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Green Beer: Incentivizing Sustainability in California's Brewing Industry

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GREEN BEER: INCENTIVIZING SUSTAINABILITY IN CALIFORNIA'S BREWING INDUSTRY

I. INTRODUCTION

In 1516 Duke Wilhelm IV of Bavaria proclaimed, "[I]n all cities, markets and in the country, the only ingredients used for the brewing of beer must be Barley, Hops and Water."[1] His decree marks the imposition of what is now recognized as the oldest continually enforced food safety law in the world.[2] In the years preceding Duke Wilhelm's issuance of the law, Bavarian brewers had begun to include additives such as tree bark, roots, and potato starch in their beers to mask "off" flavors and to increase alcohol levels.[3] Such practices did not go over well with Bavaria's beer-drinking public, which justifiably expected its beer to taste like beer, not like the neighborhood pine tree. A public outcry hastened royal action, and in 1516 the decree, now known as the *Reinheitsgebot*, codified integrity and purity in the brewhouse.[4]

Although more nefarious and subtler than its medieval European counterpart, modern beer makers and consumers face a similar challenge. Today's commercial breweries consume an enormous amount of energy, which is predominantly generated by the burning of fossil fuels.[5] Use of

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[1] Karl J. Eden, *History of German Brewing*, ZYMURGY, Special Ed. 1993, at 6, 7. Neither Duke Wilhelm IV nor any of his contemporaries knew about a fourth essential ingredient of beer: yeast, the agent of fermentation. *Id*. at 7. Discovery of yeast, and its addition to the list of ingredients within the scope of *Reinheitsgebot*, occurred in the 17th Century. THE OXFORD COMPANION TO BEER 692 (Garret Oliver ed., 2012).

[2] THE OXFORD COMPANION TO BEER 692 (Garret Oliver ed., 2012). The essence of the Bavarian Purity Order is still law in Germany. *See* Vorläufiges Biergesetz, § 9, BGBL I, *available at* archiv.jura.uni-saarland.de/BGBl/TEIL1/1993/19931400.1.HTML.

[3] Bayerischer Brauerbund, *Beer Purity—What Does It Mean?*, BAVARIANBEER.com, www.bavarianbeer.com/index.php?StoryID=96. "Off" is a descriptor used when beer has been contaminated with microbials and usually denotes an unintended sour or skunky flavor.

[4] *Id*.

[5] CHRISTINA GALITSKY ET AL., ERNEST ORLANDO LAWRENCE BERKELEY NAT'L LAB., ENERGY EFFICIENCY IMPROVEMENT AND COST SAVING OPPORTUNITIES FOR BREWERIES: AN ENERGY STAR GUIDE FOR ENERGY AND PLANT MANAGERS 9 (2003).

those fuels, as well as the brewing process itself, creates byproducts that negatively impact the environment.[6]

Although energy consumption and the creation of byproducts are inherent in beer making, there are several procedural and mechanical changes to the brewing process that can reduce these unnecessary externalities. Just as medieval brewers obviated the need for flavoring agents by practicing proper sanitation, so can modern brewers reduce their environmental impact by adopting new technologies and techniques. Because California is home to more breweries than any other state in the nation,[7] California's legislators, in the spirit of Duke Wilhelm, should encourage the state's breweries to become cleaner and more sustainable.

Several California breweries have come to recognize the importance of increasing sustainability practices by decreasing their carbon footprints and conserving resources for the benefit of the environment.[8] Increasing a brewery's energy efficiency by employing efficient brewing technologies can decrease energy expenses, which can result in substantial annual savings.[9] Furthermore, sustainable practices can provide a potent marketing tool for breweries seeking to set themselves apart from the myriad of brands on the market by appealing to eco-conscious consumers.[10] However, making that move is neither easy nor universally pursued. The most significant obstacle between breweries and sustainability is the initial capital expenditure associated with purchasing or upgrading energy efficiency and environmental control equipment.[11]

Governmental assistance in overcoming this obstacle would make a

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[6] Most notably these byproducts include greenhouse gases. Packaging waste, biological contaminants, and copious amounts of wastewater are also dangerous waste products of brewing.

[7] BEER INST., BREWERS ALMANAC: ACTIVE BREWER PERMITS BY STATE 1 (2011), *available at* www.beerinstitute.org/statistics.asp?bid=200 (follow "Brewers Almanac 2011" link).

[8] Several large brewers embrace renewable energy sources: Sierra Nevada Brewery (solar and hydrogen fuel cell, 6th largest American brewery by volume), *Our Environment: Solar Energy*, SIERRA NEVADA BREWING CO., www.sierranevada.com/environment.html (2008); New Belgium Brewery (wind, seventh largest American brewery by volume) THE OXFORD COMPANION TO BEER, *supra* note 2, at 607; Stone Brewery (solar, twenty-third largest American Brewery by volume), *The Press Room: Environmental, Sustainable and Philanthropic Efforts*, STONE BREWING CO., stonebrew.com/press/facts.asp (2011). For brewery sizes by output volume, see *Brewers' Association, Top 50 Breweries for 2009*, BEERPULSE.COM (Apr. 14, 2010), beernews.org/2010/04/brewers-association-announces-top-50-breweries-for-2009.

[9] *See generally* GALITSKY ET AL., *supra* note 5.

[10] *See* any Anderson Valley Brewing Company bottle cap, which proudly proclaims that it came from a solar-powered brewery (except, of course, that brewery's Brother David series of abbey ales, of which the bottlenecks are sealed with wax). Berkeley's Bison Brewery and Eel River Brewing Company employ similar appellations on their packaging materials.

[11] *See* Implementing Renewable Energy Sources in Breweries, *infra*, Part VII.A.

positive impact on both a burgeoning California industry and on the environment. Therefore, the State of California should institute a legislative or regulatory scheme to provide brewers with incentives to adopt ecologically sustainable beer-production methods. Because beer holds a commonplace position in California society, the consumption of sustainably produced beer could also work to normalize consumption of sustainably produced goods. That process benefits society by inspiring environmentally conscious production and consumption patterns with reduced environmental impacts.

Part II of this Article examines the role of alcoholic beverages in human history, paying special attention to alcohol as a motivating factor in large-scale social change. Part III examines the prominence of California's unique brewing industry and the economic and social ubiquity of Californian beer. As discussed in Parts IV and V, that ubiquity and prominence, as well as California's historical leadership on environmental issues, make the state an ideal testing ground for sustainable brewing legislation. After an examination of California's energy use in producing beer, Parts VI and VII break down the brewing process and explain a selection of opportunities to mitigate its environmental impact. These Parts discuss general and process-specific measures that either reduce energy demand or provide some other type of environmental control. Part VIII turns to various California legislative schemes that purport to achieve similar goals. It examines how various aspects of these schemes might serve as models for sustainable brewing legislation. Part IX synthesizes those models by proposing a sustainable brewing legislative scheme.

II. A SHORT HISTORY OF ALCOHOLIC BEVERAGES

Alcohol and its effects have long fascinated humanity.[12] The earliest proto-humans consumed fermented fruits and honey for nutritional as well as mind-altering benefits, and were known to overindulge when afforded the opportunity.[13] Professor Patrick E. McGovern, the Scientific Director at the University of Pennsylvania Museum's Biomolecular Archaeology Laboratory, has uncovered evidence of artificially

[12] While the focus of this Article is exclusively on incentivizing sustainable beer production, a discussion of the human relationship with alcoholic beverages in general will prove informative.

[13] PATRICK E. MCGOVERN, UNCORKING THE PAST: THE QUEST FOR WINE, BEER AND OTHER ALCOHOLIC BEVERAGES 10 (2009). When ripe fruit falls from a tree, its skin can burst open, making its sugar available to airborne or animal-borne yeast cells. If such exposure occurs, the yeast metabolizes the sugars in the fruit just as it would when artificially added to beer. The fruit itself becomes alcoholic as a result. *See id*. at 8.

fermented beverages composed of fruit and cereal grains that date to 7000 B.C. in Neolithic China.[14] Barley beer, on the other hand, is a slightly more recent development. Evidence of beer brewing with domesticated barley crops dates to 3500 B.C. in Sumer, in the area that is present-day Iraq.[15]

The domestication of various plants and animals during the Neolithic period,[16] along with the development of pottery, laid the groundwork for human civilization.[17] It is unclear, however, what catalyzed those advancements.[18] One enticing theory is that the production and storage of agricultural products gave humans increased access to alcoholic beverages.[19] Professor McGovern hypothesizes that Paleolithic humans stumbled on the first wine recipe soon after they began to store fruit.[20] Professor Jonathan D. Sauer, Emeritus Professor of Geography at the University of California, Los Angeles, suggests beer-making drove the domestication of cereal grains.[21] Because humans enjoy alcoholic beverages and the resulting inebriation,[22] the alcoholic fruits of agricultural labor were strong incentives to continue producing cereal grains and fruit crops.[23] In turn, that inebriating effect expands the realm of human imagination, which encourages more innovation.[24] Although those hypotheses are debatable,[25] it is clear that the consumption of artificially fermented alcohol significantly impacted human culture once our ancestors mastered the cultivation and storage of the required raw materials.

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[14] MCGOVERN, *supra* note 13, at 31, 36-38. Professor McGovern characterized this oldest alcoholic beverage as "grog," because it was a mixed beverage, containing grape and hawthorn-fruit wine, honey mead, and rice beer. Interestingly, McGovern and Dogfish Head Brewery of Rehoboth Beach, Delaware, developed and produced a modern version of this beverage called "Chateau Jihau," named for the archaeological site where evidence of the grog was discovered.

[15] *See generally* MCGOVERN, *supra* note 13.

[16] Circa 8500–4000 B.C.

[17] MCGOVERN, *supra* note 13, at 73.

[18] *See* Robert J. Braidwood et al., *Symposium: Did Man Once Live by Beer Alone?,* 55 AMERICAN ANTHROPOLOGIST 515, 517 (Oct.1953). Professor Sauer's hypothesis raised "a most fascinating problem—if a most unapproachable one." *Id*.

[19] *Id*. at 515-16.

[20] MCGOVERN, *supra* note 13, at 12-13.

[21] Braidwood et al., *supra* note 18, at 515-16. Sauer's hypothesis challenged the generally held conception that bread drove grain domestication. *Id*.

[22] *See* MCGOVERN, *supra* note 13, at 6-11. Professor McGovern notes that the human body has evolved a specialized ability to process moderate amounts of alcohol. That our "thirst for alcohol sometimes far exceeds any obvious nutritional or medical benefit" is further evidence of our deep-seated drive to enjoy it. *Id*. at 9.

[23] *See* Braidwood et al., *supra* note 18, at 516.

[24] MCGOVERN, *supra* note 13, at 27.

[25] *See* Braidwood et al., *supra* note 18, at 515, 515-26.

Throughout human history there are several expressions of alcoholic beverages' role in large-scale social change. Beginning around 1200 B.C., alcohol was the catalyst for Mediterranean trade that expanded the cultural influence of the Phoenicians, Greeks, and Romans.[26] It was important in the east-west cultural exchange along the Silk Road[27] and drove the domestication of maize in South America.[28] Alcohol has played some role in almost every major religion, from the pantheons of the Greeks[29] and the Norse[30] to modern Judeo-Christianity.[31] Alcoholic beverages fueled colonial ire that culminated in the American Revolution: Thomas Jefferson,[32] Samuel Adams,[33] and George Washington[34] all were involved in brewing and saw British control of the brewing industry as "antithetical to America's nascent democracy."[35]

Thus, alcohol has long been a fuel of, and a reward for, human technological and cultural innovation. As Professor McGovern explains,

> [E]conomic, utilitarian and environmental arguments . . . can only go so far in explaining who we are and how our species arrived at where it is today . . . . [T]he driving forces in human development from the Palaeolithic period to the present have been the uniquely human traits of self-consciousness, innovation, the arts and religion, all of which can be heightened and encouraged by the consumption of an alcoholic beverage, with its profound effects on the human brain.[36]

In light of current environmental concerns, it is again time to harness the self-consciousness and innovation that have driven our cultural development since the Paleolithic. Climate change is a threat that humanity must address.[37] Doing so will require innovation and creativity.

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[26] MCGOVERN, *supra* note 13, at 279.

[27] *Id*. at 128.

[28] *Id*. at 205.

[29] Dionysus was the Greek god of wine.

[30] Odin, father of all the Aesir, could ingest only mead and speak only in rhyme.

[31] Wine accompanies the Eucharist in Christianity and most celebrations in Judaism.

[32] THE OXFORD COMPANION TO BEER, *supra* note 2, at 504-05.

[33] CHRISTOPHER MARK O'BRIEN, FERMENTING REVOLUTION: HOW TO DRINK BEER AND SAVE THE WORLD 79 (2006).

[34] THE OXFORD COMPANION TO BEER, *supra* note 2, at 823-24.

[35] O'BRIEN, *supra* note 33, at 79-80.

[36] MCGOVERN, *supra* note 13, at 26-27.

[37] *See generally* Int'l Panel on Climate Change, *Summary for Policymakers*, *in* CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS. CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (S. Solomon et al., eds. 2007), *available* at www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf. For a more illustrative source, *see also* Daniel Glick, *Signs from Earth: The Big Thaw,* NAT'L GEOGRAPHIC, Sept. 2004, at 12, *available at* environment.nationalgeographic.com/

California should harness alcohol's role in effecting social change and spurring innovation as a facet of its policy campaign against human contribution to global warming.

California is in a unique position to catalyze another significant development in human cultural history: large-scale normalization of sustainable production and consumption. It is so positioned as a result of the prominence and prestige of California's brewing industry,[38] its reputation as a world leader in sustainability measures, and its legislative recognition of the need to mitigate negative human impacts on the environment.

III. CALIFORNIA'S BREWING INDUSTRY

The current condition of the California brewing industry presents an ideal opportunity to employ a sustainable production incentive program. The state's brewers are many in number, and they vary in scale. Last year, Californians consumed roughly 22.1 million barrels[39] of beer.[40] In 2010 there were 318 licensed breweries in California, more than in any other state in the nation.[41] Of those, only three produce enough beer to be deemed "large" brewers.[42] California breweries provided 117,240 jobs in 2011 and in a $9.2 billion industry, generated $4.7 billion in taxes.[43]

Traditional statistics offer only a portion of the larger picture. California is a prestigious brewing state. At the 2011 Great American Beer Festival, Port Brewing of San Diego County received fifteen

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environment/global-warming/big-thaw/#page=1.

[38] *See* California's Brewing Industry, *infra* Part III.

[39] 1 barrel = 31 gallons. BREWERS' ASS'N, FACTS (2011), www.brewersassociation.org/pages/business-tools/craft-brewing-statistics/facts. This equates to 26.2 gallons/person/year.

[40] BEER INST., BREWERS ALMANAC: US AND STATE POPULATIONS 19; PER CAPITA BEER CONSUMPTION BY STATE 21 (2011), *available at* beerinstitute.org/statistics.asp?bid=200.

[41] BEER INST., BREWERS ALMANAC: ACTIVE BREWERS PERMITS BY STATE 1 (2011), *available at* www.beerinstitute.org/statistics.asp?bid=200 (follow "Brewers Almanac 2011" link). In fact, California is home to more than twice as many breweries (318) as Washington, the state with the second most breweries (148).

[42] *See California Breweries by City*, BEER EXPEDITION, beerexpedition.com/ca/index_bycity.shtml (last visited Nov. 26, 2011). The Brewers Association, a trade organization representing craft brewers, delineates market segments on the basis of barrels produced. A microbrewery produces less than 15,000 barrels per year and typically falls within the brewpub category under which 25% of the product is consumed onsite. A regional brewery produces between 15,000 and 6 million barrels per year, and a large brewer over 6 million barrels. The Association's notation is used throughout this Article. *See Craft Brewer Defined*, BREWERS ASS'N, www.brewersassociation.org/pages/business-tools/craft-brewing-statistics/craft-brewer-defined (last visited Mar. 12, 2012).

[43] *See* BEER INST., BREWERS ALMANAC: 2010 ECONOMIC IMPACT STUDY 41 (2011), *available at* www.beerinstitute.org/statistics.asp?bid=200 (follow "Brewers Almanac 2011" link).

medals in individual beer categories.[44] It also won two overall awards for Best Small Brewpub and Brewmaster, and Best Large Brewpub and Brewmaster.[45] Firestone Walker Brewery of Paso Robles took home the award for Mid-Size Brewing Company and Mid-Size Brewing Company Brewer of the Year. In all, California breweries won almost twenty percent of the individual beer category medals and four of the six overall medals.[46]

Additionally, *Zymurgy*, a magazine dedicated to home brewing, released a readers' poll of the best commercial beers in America. California was represented by sixteen of the top fifty beers in that poll, including the number one beer.[47] Six of the top twenty-five breweries were from California.[48] Four of five "Spirit of Homebrew" awards, which recognize small producers, went to California.[49]

In assessing whether to implement a sustainability incentive program for California breweries, the growing market for California beer becomes particularly intriguing. Consumers of California beer are found well outside the state's borders. Despite the U.S. brewing industry's complicated system of interstate distribution, Sierra Nevada brewery in Chico has succeeded in expanding its distribution to all fifty states.[50] Stone Brewery of Escondido is set to be the first American craft brewery to open a satellite facility in Germany, home to a proud beer culture.[51] The demand for Californian beer is growing. As it does, the need and opportunity to make it a sustainable industry come into sharp relief.

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[44] BREWERS ASS'N, 2011 GREAT AMERICAN BEER FESTIVAL WINNERS LIST (2011), *available at* www.greatamericanbeerfestival.com/wp-content/themes/2011/assets/uploads/gabf11_winners.pdf. The Great American Beer Festival is the most prominent brewing competition and convention in the United States.

[45] *Id*.

[46] *Id*.The Great American Beer Festival awards three medals per style in eighty-three individual style categories for a total of 249 possible winners. California breweries took home forty-eight style medals.

[47] AMERICAN HOMEBREWERS ASS'N., 2011 ZYMURGY BEST BEERS IN AMERICA (2011), www.homebrewersassociation.org/pages/community/news/show?title=2011-best-beers#. *Zymurgy* magazine is the journal of the American Homebrewers Association. Its readers have some interest in beer beyond the baseline, evidenced by their interest in or practice of making their own. The number one beer on the list was Pliny the Elder, brewed by Russian River Brewery in Santa Rosa. This was the third year in a row Pliny won the distinction.

[48] *Id*.

[49] *Id*. This award recognizes popular appreciation of relatively small brewing operations.

[50] THE OXFORD COMPANION TO BEER, *supra* note 2, at 732. For discussion of difficulties in interstate distribution, see *id*. at 291-92.

[51] Peter Rowe, *Stone: An American in Europe?*, SIGNONSANDIEGO.COM (Feb. 14, 2011), www.signonsandiego.com/news/2011/feb/14/stone-american-europe.

IV. CALIFORNIA'S REPUTATION FOR ENCOURAGING SUSTAINABILITY

California's energy history is marked by innovation and has a legacy of utilizing alternative green-power production methods. In the early twentieth century, the state nearly exhausted its coal supplies [52] and reverted to using firewood, but its energy demands were much too large for that stopgap.[53] The state then turned to hydroelectric power, built on infrastructure left over from the 1849 gold rush.[54] "Forty-niners" who had tapped the rugged terrain of the Sierra Nevada to pressurize hoses for hydraulic mining outfits abandoned most of the waterways that had provided the hydraulic pressure.[55] Energy entrepreneurs simply built hydroelectric plants at the bottom of those channels to convert the waterways' kinetic energy into electricity.[56] Building a grid to transport that energy from the Sierras to the major metropolitan areas of the time was a separate innovation in itself.[57]

The state's energy innovation did not stop in the nineteenth century. The first nuclear plant to provide electricity to a private utility in the United States was the Santa Susana Experimental Station in Ventura County in 1956.[58] At that time, the state also planned to build as many as sixty nuclear plants up and down its coast.[59] That plan, however, was abandoned in the face of a nascent environmental movement and the formation of the California Public Utilities Commission, which was charged with decreasing energy demand rather than building more power plants.[60] This "conservation and not generation" attitude has become a hallmark of the state's energy policy.[61]

In 1978, Congress passed the Public Utility Regulatory Policy Act (PURPA), which allows private companies to construct renewably sourced energy plants in the states.[62] California became "the most aggressive state [in] implementing PURPA."[63] In doing so, it became a hotbed of hydro, solar, wind, geothermal, and biomass electricity

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[52] PETER ASMUS, INTRODUCTION TO ENERGY IN CALIFORNIA 8-9 (2009).

[53] *Id*. at 10-11.

[54] *Id*. at 11-12.

[55] *Id*. at 11-12.

[56] *Id*. at 12.

[57] *Id*. at 14-15.

[58] PETER ASMUS, INTRODUCTION TO ENERGY IN CALIFORNIA 56 (2009).

[59] *Id*. at 59.

[60] *Id*. at 59-61.

[61] *Id*. at 67-70. Notably, California has particularly strict building codes that require a building to meet a benchmark of energy efficiency.

[62] 16 U.S.C.A. § 2601 et seq. (Westlaw 2011).

[63] ASMUS, *supra* note 52, at 71.

generation.[64] Although renewable generation waned after the utility deregulation of the 1990s, private renewables remain a growing industry in California.[65] For example, by 2009, California had installed over 336 megawatts (MW) of solar-energy-generating capacity;[66] the state is expected to have added to its grid over 3000 MW by 2016.[67]

V. RECOGNITION OF HARMFUL ENVIRONMENTAL IMPACTS

The California legislature has codified the state's recognition of and response to anthropogenic environmental concerns. In 2006, California passed the Global Warming Solutions Act, known colloquially as AB 32.[68] This legislation provides tools for the state to combat global warming, termed "a serious threat to the economic well-being, public health, natural resources, and the environment of California."[69] This cap and trade solution limits the amount of greenhouse gases any public or private entity may emit.[70] Moreover, the Act imposes civil and criminal penalties for limitation violators.[71]

Without weighing in on AB 32's method, the policy goals it seeks to achieve are essential for the continued viability of our environment. The legislation recognizes the potential risks of failing to address global warming and attempts to remedy them.[72] Notably, it explicitly seeks private industry cooperation in implementing its tenets.[73] AB 32's purpose is to maintain California's position at the forefront of environmental stewardship policy.[74]

Perhaps the most important clause in AB 32's mission statement is California Health and Safety Code section 38501(d), which states, "National and international actions are necessary to fully address the issue of global warming. However, action taken by California to reduce emissions of greenhouse gases will have far-reaching effects by encouraging other states, the federal government, and other countries to

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[64] ASMUS, *supra* note 52, at 71. California was generating less than five Megawatt-hours (MW-h) from renewable sources; in 1990, that number peaked at almost forty-five MWh. *See id.* at 75.

[65] *Id.* at 137.

[66] *Id.* at 152.

[67] *Id.* at 157.

[68] CAL. HEALTH & SAFETY CODE § 38500 et seq. (Westlaw 2011).

[69] CAL. HEALTH & SAFETY CODE § 38501(a) (Westlaw 2011).

[70] CAL. HEALTH & SAFETY CODE § 38550 (Westlaw 2011).

[71] CAL. HEALTH & SAFETY CODE § 42400 (Westlaw 2011).

[72] CAL. HEALTH & SAFETY CODE § 38501(a), (b) (Westlaw 2011).

[73] CAL. HEALTH & SAFETY CODE § 38501(h) (Westlaw 2011).

[74] CAL. HEALTH & SAFETY CODE § 38501(c) (Westlaw 2011).

act."[75] This subsection indicates that although climate change solutions require international cooperation, California recognizes that even a small reduction in greenhouse gas emissions is a step in the right direction. This political landscape provides the perfect setting in which to test a sustainable production program. The government desires to achieve global-warming and emission-reduction goals. The state has the public and private infrastructure, and the reputation, necessary to implement such a program. The California brewing industry is also beginning to make a major economic impact on the nation. It is within this context that this Article turns to a discussion of the energy-efficiency opportunities available to California's breweries by which they may mitigate their greenhouse gas emissions and save money in the process.

VI. THE NEED TO REDUCE ENERGY CONSUMPTION IN THE BREWING INDUSTRY

Commercial brewing is an energy-intensive process. Production of one barrel of beer requires approximately 334 kilo-British Thermal Units (kBtu),[76] or 80.5 kilowatt hours (kWh).[77] In 2010, U.S. breweries produced 194,169,303 barrels of beer.[78] California shipped 11.4% of all the beer in the United States that year, a total of 22,169,199 barrels.[79] Thus, the state's breweries required just under 1.8 million megawatt-hours (MWh) of energy to brew beer in 2010.[80] Nationwide, the commercial brewing industry spent over $363 million on fuel and electricity in 2009.[81] Energy expenditures can account for as much as 8%

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[75] CAL. HEALTH & SAFETY CODE § 38501(d) (Westlaw 2011).

[76] One Btu is equivalent to the amount of heat necessary to raise the temperature of one pound of water one degree Fahrenheit. A kWh is equal to 3,412 Btu. U.S. ENERGY INFO. ADMIN., ENERGY UNITS AND CALCULATORS EXPLAINED: BRITISH THERMAL UNITS (BTU) (Oct. 26, 2011), www.eia.gov/energyexplained/index.cfm?page=about_btu.

[77] *See generally* GALITSKY ET AL., *supra* note 5. A kWh is equivalent to 1,000 watts working for one hour. U.S. ENERGY INFO. ADMIN., ELECTRICITY EXPLAINED: MEASURING ELECTRICITY (June 7, 2011), www.eia.gov/energyexplained/index.cfm?page=electricity_measuring.

[78] BEER INST., BREWERS ALMANAC: ANNUAL PRODUCTION OF MALT BEVERAGES BY TYPE 4 (2011), *available at* www.beerinstitute.org/statistics.asp?bid=200 (follow "Brewers Almanac 2011" link).

[79] BEER INST., BREWERS ALMANAC: BEER SHIPMENTS BY STATE 20 (2011), *available at* www.beerinstitute.org/statistics.asp?bid=200 (follow "Brewers Almanac 2011" link).

[80] This figure represents the number of barrels shipped by California breweries multiplied by the energy per barrel discussed in the Galitsky report, *e.g.* 22,169,199 barrels x 80.5 kWh. *See* GALITSKY ET AL., *supra* note 5.

[81] *See* BEER INST., BREWERS ALMANAC: ANNUAL SURVEY OF MANUFACTURES—BREWERIES 45 (2011), *available at* www.beerinstitute.org/statistics.asp?bid=200 (follow "Brewers Almanac 2011" link). This figure does not account for home brewing operations.

of a brewery's overhead costs.[82]

Because brewing beer is energy-intensive, breweries should move toward sustainability by reducing their reliance on traditional fuels. Employing clean, renewable energy sources and decreasing energy consumption, either by lowering demand or using procedural efficiency improvements, can accomplish this task. California's brewing industry enjoys an unparalleled beer-cultural eminence in the United States and abroad, in both reputation and influence. The state should therefore incentivize the industry's movement toward sustainability.

VII. METHODS FOR ACHIEVING SUSTAINABILITY

A. IMPLEMENTING RENEWABLE ENERGY SOURCES IN BREWERIES

The brewing industry relies predominantly on coal and natural gas for its thermal and electricity demands.[83] These fuel sources present several environmental concerns because of the undesirable byproducts of their combustion. Coal releases more carbon dioxide when burned than any other fossil fuel.[84] Natural gas, although the cleanest of all fossil fuels in terms of particulate pollutants, produces high levels of methane and carbon monoxide when burned.[85] Also, these forms of fuel are increasingly unavailable to California businesses, because California has all but banned coal fire plants,[86] and cheap, domestic supplies of natural gas are largely used up, necessitating reliance on foreign sources for that fuel.[87] Finally, because of that scarcity, traditional fuels are on track to become unnecessarily expensive for the brewing industry. In the face of these problems, some California breweries have successfully sought other options.

Generating onsite energy is an alternative to utilizing costly fossil

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[82] *See generally* GALITSKY ET AL., *supra* note 5.

[83] *Id*. at 9.

[84] ASMUS, *supra* note 52, at 130. Coal emits 2.1 pounds of carbon dioxide, a potent greenhouse gas, per kWh electricity produced. This level is twice as much as petroleum emits in producing the same amount of electricity.

[85] *Id*. at 124. Methane is a very potent greenhouse gas responsible for climate change. Carbon monoxide is a hazard to human health. Natural gas plants emit as much as three times the carbon monoxide as do coal plants. *Id*.

[86] CAL. PUB. UTIL. CODE § 8340 et seq. (Westlaw 2011). This code section limits the California Public Utilities Commission's power to grant a permit to a power generator that does not meet specific greenhouse gas emissions standards. It is exceedingly difficult for a coal fire plant to meet those standards.

[87] ASMUS, *supra* note 52, at 125.

fuels. The state's leading brewery in onsite energy generation is the Sierra Nevada Brewery in Chico, California. Sierra Nevada brewed nearly 800,000 barrels of beer in 2010, making it the second largest regional brewer in the United States.[88]

Sierra Nevada is an exceptional model for implementing sustainability measures in an industrial setting. In 2007, the brewery embarked on an energy generation project that resulted in a clean, onsite supply of more than half of its energy demands.[89] Its system involves a solar array capable of producing 1.94 MW,[90] four 300 kW hydrogen fuel cells,[91] and a biogas recovery system that utilizes biogas from onsite wastewater treatment to offset the brewery's natural gas demands.[92]

There are significant barriers to widespread use of the sustainability measures that Sierra Nevada has successfully employed. Implementing renewable energy sources into brewing operations is expensive, and thus it is generally confined to well-established and sufficiently capitalized breweries. For instance, Anheuser-Busch Inbev, the largest brewer in the world, installed a 1.5 mW wind turbine at its Fairfield plant, in addition to an existing solar array.[93] The turbine cost approximately $4 million to install.[94] Anderson Valley Brewing Co. in Boonville sources forty percent of its energy demand from an onsite solar array.[95] Anderson Valley was founded in 1987 and produces 25,000 barrels per year.[96] The brewery's solar array cost $860,000 outright.[97] Power generated in hydrogen fuel cells, such as those employed at Sierra Nevada, costs $500.00 per kW.[98]

Furthermore, most of these methods require a large amount of physical space. It is no coincidence that Sierra Nevada and Anderson

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[88] SIERRA NEVADA BREWING CO., 2010 SUSTAINABILITY REPORT 6 (2010), *available at* www.sierranevada.com/environment/images/2010SierraNevadaSustainabilityReport.pdf.

[89] *Id*. at 11.

[90] *Id*. at 10.

[91] *Id*. at 11.

[92] *Id*. at 13.

[93] Barry Eberling, *Fairfield Brewery Gets Mammoth Wind Turbine to Power Plant*, DAILYREPUBLIC.COM (Oct. 21, 2011), www.dailyrepublic.com/featured-stories/fairfield-brewery-gets-mammoth-wind-turbine-to-power-plant. This turbine has the potential to provide 20% of that brewery's energy demand.

[94] *Id*.

[95] ANDERSON VALLEY BREWING CO., ANDERSON VALLEY BREWING COMPANY BEER . . . DRINK IT IN GOOD CONSCIENCE: FACT SHEET (2011).

[96] *Industry Veteran to Acquire Anderson Valley Brewery*, NORTHBAYBUSINESSJOURNAL.COM (Mar. 16, 2010), www.northbaybusinessjournal.com/19392/industry-veteran-to-acquire-anderson-valley-brewery.

[97] ANDERSON VALLEY BREWING CO., *supra* note 95.

[98] ASMUS, *supra* note 52, at 222.

Valley sit on large plots in rural parts of California.[99] A small urban brewpub such as Magnolia in the Haight-Ashbury district of San Francisco does not have the requisite physical space to implement these types of renewable sourcing. Implementing these technologies also requires a corporate philosophy that goes beyond the fiscal bottom line.[100] Therefore, in order to realize energy conservation goals, environmental controls and enhancements that are specific to the brewing process, the legislature must present more viable options for small brewers.

B. PROCESS-SPECIFIC EFFICIENCY MEASURES

i. Efficient Technologies

Breweries can substantially reduce their environmental impact by improving brewhouse energy efficiency and lowering energy demands. As the brewing process is essentially a heating/cooling cycle, waste energy and materials can be recycled within the brewery to provide energy for opposite ends of that cycle. This Section describes the brewing process in detail and offers an abbreviated list of potential technological opportunities to increase energy efficiency at each stage.[101] It is based on a report commissioned by the U.S. Environmental Protection Agency that discusses opportunities for energy efficiency and demand mitigation in the brewing sector.[102]

The brewing process begins with the mash. Grist, the mixture of cereal grains that forms the backbone of a beer, is combined with water, heated to a specified temperature between 130° and 155°F, and left to steep.[103] At this stage, waste heat can be captured for mashing elsewhere, or for use in the pasteurization process, which requires beer to be heated

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[99] Anderson Valley Brewing Company is in Boonville. The brewery's grounds are large enough to accommodate the brewhouse, a large pub, the solar array, three wastewater treatment ponds, and a championship frisbee golf course. Sierra Nevada, in Chico, has the brewhouse, pub, restaurant, music hall, shipping facility, and farm on its expansive plot.

[100] Sierra Nevada founder Ken Grossman states his brewery's philosophy as follows: "There will always be more we can do to reduce our environmental footprint. I am committed to the traditions I started thirty years ago and will continue to make the highest quality beer while minimizing our negative impacts." *2010 Sustainability Report*, 4 SIERRA NEVADA BREWING CO., *supra* note 88, at 4.

[101] This Section is limited to the brewing process as it takes place within the brewhouse. Upstream and downstream sustainability practices are outside the scope of this Article.

[102] *See generally* GALITSKY ET AL., *supra* note 5.

[103] THE OXFORD COMPANION TO BEER, *supra* note 2, at 576-77.

to only 140°F.[104] To recapture that heat, the mashing vessel must be retrofitted with a heat transfer area.[105]

The next phase, the boil, is the most fuel-intensive stage of the brewing process and one that provides several opportunities to increase efficiency.[106] The sugar-laden liquid that results from mashing the grist is called wort.[107] At this point in the brewing, the wort is heated to boiling, and hops are added.[108] This is done in a kettle heated by steam, which is typically generated by burning natural gas. The boil produces a large amount of steam, so employing vapor condensers to recover heat can produce significant energy savings. This system collects the steam that rises from the boil and converts it into heat for use in other phases of the brewing process.[109] This reduces the amount of natural gas a brewery must use to heat wort.[110] Energy savings here can be as high as 22 kBtu per barrel.[111] This technology has a payback period of two to five years, making it exceptionally suited for small brewing operations that must borrow against capital in order to technologize.[112]

Physical alterations to the wort boiling process can also result in increased energy conservation. In recompression boiling, steam used to heat the kettle is mechanically pressurized so that it can be heated to higher than boiling temperature. The wort is then externally heated to the temperature of the steam, 216°F. When the wort is introduced to the kettle, it drops down to 212°F, and the excess heat calories are collected by a plate heat exchanger for use elsewhere. As opposed to a traditional direct boil, this process can decrease energy requirements by as much as 30 kBtu per barrel, because the resultant heat contains more energy than the electricity used to pressurize the steam.[113]

Once the boil is complete, the wort must be cooled from approximately 210°F to below 70°F, a temperature suitable for yeast addition.[114] This is achieved by using a heat exchanger, a device in which the hot wort is passed along one side of a plate with a much colder liquid

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[104] GALITSKY ET AL., *supra* note 5, at 19.

[105] *Id*.

[106] *Id*. at 6.

[107] THE OXFORD COMPANION TO BEER, *supra* note 2, at 850-51.

[108] *Id*. at 504-05.

[109] GALITSKY ET AL., *supra* note 5, at 20.

[110] *Id*. at 20 (noting that any opportunity to mitigate fossil fuel consumption in brewery operations is a significant step toward sustainability). Galitsky et al. estimate that vapor condensers can save a brewery 1.14 million cubic meters of natural gas per year. *Id*.

[111] *Id*. at 45.

[112] *Id*.

[113] *Id*. at 21.

[114] THE OXFORD COMPANION TO BEER, *supra* note 2, at 345.

passing along the other side.[115] There are two types of heat exchangers suitable for this process: simple chilled water exchangers, and multiple stage water-glycol exchangers.[116] Of these, the latter requires less energy to lower the temperature of the cooling medium.[117] Replacing a single-stage heat exchanger with a multiple-stage exchanger can reduce chilling electricity by 25% per barrel, a savings of 17 kBtu per barrel.[118] In either case, the water used as a chilling medium is eventually heated to 185°F by the wort. The brewery can and should use this water for subsequent mashes.[119]

After the wort has cooled and the yeast has been introduced, the young beer must be stored during fermentation. At this point, the yeast begins to metabolize sugar and produce alcohol and carbon dioxide.[120] This process can take as long as ten days.[121] During that time the fermentation vessels must be kept at a constant temperature, which is accomplished through the use of cooling jackets.[122] Thus, any opportunity to accelerate the fermentation process will result in energy savings. Typically, yeast is pitched into the wort and allowed to diffuse throughout the fermentation vessel. After fermentation the spent yeast cells are filtered out of the beer. Use of a yeast immobilizer has been shown to save energy in the filtration process and to reduce fermentation times.[123] This system works by confining the yeast cells to a ceramic carrier that actually increases contact between the wort and yeast.[124]

Some brewers are hesitant to adopt this type of fermentation, however, as a beer's final character is affected by residual yeast. Certain beer styles, such as witbier or Belgian blonde, call for the presence of yeast until the beer is poured.[125] Thus, some brewmasters would refuse to consider removal of yeast cells from any part of fermentation or bottle conditioning processes. Nevertheless, there are other opportunities for environmental impact reduction during fermentation.

Carbon dioxide is an important byproduct of fermentation, as it is

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[115] *Id*. at 425-26.

[116] GALITSKY ET AL., *supra* note 5, at 23.

[117] *Id*.

[118] *Id*. Electricity for a single stage exchanger rates at 0.24 kWh per barrel, while a multiple-stage exchanger uses 0.18 kWh per barrel.

[119] *Id*.

[120] THE OXFORD COMPANION TO BEER, *supra* note 2, at 342.

[121] GALITSKY ET AL., *supra* note 5, at 7.

[122] *Id*. at 24.

[123] *Id*. Studies at various international breweries have shown that fermentation can be completed in as little as one day.

[124] *Id*.

[125] BREWERS ASS'N, *supra* note 44, at 27.

responsible for some of the carbonation in the final product.[126] Most large breweries add additional carbon dioxide to their beer after fermentation is complete.[127] A recovery system mounted on top of the fermentation vessels can recapture the carbon dioxide produced during fermentation that would otherwise be lost.[128] Such a system prevents outgassing and the effect of that greenhouse gas on the environment. The benefit of a recovery system is two-fold: it is possible for a brewery to be completely self-sufficient for carbon dioxide while preventing the byproduct from escaping into the atmosphere.[129]

Pasteurization takes place just before beer is packaged and is intended to kill off any microbial contaminants.[130] The brewing industry employs two methods of pasteurization: tunnel and flash.[131] In tunnel pasteurization, the beer is heated and kept at a temperature sufficient to kill microbials as it is passed through a long tunnel system.[132] In flash pasteurization, the beer is rapidly heated to a very high temperature and then quickly cooled.[133] The flash method consumes about one third the energy of the tunnel system and also requires significantly less physical space.[134] However, a drawback of the flash method is that it takes place before the beer reaches its final container.[135] Thus, the beer must be transferred between vessels after pasteurization, which affords an opportunity to reintroduce microbials.

ii. Efficient Techniques

In addition to the aforementioned stage-specific technological options, there are also overarching procedural changes to the brewing process that can result in energy savings. One such alteration is high-gravity brewing. Gravity is a measurement of particles in solution as compared to water.[136] In high-gravity brewing, the brewery makes higher-gravity wort (a denser solution) and then dilutes the concentrate with water to achieve the desired density and alcohol percentage.[137] The

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[126] THE OXFORD COMPANION TO BEER, *supra* note 2, at 221.
[127] GALITSKY ET AL., *supra* note 5, at 24.
[128] *Id*.
[129] *Id*.
[130] THE OXFORD COMPANION TO BEER, *supra* note 2, at 641.
[131] *Id*.
[132] *Id*. at 641-42.
[133] *Id*. at 642.
[134] GALITSKY ET AL., *supra* note 5, at 26.
[135] *See* THE OXFORD COMPANION TO BEER, *supra* note 2, at 642.
[136] *Id*. at 657.
[137] GALITSKY ET AL., *supra* note 5, at 22.

essential result is more beer produced per boil, eliminating the need to go through the energy-intensive mashing and boiling stages for the additional beer produced. While this method may have final flavor implications, it also results in reduced water use and reduced labor and cleaning costs.[138]

The preceding examples of methods and technologies are merely a selection of energy efficiency and conservation opportunities in the brew house. By employing these techniques, a brewery can expect to improve energy conservation by up to 81 kBtu per barrel, or 24.2%.[139] Additionally, the benefits of energy efficiency do not end with environmental impact mitigation. Breweries would enjoy deep energy cost savings if they were to implement one or two efficiency measures. In fact, all of the efficiency measures explored by Berkeley National Lab in the Galitsky report can be repaid through energy cost savings in no more than five and a half years.[140] In spite of these energy savings, the high initial cost of implementation can discourage breweries from making the switch to more sustainable brewing.

VIII. LEGISLATIVE ACTIONS AND CALIFORNIA SUSTAINABILITY: POTENTIAL MODELS

The California legislature has a history of incentivizing technologies that mitigate industrial environmental impacts. This Part explores four such incentive programs and culls from them aspects that can translate to energy conservation. It concludes by synthesizing those aspects into a cogent program proposal for green brewing in California.

A. SOLAR-POWER PROPERTY TAX EXEMPTION

In 2008 California renewed a legislative program that incentivizes the installation of active solar energy systems on real property through June 2016.[141] This program began in 1980 and has been continually renewed through the most recent legislative session.[142] The program excludes the value of an added solar power system from the owner's property tax assessment; that is, a property owner who installs a solar system or who purchases a new building with a solar-power system is

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[138] *Id*.

[139] *Id* at 45.

[140] *Id*. at 45-46.

[141] CAL. REV. & TAX CODE § 73 (Westlaw 2011).

[142] Cal. Stats.1980, ch. 1245, § 1.

assessed property taxes as if the system were not part of the property.[143] The program applies only to initial purchasers of solar energy systems. When the original system purchaser sells the property, the system is assessed as an improvement on the real property.[144] Separate rebates, such as those from the California Public Utilities Commission for solar power purchases, are not excluded from the property tax assessment.[145] An owner is assessed property tax on the portion of the solar power system paid for through other incentive programs.

When the California legislature developed this program, it was clear about the public policy it intended to further. In the Assembly, the Committee on Revenue and Taxation's report for the 2008 renewal bill states that "solar panels will provide more energy efficiency" and that "the market for solar energy in new home construction is critically important to the future of the state."[146] It is a program designed to make energy efficiency and impact mitigation available to a large portion of the citizens of California. In that sense, it mirrors the goals of a sustainable brewery incentive program.

A second important facet of this legislation is the decentralized generation of energy for sale back to utilities, especially during peak usage periods.[147] This occurs when a solar power system provides more energy than is needed for the immediate facility it powers. When excess energy is generated at decentralized sites, utility companies may purchase it from the individual generator.[148] That renewably generated electricity then enters the grid for use elsewhere.[149] Thus, incentivizing private solar power systems is another step toward normalizing wider sustainable energy consumption (as more renewable energy is produced, the more broadly that energy is consumed). The result is an overall reduction in our reliance on fossil fuels.

Applying a tax incentive program to the brewing industry would be a simple way to induce private sustainability measures. A tax incentive would provide uniform application and implementation, with a clear and immediate return on compliance. A brewer seeking the incentive would

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[143] CAL. REV. & TAX CODE § 73(e)(1) (Westlaw 2011).

[144] CAL. REV. & TAX CODE § 73(e)(1)(c) (Westlaw 2011).

[145] CAL. REV. & TAX CODE § 73(e)(1)(a) (Westlaw 2011).

[146] CAL. ASSEMBLY COMM. ON REV. & TAX, CAL. BILL ANALYSIS, A.B. 1451 (May 14, 2007).

[147] *Id*.

[148] The California Public Utilities Commission has implemented two decentralized generation buyback programs. *See* CAL. PUB. UTIL. COMM., DISTRIBUTED GENERATION IN CALIFORNIA (Dec. 23, 2010), www.cpuc.ca.gov/PUC/energy/DistGen.

[149] ASMUS, *supra* note 52, at 148.

need only to abide by the rules to see a clear and immediate reduction in its expenses. A reduction of both tax and energy overhead expenses is undeniably an enticing incentive.

However, employing a property tax exemption for the assessed value of added efficiency equipment may not be the best option for the brewing industry. Foremost, brewing is predominantly done by small and relatively young companies, and few breweries own the property on which they brew. In 2010, U.S. breweries spent approximately $54 million on rental property.[150] If a brewer were to install a renewable energy source at its rented brewery site, there would be no improvement to its real property, and thus no tax exemption. Furthermore, if a brewery were to install efficiency measures on its brewing equipment (and not on the real property itself), the incentive would not apply.

Another problem is that this program incentivizes by rewarding a one-time action rather than ongoing conduct. The continued application of the incentive is dependent only on the continued ownership of the real property by the system purchaser.[151] It is not dependent on the continued use or maintenance of the system. An incentive program applied to breweries must be based on the results of the efficiency measures and not the mere installation of those measures. A results-oriented system is needed due to the mechanical nature of several of the procedural efficiency measures discussed above.[152] These systems must remain fluid and well-maintained in order to achieve the policy goal at issue, that is, energy conservation. Thus, the incentive should apply only when a brewery can show a net reduction in energy consumption, and not simply that it has installed efficiency equipment.

These drawbacks can be overcome by tailoring a tax incentive program to the industry. Rather than exempting property taxes, it would be more appropriate to exempt breweries from a portion of their industry-specific excise taxes.[153] These excise taxes are assessed based on output. A brewing sustainability program should not offer incentives on initial actions alone (such as the installation of efficiency measures)

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[150] BEER INST., BREWERS ALMANAC: ANNUAL SURVEY OF MANUFACTURERS—BREWERIES 45 (2011), *available at* www.beerinstitute.org/statistics.asp?bid=200 (follow "Brewers Almanac 2011" link).

[151] CAL. REV. & TAX CODE § 73(e)(1)(c) (Westlaw 2011).

[152] A vapor recompression pump, used in high pressure boiling, is only as efficient as the motor driving compression. Without proper maintenance, that motor will lose its own efficiency and compromise the energy conservation of that system. Therefore, an incentive program for breweries must take into account that many of the measures require continued maintenance to fulfill their purposes.

[153] The California excise tax on beer is $0.04 per gallon, or $1.24 per barrel. CAL. REV. & TAX. CODE § 32151(a) (Westlaw 2011).

because brewing is inherently a continuous process. The benefit to a brewer of a one-time exemption would not significantly incentivize pursuit of this type of program. Rather, offering the incentive as a function of a brewery's output makes the incentive constant and rewards every efficient barrel the brewer produces. Excise tax exemptions are therefore better suited for incentivizing energy conservation in breweries. Such a program might take the form of a percentage reduction in a brewery's excise taxes in return for achieving an efficiency benchmark.[154]

B. METAL-PLATING FACILITY LOAN GUARANTEE PROGRAM

Another potential incentive model for the brewing industry comes from a program that targets environmental controls in the metal-plating industry.[155] The plating industry is similar to California's breweries in that it is consists primarily of small businesses that are dispersed throughout the state.[156] The program established a process by which metal-plating businesses can apply for state loan guarantees.[157] The loans are funded by private Financial Development Corporations.[158] These loans are intended to "assist metal plating facilities in purchasing high performance environmental control equipment or technologies that will enable that facility to meet new or exceed existing regulatory requirements . . . and implement additional pollution prevention opportunities."[159]

The legislature found that byproducts of the metal-plating process create serious negative impacts on the environment.[160] Additionally, it determined that several of the facilities that fall under the program are near sensitive receptors, such as schools or hospitals that would be disproportionately affected by metal-plating pollution.[161] Accordingly, the legislature found that "it [was] in the best interest of the people of California . . . to address the environmental issues posed by the metal

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[154] Pros and cons of this type of system are discussed in detail below. *See infra* Part VIII.

[155] CAL. PUB. RES. CODE § 42100 et seq. (Westlaw 2011) (repealed operative Jan. 1, 2012).

[156] Metal Plating Facility Loan Guarantee Program, 2005 Cal. Legis. Serv. 695 (West) (codified at CAL. PUB. RES. CODE § 42100 et seq. (repealed operative Jan. 1, 2012)).

[157] CAL. PUB. RES. CODE § 42102 (Westlaw 2011) (repealed operative Jan. 1, 2012).

[158] CAL. PUB. RES. CODE § 42101(a) (Westlaw 2011) (repealed operative Jan. 1, 2012).

[159] *Id*.

[160] Metal Plating Facility Loan Guarantee Program, 2005 Cal. Legis. Serv. 695, § 1(a)(4) (Westlaw 2011) (codified at CAL. PUB. RES. CODE § 42100 et seq. (repealed operative Jan. 1, 2012)).

[161] Metal Plating Facility Loan Guarantee Program, 2005 Cal. Legis. Serv. 695, § 1(a)(3) (Westlaw 2011) (codified at CAL. PUB. RES. CODE § 42100 et seq. (repealed operative Jan. 1, 2012)).

plating industry."[162] The legislation's cornerstone is an incentive program that operates in tandem with regulatory pollution control.

The loan guarantee scheme has several facets that would translate well into a sustainable brewing program. Most of the energy conservation techniques applicable to the brewing and metal-plating industries require the purchase of environmental control equipment. However, the main obstacle for the metal-plating industry in obtaining that equipment is accessing capital, and the same is true of the brewing industry.[163] A loan guarantee program overcomes that obstacle without immediately draining California's general fund.

In order to qualify for the guarantee program there are several eligibility requirements a metal-plating facility must meet. In addition to lacking a funding source, the facility must already be participating in an established green business program, a model shop program, or the U.S. EPA's National Metal Finishing Strategic Goals Program.[164] If the facility meets those requirements the California Business, Transportation, and Housing Agency evaluates its loan guarantee application. If that application is accepted the facility can apply for a loan from Financial Development Corporations.[165] This helps negate the immediate fiscal impact on state coffers.

The loan guarantee method makes particular sense as applied to the brewing industry, wherein most efficiency equipment pays for itself through energy expense savings over a relatively short period of time.[166] These loans are lower risk because they can be paid back with expenses saved, rather than projected revenue. Furthermore, the program caps the value of a loan the state can guarantee at $100,000.[167] From a purely fiscal standpoint, a loan guarantee program is more feasible than a comparable tax exemption or grant program, which would immediately deplete California's financial resources.

The metal-plating loan guarantee program takes a more holistic approach to remediating the environmental impacts of that industry. In addition to providing a mechanism by which facilities can acquire

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[162] Metal Plating Facility Loan Guarantee Program, 2005 Cal. Legis. Serv. 695, § 1(b) (Westlaw 2011) (codified at CAL. PUB. RES. CODE § 42100 et seq. (repealed operative Jan. 1, 2012)).

[163] Metal Plating Facility Loan Guarantee Program, 2005 Cal. Legis. Serv. 695 § 1(a)(8) (Westlaw 2011) (codified at CAL. PUB. RES. CODE § 42100 et seq. (repealed operative Jan. 1, 2012)).

[164] CAL. PUB. RES. CODE § 42101.1(c) (Westlaw 2011) (repealed operative Jan. 1, 2012); *see also* CAL. PUB. RES. CODE § 42100(i), (k), (l) (repealed operative Jan. 1, 2012). A green business program is an environmental law compliance program administered by a governmental agency. A model shop program is a voluntary pollution control program.

[165] CAL. PUB. RES. CODE § 42101.1 (Westlaw 2011) (repealed operative Jan. 1, 2012).

[166] See GALITSKY ET AL., *supra* note 5, at 45-46.

[167] CAL. PUB. RES. CODE § 42101.2 (Westlaw 2011) (repealed operative Jan. 1, 2012).

environmental control equipment, the program requires participation in a separate outreach program.[168] These programs invite governmental and industrial cooperation in identifying problems and solutions in the metal-plating industry. For example, the Model Shop Program is intended to develop "alternative business practices in order to run cleaner, safer shops."[169] The program offers seminars to metal-plating facilities on pertinent topics such as permitting and green process pre-treatment options, information about other pollution prevention incentives, and resources for connecting with other facilities and relevant government agencies.[170] The program is run by the California Department of Toxic Substances Control, which partners with trade associations and local governments.[171] The brewing industry would benefit from a similar outreach program and, more generally, a holistic approach to applying sustainable brewing techniques.

It is important to note that the viability of the metal-plating loan guarantee program has not been proven. This program began in 2006 and was scheduled to sunset in 2012.[172] By January 2009, no formal requests for loan guarantees had been received by the Business, Transportation, and Housing Agency.[173] The Agency explained that new pollution control regulations were scheduled to go into effect later in 2009, and that demand for the program would be driven by the new regulations.[174] Although there were no loan guarantee applications between 2006 and 2009, the Agency spent considerable efforts enrolling metal-plating facilities in the various outreach programs associated with the loan guarantee applications.[175] However, despite its intended 2012 repeal date, the loan guarantee program was suspended in July 2009 due to Budget Act amendments.[176] Consequently, there is no data on how successful the loan guarantees would have been had any metal-plating facilities taken loan guarantee offers.

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[168] CAL. PUB. RES. CODE § 42101.1(c) (Westlaw 2011) (repealed operative Jan. 1, 2012).

[169] CAL. PUB. RES. CODE § 42100(k) (Westlaw 2011) (repealed operative Jan. 1, 2012).

[170] *Metal Finishing Model Shop Program*, CAL. DEP'T OF TOXIC SUBSTANCES CONTROL, www.dtsc.ca.gov/PollutionPrevention/MFMS/Metal_Finishing_Model_Shop_Program.cfm.

[171] *Id*.

[172] CAL. BUS., TRANSP. & HOUS. AGENCY, METAL PLATING FACILITY LOAN GUARANTEE PROGRAM, BIENNIAL REPORT 1 (Jan. 2009).

[173] *Id*. at 3.

[174] *Id*.

[175] *Id*.

[176] CAL. DEP'T OF FIN., AMENDMENTS TO THE BUDGET ACT OF 2009, at 28 (July 28, 2009), *available at* 2009-10.archives.ebudget.ca.gov/pdf/Enacted/BudgetSummary/AmendmentstotheBudgetActof2009.pdf. The amendment suspended the program so the state could subsume the program's $3.5 million pollution prevention fund into the general fund.

C. ENERGY CONSERVATION ACT OF 2001

The Energy Conservation Act of 2011 takes a progressive approach to increasing energy efficiency across California's diverse population by providing graduated efficiency incentives to low-income residents, small businesses, and residential property owners.[177] Depending on their financial situation, this act provides cash for applicants to incorporate energy-efficient materials into building construction and retrofitting projects.[178] It also makes loans for applicants to purchase energy-efficient refrigeration equipment.[179] The Act does not subsidize the purchase of energy-efficient industrial process equipment.

The gradually increasing incentive scheme of the Act suggests it was intended to disperse energy-efficiency measures throughout California's population and achieve widespread energy conservation.[180] Low-income individuals receive grants under the plan, whereas residential property owners and small business owners receive inexpensive loans.[181] It does not provide for loans to property or business owners who earn more than $100,000 per year.[182]

Progressive incentives would carry over well to the brewing industry. Because the industry is so varied in scale, offering incentives based on revenue or brewing capacity would better address the capital access problem. Brewpubs that produce less than 15,000 barrels per year would likely have a more difficult time seeking efficiency retrofit loans than would national brewers brewing more than six million barrels per year. Because California's brewing industry is dominated by small businesses, it makes more sense to weight an incentive program toward those breweries. Doing so maximizes the mitigation of environmental impacts by increasing the number of breweries that have access to energy conservation equipment.

An obvious drawback of a loan or grant program is the immediate fiscal impact on the state. The Energy Conservation Act set aside $100 million for construction and retrofit loans from the general fund and the Proposition 98 Reversion Fund, merging them into the newly created Renewable Energy Loan Loss Reserve Fund.[183] Given the current

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[177] CAL. PUB. RES. CODE § 25433 (Westlaw 2011).

[178] *Id*.

[179] CAL. PUB. RES. CODE § 25436 (Westlaw 2011).

[180] CAL. ASSEMBLY COMM. ON REV. & TAX., CALIFORNIA BILL ANALYSIS, A.B.X1 29 (Mar. 6, 2001).

[181] CAL. PUB. RES. CODE §§ 25433.5 (a)(1)-(2) (Westlaw 2011).

[182] Cal. Pub Res. Code CAL. PUB. RES. CODE § 25433.5(a)(2) (Westlaw 2011).

[183] CAL. SENATE RULES COMM., CALIFORNIA BILL ANALYSIS, A.B.X1 29 (Apr. 4, 2001).

economic crisis facing California,[184] establishing a beer incentive program using general fund money would be a hard sell. While this program offers important tools for the administration of a sustainable brewing incentive program, its method is not currently feasible.

D. U.S.D.A. NATIONAL ORGANIC PROGRAM

Finally, an additional incentive borrowed from the U.S. Department of Agriculture should be addressed here. The U.S.D.A. oversees the National Organic Program, a statutory scheme that regulates the use of the term "organic" as applied to food and goods.[185] When a producer meets specified standards of cultivation, the U.S.D.A. allows the producer to use the U.S.D.A.'s "organic" logo on the producer's packaging.[186] A similar program could be a powerful marketing tool for California's brewing industry. As part of an incentive program, the state could trademark a logo and license it to breweries that participate in the model brewery program or that achieve a certain sustainability benchmark in their production processes. This affords consumers an opportunity to purchase sustainably produced beer over non-sustainable products. This, after all, is the ultimate goal. When consumers choose sustainable, it reinforces sustainable choices further up the production chain.

IX. CALIFORNIA SUSTAINABLE BREWING PROGRAM: A PROPOSAL

In developing a sustainable brewing program that would help California's breweries conserve energy, the California legislature must address several issues. The first consideration is that any incentive program will cost the state money. Regardless of the program's form, it will impose a burden on the state budget in the form of operational and administrative costs. As such, it must seek to limit its fiscal impact to succeed. The program must also be true to its directive by mitigating environmental impacts in as many of California's 318 breweries as possible. It should take into account the variety of breweries in California by administering incentives to all segments of the industry. Finally, this program should take a holistic approach to curbing those impacts. Fiscal

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[184] Wyatt Buchanan, *State Fiscal Nightmare: Deep Cuts on Horizon*, S.F. CHRONICLE, at A1 (Nov. 17, 2011), *available at* www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2011/11/17/MNSO1LVO2M.DTL.

[185] 7 U.S.C.A. § 6501 et seq. (Westlaw 2011).

[186] 7 U.S.C.A § 6505 (Westlaw 2011). The general benchmarks are listed at 7 U.S.C.A. § 6504.

incentives are effective, but given the cultural import of California's brewing industry, educational and cooperative methods must also be pursued.

Taking the above principles into consideration, a California sustainable brewery incentive program should take the form of a loan guarantee program. In addition to having almost no immediate fiscal impact on the state, a loan guarantee program is particularly suited to the brewing industry. So much of a brewery's increased energy efficiency is based on the incorporation of new equipment into existing production processes. That equipment tends to pay for itself quickly through energy savings. Because a brewery would seek a loan to mitigate expenses already incurred rather than in the hopes of expanding future revenues, the risk to the state of backing those loans is relatively low. Moreover, a loan guarantee program would allow breweries to pace retrofitting projects. Because there is no limited fund from which loans must be drawn, breweries would not have to scramble to compete for funding. Efficiency retrofitting could take place at an organic pace. This would, in turn, further decrease the state's financial risk by ensuring that breweries are ready to take on the retrofit projects for which they apply.

The loan guarantee application process should closely parallel the metal-plating loan guarantee program in its stringency. California breweries should be required to submit detailed proposals with their efficiency goals that include pre-retrofit energy audits and lists of the equipment they would purchase if accepted.[187] The state should establish efficiency benchmarks in evaluating applications and refuse to accept applications that would not significantly decrease energy consumption in brewhouses. In light of the methods discussed above, a 15-20% reduction in purchased energy consumption represents a reasonable goal for most breweries.[188] If an application fails to meet that standard, it should be rejected subject to a show of cause that the brewery should qualify for a

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[187] The California Public Utilities Commission has earmarked more than $34 million to subsidize commercial energy audits that are performed by engineers from major utility companies. *See* CAL. PUB. UTIL. COMM'N, FACT SHEET: ENERGY EFFICIENCY STATEWIDE COMMERCIAL PROGRAM (2010-2012) 1 (Nov. 2010), *available at* www.cpuc.ca.gov/NR/rdonlyres/259A1673-53AB-451C-906E-CAA4A9A8B047/0/EE8Commercial1110.pdf.

[188] Since incorporating a large swath of sustainability measures, Sierra Nevada has significantly improved its energy efficiency. Between 2007 and 2010, that brewery's energy consumption *peaked* at just over 24 kWh/barrel. *See* SIERRA NEVADA BREWING CO., 2010 SUSTAINABILITY REPORT: SIERRA NEVADA TOTAL OPERATIONS KWH PER BBL BEER PRODUCED 13, *available at* www.sierranevada.com/environment/images/2010SierraNevadaSustainability Report.pdf (providing graph). That is nearly a 75% reduction from the industry standard of 80.5 kWh/barrel. Thus, a 15-20% reduction should be viewed as a feasible goal, especially with governmental assistance.

loan despite a lesser marginal increase in efficiency.

The loan guarantee program should also be progressive in its implementation by staggering benefits in favor of smaller or less capitalized breweries. Applications from breweries that fit this profile and show energy inefficiencies should be given additional weight in the selection process. The system should be based on production history in relation to brewing capacity. Applications should be selected from those breweries that have smaller production capacities, perhaps less than 100,000 barrels per year, but that are producing all the beer they possibly can. Given the popularity of some of California's smallest commercial breweries, it would not be difficult to find this type of application.

Guaranteed loans should not exceed the amount necessary to purchase and install the equipment listed in an application. Furthermore, loan periods should not exceed the time necessary for the equipment to pay for itself in the form of energy cost savings. Although California's breweries should be encouraged to take significant steps to implement conservation measures, the state also has an interest in making sure that the breweries actually realize their conservation potential. Therefore, loans should be available only for the portion of a brewery's equipment needed to meet that 15-20% reduction benchmark. In order to be eligible for subsequent loan guarantees, a brewery must show that it has actually achieved that benchmark and maintained it. Subsequent loans should therefore be available only if the brewery has maintained increased energy efficiency for a period of two to three years. This insures that the brewery performs proper maintenance on efficiency equipment and that the state actually realizes an energy conservation return on its risk.

A successful application should be contingent on an applicant's participation in a model brewery program. Just as with the Model Shop Program mandated by Metal Plating Loan Guarantee Program, a model brewery program would provide resource assistance to breweries by offering a venue for discussion and education. Breweries participating in such a program would be able to submit their energy audits for general review, and a best brewing practices guide could be created from members' experiences. Furthermore, active participants in the Model Brewery Program should be licensed an appellation similar to the National Organic Program logo. Doing so would be a valuable marketing tool to distinguish successful brewers from those not joining the initiative. The logo would inform consumers that the beer they have purchased was brewed with sustainable equipment and with a decreased environmental impact. A green bottle cap or pull-tab on a can would be a suitable marker, to go along with an insignia for use on the brewery's packaging and marketing materials.

X. CONCLUSION

Since their first use in prehistoric Mesopotamia, alcoholic beverages have fostered a special kind of creativity in humankind. While the primary relationship humanity shares with alcohol is one of biology, it has provided us with the creativity and bravado to make some of our most important social advances. California has the opportunity to harness that relationship for another desperately needed social change: decreasing our dependence on fossil fuels and mitigating our greenhouse gas emissions.

By instituting a program that would help breweries purchase and implement environmental control and energy-efficiency equipment, the California legislature would take an important step toward achieving that goal. Given the size and variety of California's brewing industry, such a program would have an immediate impact by reducing the brewing sector's environmental impact. However, the benefits of the program do not stop there. Offering a sustainable option in such a ubiquitous consumer good encourages more generalized sustainability practices among industry and consumers alike.

A loan-guarantee program is a strong candidate model upon which to build a sustainable brewing program. This type of program limits the financial outlay the cash-starved state would need to provide, while at the same time maximizing the amount of sustainability equipment made available to breweries. Because the necessary equipment typically has short payback periods, a program of this nature has a low risk of default by the loan recipients. Thus, the state's financial risk is minimal.

California is the ideal place to introduce this type of legislation because the brewing industry here is a trendsetter. Offering breweries the opportunity to move toward sustainability would have a ripple effect among breweries outside the state by introducing sustainability as an important marketing tool. Furthermore, sustainability efforts would have a large impact on California because of the sheer amount of beer brewed and consumed in this state. The state legislature has a history of promoting sustainability in other industries and generally among the population. This would be one more facet of the state's broad policy of environmental impact reduction.

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