

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Citation: Jay Brigham. Review of Williams, James C., *Energy and the Making of Modern California.* H-Environment, H-Net Reviews. July, 1998.
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