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## Stop, Think, Build, Repeat: Using Behavioral Economics to Better Design Energy Efficiency Policies for Our Cities' Buildings

Victor M. Hanna

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## Stop, Think, Build, Repeat: Using Behavioral Economics to Better Design Energy Efficiency Policies for Our Cities' Buildings

VICTOR M. HANNA\*

*Securing our country's supply of energy resources for future generations has been and continues to be a complex scientific, political, and economic issue throughout the United States. While these efforts have to a certain extent focused on securing an adequate supply of fossil fuels for our country, perhaps we need a better, more efficient perspective. Prior to dedicating our efforts to ensuring an adequate supply of energy resources—whatever that resource may be—we should instead strive to become a more energy efficient society and reduce our overall demand for energy. By maintaining our current lifestyles and productivity while simply using less energy, we can avoid some of the negative environmental impacts from burning fossil fuels for energy while simultaneously reducing our overall consumption of energy in the United States. The reality, however, is that human behavior poses a significant number of cognitive obstacles to acting in a more energy efficient manner, specifically with regard to adopting more energy efficient practices in the building and utilization of our cities' homes, office buildings, and other energy-consuming properties.*

*This article will address the negative environmental impacts of our continued reliance on fossil fuels for energy and how greater energy efficiency can produce significant environmental and economic benefits to our society. The focus then will be on how a thorough understanding of human behavior can help us design better energy efficiency policies at the municipal level for overcoming the behavioral obstacles preventing us from building and utilizing more energy efficient buildings throughout the United States. By examining the energy efficiency policies currently in place in four California cities,*

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this article attempts to analyze in practical terms how we can turn our own behavior from a barrier into a valuable tool for achieving greater energy efficiency. By understanding these behavioral obstacles, we will be in a much better position to remove them from the equation at the outset, thereby putting ourselves in a much better position both environmentally and economically.

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I. INTRODUCTION

The quickest and easiest way to reduce our carbon emissions is to make our appliances, cars, homes and other buildings more efficient. In fact, energy efficiency is not just low-hanging fruit; it is fruit that is lying on the ground. . . . We have talked for decades about the energy problem; it is time to solve it. . . . This is our opportunity to shape our energy destiny, and we must seize it.<sup>1</sup>

Not too long ago, the then-planned future of domestic energy policy in the United States could be heard echoing through the rafters of the Xcel Energy Center in Saint Paul, Minnesota, during the 2008 Republican National Convention: “Drill, baby, drill!”<sup>2</sup> In light of what we know

1. Steven Chu, *Cleaning Up: Energy and Climate Bill Will Boost the Economy*, RICHMOND TIMES-DISPATCH (July 22, 2009, 6:01 AM), [http://www.timesdispatch.com/news/article\\_e5d2835d-c68e-5249-8cc4-7af214751182.html](http://www.timesdispatch.com/news/article_e5d2835d-c68e-5249-8cc4-7af214751182.html).

2. Mary Lu Carnevale, *Steele Gives GOP Delegates New Cheer: ‘Drill, Baby, Drill!’*, WALL

today about how our prolonged dependence on fossil fuels<sup>3</sup> continues to impact our environment,<sup>4</sup> those three words represent a misguided—although an admittedly concise and catchy—characterization of our pursuit of the proverbial panacea for all domestic ills: job creation, economic growth, and energy independence by ending our country’s dependence on foreign sources of energy.<sup>5</sup>

The unfortunate truth is that a simple, one-size-fits-all<sup>6</sup> solution to slowing the negative effects of climate change and to ensuring our country’s domestic energy independence just does not seem to exist. Thus, domestic energy policy at all levels—federal, state, and municipal—should be designed with a view toward pursuing any and all possible solutions to address our country’s dependence on fossil fuels and the resulting effects on our climate and environment, even if those solutions exist only at the margins.

As a matter of common sense, it is important to note that, as famously quipped by Dr. Steven Chu,<sup>7</sup> before adopting any sort of pol-

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ST. J. (Sept. 3, 2008, 10:50 PM), <http://blogs.wsj.com/washwire/2008/09/03/steele-gives-gop-delegates-new-cheer-drill-baby-drill/tab/article/>.

3. The term “fossil fuels” will be used throughout this article to include oil, natural gas, and coal. UNITED NATIONS DEV. PROGRAMME, WORLD ENERGY ASSESSMENT: ENERGY AND THE CHALLENGE OF SUSTAINABILITY 4 (2000), available at <http://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/sustainable-energy/world-energy-assessment-energy-and-the-challenge-of-sustainability/World%20Energy%20Assessment-2000.pdf>.

4. See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS 11–13 (Thomas F. Stocker et al. eds., 2013) [hereinafter IPCC CLIMATE CHANGE 2013], available at [http://www.climatechange2013.org/images/report/WG1AR5\\_ALL\\_FINAL.pdf](http://www.climatechange2013.org/images/report/WG1AR5_ALL_FINAL.pdf) (describing unprecedented levels of atmospheric concentrations of carbon dioxide, methane, and nitrous oxide resulting from fossil fuel combustion and other human activities, leading to, among other effects, ocean acidification and surface warming).

5. Adopting policies pushing for more energy efficient buildings certainly has the potential to encourage the creation of more jobs domestically, provide a catalyst for economic growth, and increase the energy independence of the United States. Nevertheless, the focal point of this article is simply that we must utilize energy efficiency as a means to a specific end. By reducing our demand for energy resources in our buildings, including energy-using appliances and devices within those buildings, we will reduce our overall reliance on and consumption of fossil fuels for energy and help curb the negative environmental effects associated with the consumption of fossil fuels.

6. In March 2012, President Barack Obama set out to highlight his Administration’s “all-of-the-above energy strategy,” which emphasizes a number of approaches to increasing the United States’ energy security. These approaches included expanding responsible oil and gas development, increasing the fuel economy of vehicles, supporting renewable energy sources, and investing in research and development. To further bolster the point, the White House acknowledged that “there’s no silver bullet for meeting our energy needs . . . .” Office of the Press Secretary, *FACT SHEET: Obama Administration’s All-of-the-Above Approach to American Energy*, WHITE HOUSE (Mar. 21, 2012), [http://www.whitehouse.gov/sites/default/files/email-files/fact\\_sheet\\_obama\\_administration\\_92s\\_all\\_of\\_the\\_above\\_a\\_windows\\_approach\\_to\\_american\\_energy.pdf](http://www.whitehouse.gov/sites/default/files/email-files/fact_sheet_obama_administration_92s_all_of_the_above_a_windows_approach_to_american_energy.pdf).

7. Dr. Steven Chu served as the United States Secretary of Energy from January 21, 2009, to

icy that would aggressively pursue unutilized or undiscovered sources of fossil fuels, an easier, faster, and more intuitive approach would be to continue going about our daily lives while simply using less electricity.<sup>8</sup> Indeed, the ability to ensure the stability of the electric grid in the United States by reducing our demand for energy, rather than increasing our supply, is a crucial factor in expanding the use of minimum energy performance standards.<sup>9</sup> In the context of meeting the forecasted demand for energy, many public utility commissions utilize an integrated resource plan in order to investigate and develop demand-side alternatives to new energy supplies, such as investing in energy efficiency programs to reduce future demand.<sup>10</sup> Accordingly, the starting point for domestic energy policy—particularly in the context of our homes and buildings—should be addressing the domestic population’s demand for energy by increasing our energy efficiency in every facet of life.<sup>11</sup>

At the outset, such a demand-side solution almost sounds too obvious.<sup>12</sup> If manufacturers simply produce and consumers simply buy, rent,

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April 22, 2013, and received the Nobel Prize for Physics in 1997. *Dr. Steven Chu*, U.S. DEP’T OF ENERGY, <http://energy.gov/contributors/dr-steven-chu> (last visited Aug. 26, 2014).

8. Accounting for 32% of the United States’ total greenhouse gas emissions, the electricity sector, involving the generation, transmission, and distribution of electricity, was the largest source of greenhouse gas emissions in the United States as of 2012. *Electricity Sector Emissions*, U.S. ENVTL. PROT. AGENCY, <http://www.epa.gov/climatechange/ghgemissions/sources/electricity.html> (last visited Sept. 8, 2014). In 2012, fossil fuels generated most of the electricity in the United States, with coal, natural gas, and petroleum accounting for 37%, 30%, and roughly 1% of the electricity generated in the United States, respectively. *Electricity in the United States*, U.S. ENERGY INFO. ADMIN., [http://www.eia.gov/energyexplained/index.cfm?page=electricity\\_in\\_the\\_united\\_states](http://www.eia.gov/energyexplained/index.cfm?page=electricity_in_the_united_states) (last visited Aug. 26, 2014). Accordingly, the focus of this piece will be on reducing our consumption of electricity through greater energy efficiency, thereby reducing our reliance on fossil fuels as a fuel source for the consumption of electricity.

9. Noah M. Sachs, *Can We Regulate Our Way to Energy Efficiency? Product Standards as Climate Policy*, 65 VAND. L. REV. 1631, 1633, 1639 (2012).

10. See JOHN SHENOT, STATE & LOCAL ENERGY EFFICIENCY ACTION NETWORK, USING INTEGRATED RESOURCE PLANNING TO ENCOURAGE INVESTMENT IN COST-EFFECTIVE ENERGY EFFICIENCY MEASURES 1–4 (2011), available at [https://www4.eere.energy.gov/seeaction/sites/default/files/pdfs/ratepayer\\_efficiency\\_irpportfoliomangement.pdf](https://www4.eere.energy.gov/seeaction/sites/default/files/pdfs/ratepayer_efficiency_irpportfoliomangement.pdf). An integrated resource plan (“IRP”) is a long-range utility plan for meeting the forecasted demand for energy by utilizing a combination of supply-side resources and demand-side resources. *Id.* at 1. As of 2011, thirty-four states required some type of IRP process for electricity planning. *Id.* at 2. An IRP can be a “powerful impetus” for catalyzing increased energy efficiency when the IRP process is mandatory and overseen by a public utility commission because the IRP may require utilities to consider demand-side resources that would benefit the ratepayers, even if those resources would not benefit the shareholders of the utility. *Id.* at 3–4.

11. While both energy efficiency and energy conservation can reduce greenhouse gas emissions, it is instructive to note at the outset that energy efficiency and energy conservation are two separate ideas. Energy efficiency is essentially “using less energy to provide the same service,” while energy conservation is simply “reducing or going without a service to save energy.” *What’s Energy Efficiency?*, LAWRENCE BERKELEY NAT’L LAB., <http://eetd.lbl.gov/ee/ee-1.html> (last visited Aug. 26, 2014).

12. As we know, often times the solution to a given problem is the most obvious. Consider,

and use more energy efficient appliances, cars, homes, and buildings, then we can immediately begin to reduce our reliance on fossil fuels in hopes of slowing and potentially reversing some of the negative effects of climate change. The reality, however, is that such a course of action—whether brought about with or without government intervention—necessarily requires a fundamental change in human behavior and perception.<sup>13</sup> Understanding that behavior is a crucial step toward designing policies that better address the goals of creating a more energy efficient society in the United States.

Yet, it seems that traditional economic theory often falls just short of providing the best possible understanding of these behaviors. Behavioral economics, which draws on observations from the social sciences, provides us with an invaluable tool by offering comprehensive and instructive insights into how to bring about such sweeping changes in human behavior. With that understanding in our arsenal, we will be in a better position to take advantage of that “fruit that is lying on the ground,”<sup>14</sup> and make the United States more energy efficient.<sup>15</sup> Specifically, behavioral economics can prove to be extremely valuable in designing policies and incentives at the municipal level for building and maintaining more energy efficient homes, offices, and other buildings.<sup>16</sup>

While traditional economics assumes that individuals always behave rationally, behavioral economics instead focuses on the irrational aspect of our decision-making, referred to as “behavioral failures.”<sup>17</sup> Curiously enough, it may actually be true that we are “predictably irra-

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for example, that the Northwest Power and Conservation Council developed an IRP in 2010 for the Bonneville Power Administration and discovered that 85% of its projected growth in demand for the following twenty years could be met through energy efficiency. SHENOT, *supra* note 10, at vii.

13. See CHARLES WEISS & WILLIAM B. BONVILLIAN, *STRUCTURING AN ENERGY TECHNOLOGY REVOLUTION* 28–29 (2009). Charles Weiss and William Bonvillian observed that the “influence of a long-standing economic and policy environment” in the United States has in part “given rise to huge and politically powerful companies” and has “contributed to a political culture that takes it for granted that fossil fuels are the basis of the economy.” *Id.* at 28. Acknowledging the “deeply felt public expectations that cheap and readily available energy is part of the American birthright,” the authors further note that “[t]he result is a technological-economic-political paradigm that is resistant to change.” *Id.* at 28–29.

14. Chu, *supra* note 1. In fact, the fruit may as well be lying on the ground and rolling toward our feet at a considerable speed given that the McKinsey Global Greenhouse Gas Abatement Cost Curve actually suggests that there is a negative cost associated with abating greenhouse gas emissions through energy efficiency in buildings. PER-ANDERS ENKVIST ET AL., MCKINSEY & CO., *IMPACT OF THE FINANCIAL CRISIS ON CARBON ECONOMICS: VERSION 2.1 OF THE GLOBAL GREENHOUSE GAS ABATEMENT COST CURVE* (2010), available at [http://www.mckinsey.com/~media/McKinsey/dotcom/client\\_service/Sustainability/cost%20curve%20PDFs/ImpactFinancialCrisisCarbonEconomicsGHGcostcurveV21.ashx](http://www.mckinsey.com/~media/McKinsey/dotcom/client_service/Sustainability/cost%20curve%20PDFs/ImpactFinancialCrisisCarbonEconomicsGHGcostcurveV21.ashx).

15. See discussion *infra* Part III.

16. See discussion *infra* Part IV.

17. Michael G. Pollitt & Irina Shaorshadze, *The Role of Behavioural Economics in Energy*

tional,” meaning that our irrational behaviors are not random anomalies at all, but that these irrational behaviors are both systematic and predictable.<sup>18</sup> So, if these behavioral failures operate in such a way as to make us act against our own long-term interests,<sup>19</sup> then understanding our behavioral failures should mean that we can predict them. If we can predict these systematic irrationalities, we should be able to design energy efficiency policies that remove these failures from the equation at the outset.

The goal of this article is to understand and analyze, in specific terms, why a better understanding of the relationship between human behavior and traditional economic theory can inform us on how to better design energy efficiency policies at the municipal level. Accordingly, the ultimate goal would be to increase the energy efficiency of our buildings, simultaneously saving individuals money and reducing overall energy consumption in the United States. Part II provides a brief overview of the current state of affairs, both from the perspective of how our consumption of fossil fuels for energy negatively impacts the environment, as well as the potential environmental and economic benefits that we stand to gain from making our buildings more energy efficient. Part III defines and examines the various facets of behavioral economics that play a significant role in addressing how individuals and consumers perceive energy efficiency and how human behavior can often act as a silent barrier to becoming a more energy efficient society. Part IV will provide an overview of current building energy efficiency policies in the United States and will also analyze the current building energy efficiency policies in force at the municipal level throughout four California cities. Part V will address policy prescriptions and provide ideas for designing better, more effective energy efficiency policies for our cities’ buildings throughout the United States.

## II. THE CURRENT STATE OF AFFAIRS

But the essence of the challenge we face is not just to adapt to the changes that have occurred . . . . There’s no way to adapt in the long run to an unrestrained dumping of all this global warming pollution, because the changes, if not confronted and responded to, would threaten [to bring about] the end of civilization itself.<sup>20</sup>

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and *Climate Policy* 2 (ESRC Elec. Policy Research Grp., Working Paper No. 1130, 2011), available at [http://www.eprg.group.cam.ac.uk/wp-content/uploads/2011/12/EPRG1130\\_Main.pdf](http://www.eprg.group.cam.ac.uk/wp-content/uploads/2011/12/EPRG1130_Main.pdf).

18. DAN ARIELY, PREDICTABLY IRRATIONAL: THE HIDDEN FORCES THAT SHAPE OUR DECISIONS, at xx (2008).

19. Pollitt & Shaorshadze, *supra* note 17, at 2.

20. Interview by Patty Kim with Al Gore, Former U.S. Vice President (Nov. 27, 2006), available at [http://news.nationalgeographic.com/news/2006/11/061127-al-gore\\_2.html](http://news.nationalgeographic.com/news/2006/11/061127-al-gore_2.html).

In order to understand why it is necessary to adopt stronger, more informed policies designed to encourage more energy efficient behavior regarding buildings in the United States, it is important to clarify two basic presumptions at the outset. First, we must establish that the negative effects of climate change are, at least in some part, caused by the population's use of and reliance on fossil fuels as an energy source. Second, we must establish that, if we reduce our use of and reliance on fossil fuels as an energy source by creating more energy efficient buildings, we can begin to reduce our reliance on fossil fuels by simply reducing our demand for energy. As a result, we can help curb the attendant negative effects of climate change, and maybe even save ourselves some money in the process.

#### A. *Climate Change—A Brief Snapshot*

According to the Intergovernmental Panel on Climate Change (“IPCC”),<sup>21</sup> “[w]arming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia.”<sup>22</sup> The Supreme Court of the United States has even offered its own opinion on the matter, stating that “the harms associated with climate change are serious and well recognized,”<sup>23</sup> and acknowledging “the enormity of the potential consequences associated with man-made climate change.”<sup>24</sup>

As human activities continue to change the surface and atmospheric composition of the Earth, some of these changes have a direct or indirect impact on the Earth's energy balance, thus driving climate change.<sup>25</sup> The observed atmospheric increase of carbon dioxide<sup>26</sup> indicates that these increases are driven by anthropogenic<sup>27</sup> emissions occurring primarily in

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21. The IPCC, established by the United Nations Environment Programme and the World Meteorological Organization in 1988, is an international body that assesses climate change and provides a scientific perspective on the state of knowledge in climate change and its potential environmental impacts. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, <http://www.ipcc.ch/organization/organization.shtml#UtBChmRDuzk> (last visited Aug. 26, 2014). With 195 current members, the IPCC is an intergovernmental body that is open to all member countries of the United Nations and the World Meteorological Organization. *Id.*

22. IPCC CLIMATE CHANGE 2013, *supra* note 4, at 4.

23. Massachusetts v. E.P.A., 549 U.S. 497, 521 (2007).

24. *Id.* at 525.

25. IPCC CLIMATE CHANGE 2013, *supra* note 4, at 53.

26. Carbon dioxide (chemical formula “CO<sub>2</sub>”) is the primary greenhouse gas emitted through human activities, but the main activity that emits carbon dioxide is the combustion of fossil fuels such as coal, natural gas, and oil for energy and transportation uses. *Carbon Dioxide Emissions*, U.S. ENVTL. PROT. AGENCY, <http://www.epa.gov/climatechange/ghgemissions/gases/co2.html> (last visited Aug. 26, 2014). In 2011, carbon dioxide accounted for roughly 84% of all U.S. greenhouse gas emissions from human activities. *Id.*

27. “Anthropogenic” is defined as, “of, relating to, or resulting from the influence of human beings on nature.” MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY (11th ed. 2003).

industrialized countries north of the Equator.<sup>28</sup> Indeed, the main contributors to the increasing carbon dioxide abundance are fossil fuel combustion and land use change, with evidence indicating that most of the increasing atmospheric burden of carbon dioxide stems from fossil fuel combustion.<sup>29</sup> Furthermore, the emissions from the extraction and use of fossil fuels constitute one of the dominant anthropogenic sources of methane.<sup>30</sup>

It should come as no surprise then that the natural carbon cycle has been disturbed since the beginning of the Industrial Revolution around 1750.<sup>31</sup> This disturbance is a result of the anthropogenic release of carbon dioxide into the atmosphere, occurring almost entirely as a result of fossil fuel combustion and land use change.<sup>32</sup> In response to the increased anthropogenic carbon dioxide in the atmosphere, the oceans have absorbed about 30% of the emitted anthropogenic carbon dioxide, resulting in ocean acidification.<sup>33</sup>

Prior to the beginning of the industrial era, global carbon dioxide concentrations measured approximately 280 ppm,<sup>34</sup> rising to an annual average of 394 ppm in 2012.<sup>35</sup> Given this marked increase, consider, as a matter of degree, that the annual carbon dioxide concentration growth rate was larger during the ten-year period between 1995 and 2005 (1.9 ppm per year) than it had been during the 45-year period between 1960 and 2005 (1.4 ppm per year).<sup>36</sup> The “450 Scenario” illustrates an energy pathway that would set the global energy system on track to have a 50% chance of limiting the long-term increase in average global temperature

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28. IPCC CLIMATE CHANGE 2013, *supra* note 4, at 50.

29. *Id.* at 167.

30. *Id.* at 52.

31. *Id.* at 96.

32. *Id.*

33. *Id.* at 11. “When carbon dioxide (CO<sub>2</sub>) is absorbed by seawater, chemical reactions occur that reduce seawater pH, carbonate ion concentration, and saturation states of biologically important calcium carbonate minerals. These chemical reactions are termed ‘ocean acidification’ or ‘OA’ for short. . . . [C]ontinued ocean acidification is causing many parts of the ocean to become undersaturated with these minerals, which is likely to affect the ability of some organisms to produce and maintain their shells.” *What’s Ocean Acidification?*, NAT’L OCEANIC & ATMOSPHERIC ADMIN., <http://www.pmel.noaa.gov/co2/story/What+is+Ocean+Acidification%3F> (last visited Sept. 8, 2014).

34. “[P]pm (parts per million) . . . is the ratio of the number of gas molecules to the total number of molecules of dry air. For example, 300 ppm means 300 molecules of a gas per million molecules of dry air.” IPCC CLIMATE CHANGE 2013, *supra* note 4, at 11 n.11.

35. U.S. ENVTL. PROT. AGENCY, ATMOSPHERIC CONCENTRATIONS OF GREENHOUSE GASES 2–3 (2013), available at [http://www.epa.gov/climatechange/pdfs/print\\_ghg-concentrations-2013.pdf](http://www.epa.gov/climatechange/pdfs/print_ghg-concentrations-2013.pdf).

36. IPCC, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 2 (Susan Solomon et al. eds., 2007), available at [http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4\\_wg1\\_full\\_report.pdf](http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4_wg1_full_report.pdf).

to two degrees Celsius.<sup>37</sup> That is to say, in order to give ourselves a 50% chance of limiting the long-term increase in the average global temperature to just two degrees Celsius, the concentration of greenhouse gases in the atmosphere around the middle of the century must peak at a level around approximately 450 ppm—the 450 Scenario.<sup>38</sup> Under the 450 Scenario, energy demand would increase by only 14% between 2011 and 2035, and just 0.3% per year after 2020, representing “a massive and extremely challenging change in trajectory.”<sup>39</sup>

Today, generating electricity and heat is the largest source of carbon dioxide emissions, which accounted for 41% of world carbon dioxide emissions in 2012.<sup>40</sup> On a worldwide scale, this sector heavily relies on coal, the most carbon-intensive of the fossil fuels, to generate electricity and heat.<sup>41</sup> In 2012, the United States used coal to generate 37% of the four trillion kilowatt-hours (“kWh”) of electricity generated in the United States,<sup>42</sup> or approximately 1.48 trillion kWh of electricity.<sup>43</sup> Anthracite, a specific type of coal that produces the most energy among different types of coal as it contains the most carbon content,<sup>44</sup> is capable of producing 920 grams of carbon dioxide per kWh of electricity generation (“gCO<sub>2</sub>/kWh”).<sup>45</sup> Luckily, anthracite comprises less than 1% of the world’s coal reserves;<sup>46</sup> however, sub-bituminous coal, accounting for roughly 30% of the world’s reserves,<sup>47</sup> is also capable of producing 920 gCO<sub>2</sub>/kWh.<sup>48</sup> In comparison, natural gas and fuel oil, respectively accounting for 30% and less than 1% of all electricity in the United States in 2012,<sup>49</sup> can produce 400 gCO<sub>2</sub>/kWh and 670 gCO<sub>2</sub>/

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37. INT’L ENERGY AGENCY, WORLD ENERGY OUTLOOK 33, 56 (2013).

38. *Id.* at 37.

39. *Id.* at 56–57.

40. INT’L ENERGY AGENCY, CO<sub>2</sub> EMISSIONS FROM FUEL COMBUSTION: HIGHLIGHTS 9 (2012) [hereinafter CO<sub>2</sub> EMISSIONS FROM FUEL COMBUSTION].

41. *Id.*

42. *Electricity Sector Emissions*, *supra* note 8.

43. As a reference point, the 100 nuclear reactors in the United States produced 789 billion kWh in 2013 alone. See *Nuclear Power in the USA*, WORLD NUCLEAR ASS’N, <http://www.world-nuclear.org/info/Country-Profiles/Countries-T-Z/USA—Nuclear-Power/> (last visited Aug. 26, 2014). Under this assumption, it would have taken 188 nuclear reactors to provide us with the electricity generated by coal in the United States in 2012.

44. WORLD COAL INST., THE COAL RESOURCE: A COMPREHENSIVE OVERVIEW OF COAL 2–3 (2009), available at [http://www.worldcoal.org/bin/pdf/original\\_pdf\\_file/coal\\_resource\\_overview\\_of\\_coal\\_report\(03\\_06\\_2009\).pdf](http://www.worldcoal.org/bin/pdf/original_pdf_file/coal_resource_overview_of_coal_report(03_06_2009).pdf).

45. CO<sub>2</sub> EMISSIONS FROM FUEL COMBUSTION, *supra* note 40, at 41.

46. WORLD COAL INST., *supra* note 44, at 4; *Anthracite: An Increasingly Valuable Commodity*, CORNERSTONE: OFFICIAL J. WORLD COAL INDUSTRY, Summer 2013, at 28, available at [http://www.worldcoal.org/bin/pdf/original\\_pdf\\_file/cornerstone\\_volume\\_1\\_issue\\_2\(09\\_07\\_2013\).pdf](http://www.worldcoal.org/bin/pdf/original_pdf_file/cornerstone_volume_1_issue_2(09_07_2013).pdf).

47. WORLD COAL INST., *supra* note 44, at 4.

48. CO<sub>2</sub> EMISSIONS FROM FUEL COMBUSTION, *supra* note 40, at 41.

49. *Electricity Sector Emissions*, *supra* note 8.

kWh, respectively.<sup>50</sup>

The IPCC reported that numerous long-term changes to the climate have already been observed, including, but not limited to, changes in many extreme weather and climate events, warming of the global troposphere,<sup>51</sup> reduction in the amounts of snow and ice, and rising sea levels.<sup>52</sup> The IPCC states that it is “*virtually certain*”<sup>53</sup> that the upper ocean (0–700 m) warmed from 1971 to 2010.<sup>54</sup> Additionally, it is also “*virtually certain* that global mean sea level rise will continue beyond 2100.”<sup>55</sup> More importantly, the IPCC’s observations indicate significant warming during the first half of the twentieth century, which is *very unlikely* to be due to internal variability alone.<sup>56</sup> It is certain that increasing atmospheric burdens of CO<sub>2</sub> helped result in a further increase in radiative forcing<sup>57</sup> from 2005 to 2011.<sup>58</sup>

Thus, as the challenge of climate change today remains simultaneously a complex scientific and thorny political issue,<sup>59</sup> the IPCC’s findings, at the very least, provide a rather strong and objective scientific basis for the notion that the widespread use of fossil fuels by modern society is partly responsible for the potentially devastating risks to the

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50. CO<sub>2</sub> EMISSIONS FROM FUEL COMBUSTION, *supra* note 40, at 41.

51. See R. M. Harrison, *Chemistry and Climate Change in the Troposphere*, in POLLUTION: CAUSES, EFFECTS, AND CONTROL 194, 194 (4th ed. 2001) (“The atmosphere may conveniently be divided into a number of bands reflective of its temperature structure. . . . The lowest part, typically about 12 km in depth, is termed the troposphere . . . . The troposphere may be considered in two smaller components: the part in contact with the earth’s surface is termed the boundary layer; above it is the free troposphere.”).

52. IPCC CLIMATE CHANGE 2013, *supra* note 4, at 4–5.

53. *Id.* at 4 (“The degree of certainty in key findings in this assessment is based on the author teams’ evaluations of underlying scientific understanding and is expressed as a qualitative level of confidence (from *very low* to *very high*) and, when possible, probabilistically with a quantified likelihood (from *exceptionally unlikely* to *virtually certain*). Confidence in the validity of a finding is based on the type, amount, quality, and consistency of evidence . . . and the degree of agreement.” (emphasis in original)). “[T]he following terms have been used to indicate the assessed likelihood of an outcome or a result: *virtually certain* 99–100% probability, *very likely* 90–100%, *likely* 66–100%, *about as likely as not* 33–66%, *unlikely* 0–33%, *very unlikely* 0–10%, *exceptionally unlikely* 0–1%.” *Id.* at n.2.

54. *Id.* at 8 (emphasis in original).

55. *Id.* at 28 (emphasis in original).

56. *Id.* at 66.

57. “Radiative forcing (RF) is a measure of the net change in the energy balance of the Earth system in response to some external perturbation . . . with positive RF leading to a warming and negative RF to a cooling.” *Id.* at 53. RF is used to quantify the change in the Earth’s energy balance occurring as a result of an externally imposed change. *Id.*

58. *Id.*

59. See, e.g., Joshua Tucker, *The Fundamental \*Political\* Challenge of Climate Change*, WASH. POST (Nov. 4, 2013, 2:07 PM), <http://www.washingtonpost.com/blogs/monkey-cage/wp/2013/11/04/the-fundamental-political-challenge-of-climate-change/> (“Thus[,] we find ourselves in a troubling paradox for proponents of climate change policy: politics and science seem to be aligned in a dangerous way.”).

overall quality and sustainability of our environment,<sup>60</sup> including climate change.<sup>61</sup>

### B. *The Opportunities in Our Buildings*

Utilizing and building more energy efficient appliances, cars, homes, and buildings represents but one of the many avenues that we can explore in the process of reducing the amount of fossil fuels consumed for energy in the United States. By becoming a more energy efficient society, we will still be able to maintain our current lifestyles and productivity, but will actually do so while consuming less energy in our daily lives for the simple reason that we will be making a conscious choice to use our energy more efficiently. Specifically, a shift toward making our homes, offices, and other buildings more energy efficient represents a genuine, tangible opportunity to reduce our energy consumption given the amount of energy that is required to power these structures throughout the United States.

A 2008 study conducted by the National Renewable Energy Laboratory found that buildings consume 40% of the United States' primary energy, including 72% of electricity consumption and 36% of natural

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60. Included among those risks is the potential harm to the global food supply through rising prices and poor crop production. See Justin Gillis, *Climate Change Seen Posing Risk to Food Supplies*, N.Y. TIMES, Nov. 2, 2013, at A1, available at [http://www.nytimes.com/2013/11/02/science/earth/science-panel-warns-of-risks-to-food-supply-from-climate-change.html?\\_r=0](http://www.nytimes.com/2013/11/02/science/earth/science-panel-warns-of-risks-to-food-supply-from-climate-change.html?_r=0).

61. *Contra A Rational Discussion of Climate Change: The Science, the Evidence, the Response, Hearing Before the Subcomm. on Energy & Env't*, 111th Cong. 25 (2010) (statement of Richard S. Lindzen, Alfred P. Sloan Professor of Meteorology, Department of Earth, Atmospheric, and Planetary Science, Massachusetts Institute of Technology), available at <http://www.gpo.gov/fdsys/pkg/CHRG-111hhr62618/pdf/CHRG-111hhr62618.pdf> ("There is no such thing as average temperature for the Earth. There is a greenhouse effect. Nobody is arguing that. That CO<sub>2</sub> is a greenhouse gas is not argued by anyone I know. And that CO<sub>2</sub> is increasing due to man's activities is also widely accepted. To be sure, general agreement hardly guarantees truth . . . . But what is commonly forgotten—and that is crucial to this hearing—is that these facts do not lead to major climate concern per se."); Lianne M. Lefsrud & Renate E. Meyer, *Science or Science Fiction? Professionals' Discursive Construction of Climate Change*, 33 ORG. STUDIES 1477, 1478 (2012), available at <http://oss.sagepub.com/content/33/11/1477.full.pdf+html> ("Indeed, while there is a broad consensus among climate scientists, s[k]epticism regarding anthropogenic climate change remains. The proportion of papers found in the ISI Web of Science database that explicitly endorsed anthropogenic climate change has fallen from 75% (for the period between 1993 and 2003) as of 2004 to 45% from 2004 to 2008, while outright disagreement has risen from 0% to 6%.").

gas consumption.<sup>62</sup> On a global scale, the U.S. buildings sector<sup>63</sup> alone accounted for 7% of the global primary energy consumption in 2010.<sup>64</sup> The buildings sector in the United States actually drives the growth of new power plants, as 87% of the growth in electricity sales between 1985 and 2006 can be attributed to demand from the building sector.<sup>65</sup> In 2005, the total utility bill for energy used by buildings in the United States topped \$369 billion.<sup>66</sup>

From 1985 to 2006, the retail sales of electricity to residential and commercial<sup>67</sup> buildings increased by 1.18 trillion kWh,<sup>68</sup> representing a nearly 80% increase, while the industrial sector demand for electricity increased by a comparatively paltry 165 billion kWh, a relatively mere 20% increase.<sup>69</sup> Thus, of the total increase in retail electricity sales from 1985 to 2008, 87% of that increase can be attributed to the demand from the U.S. buildings sector.<sup>70</sup> Furthermore, the United States Energy Information Administration projects that, between 2011 and 2040, the U.S. commercial sector will account for a 3.1 quadrillion British thermal unit (“BTU”)<sup>71</sup> increase in its total primary energy use.<sup>72</sup>

The idea that the United States can become more energy efficient

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62. ELIZABETH DORIS ET AL., NAT’L RENEWABLE ENERGY LAB., ENERGY EFFICIENCY POLICY IN THE UNITED STATES: OVERVIEW OF TRENDS AT DIFFERENT LEVELS OF GOVERNMENT 5 (2009), available at <http://www.nrel.gov/docs/fy10osti/46532.pdf>. See also U.S. DEP’T OF ENERGY, OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, ENERGY EFFICIENCY TRENDS IN RESIDENTIAL AND COMMERCIAL BUILDINGS (2008) [hereinafter ENERGY EFFICIENCY TRENDS IN RESIDENTIAL AND COMMERCIAL BUILDINGS], available at [http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/bt\\_stateindustry.pdf](http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/bt_stateindustry.pdf).

63. The U.S. buildings sector includes single- and multi-family residences and commercial buildings. U.S. DEP’T OF ENERGY, OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, 2011 BUILDINGS ENERGY DATA BOOK 1-1 (2012) [hereinafter 2011 BUILDINGS ENERGY DATA BOOK], available at [http://buildingsdatabook.eren.doe.gov/docs/DataBooks/2011\\_BEDB.pdf](http://buildingsdatabook.eren.doe.gov/docs/DataBooks/2011_BEDB.pdf).

64. *Id.* at 1-1.

65. DORIS ET AL., *supra* note 62, at 5.

66. ENERGY EFFICIENCY TRENDS IN RESIDENTIAL AND COMMERCIAL BUILDINGS, *supra* note 62, at 4.

67. Commercial buildings have been defined to include offices, stores, restaurants, warehouses, and other buildings used for commercial purposes, as well as government buildings. 2011 BUILDINGS ENERGY DATA BOOK, *supra* note 63, at 1-1.

68. Again, as a reference point, in 2013 alone, the 100 nuclear reactors in the United States produced 789 billion kWh. WORLD NUCLEAR ASS’N, *supra* note 43. Under this assumption, it would take approximately 150 nuclear reactors to produce 1.18 trillion kWh of electricity.

69. ENERGY EFFICIENCY TRENDS IN RESIDENTIAL AND COMMERCIAL BUILDINGS, *supra* note 62, at 10.

70. *Id.*

71. One kWh is equal to approximately 3,412 BTUs. See *Energy Units*, AM. PHYSICAL SOC’Y, <http://www.aps.org/policy/reports/popa-reports/energy/units.cfm> (last visited Sept. 4, 2014) (providing that 1 kWh commonly, although not universally, is equivalent to approximately 3,412 BTUs). Accordingly, 3.1 quadrillion BTUs would equal over 908 billion kWh.

72. JOHN J. CONTI ET AL., U.S. ENERGY INFO. ADMIN., 2013 ANNUAL ENERGY OUTLOOK WITH PROJECTIONS TO 2040, at 60 (2013), available at [http://www.eia.gov/forecasts/aeo/pdf/0383\(2013\).pdf#page66](http://www.eia.gov/forecasts/aeo/pdf/0383(2013).pdf#page66).

while maintaining its current way of life and productivity is buttressed by the United States Energy Information Administration's estimates. Despite a projected 32% increase in the number of homes between 2011 and 2040, the annual energy use per household is estimated to decline from 97.2 million BTUs in 2011 to 75.5 million BTUs in 2040, with improvements in the efficiency of building construction playing a role in this reduction.<sup>73</sup> In the commercial sector, energy consumption for commercial end-uses, including space heating, cooling, and ventilation, is projected to decrease by 0.1% per year from 2011 to 2040, even though commercial floor space is projected to increase 1% annually during the same time frame.<sup>74</sup>

If nothing else, these figures should provide a glimpse of the size and scale of the buildings sector in the United States and, as a result, the almost alarming magnitude of energy required to sustain it. Rather than providing—and please forgive the pun—a dim view of the recent energy consumption levels in the United States, the goal here is merely to illustrate just how our buildings provide both a key opportunity for achieving greater energy efficiency and a necessary starting point for reducing our energy consumption domestically.

#### 1. ENVIRONMENTAL BENEFITS OF ENERGY EFFICIENCY

If the United States were to adopt the 2009 International Energy Conservation Code<sup>75</sup> (“IECC”), as well as the 2012 IECC, both developed by the International Code Council,<sup>76</sup> such measures would save an estimated 250 trillion end-use<sup>77</sup> BTUs<sup>78</sup> annually by 2020 in the residen-

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73. *Id.* at 61.

74. *Id.* at 64.

75. The IECC is a comprehensive energy conservation model code that establishes minimum regulations for energy efficient buildings through the use of prescriptive and performance related provisions. INT'L ENERGY CONSERVATION CODE, at iii (Int'l Code Council 2009), available at <https://law.resource.org/pub/us/code/ibr/icc.iecc.2009.pdf>. The IECC addresses the design of energy efficient buildings and the installation of energy efficient building systems by utilizing model code regulations resulting in optimal utilization of fossil fuels and finite resources. *Id.*

76. The International Code Council utilizes a consensus-based, private sector code development process to promulgate a new edition of the IECC every three years. *Id.* For more information on the International Code Council, see *About ICC*, INT'L CODE COUNCIL, <http://www.iccsafe.org/AboutICC/Pages/default.aspx> (last visited Aug. 28, 2014).

77. Regarding the generation of power, Amory Lovins, Co-Founder and Chief Scientist of the Rocky Mountain Institute, has stated that a kilowatt saved downstream at an electrical outlet actually saves up to ten kilowatts upstream at the generating station due to the “unavoidable energy loss” associated with the production and transmission of electricity. Sachs, *supra* note 9, at 1639–40. For more information on the Rocky Mountain Institute, see *ROCKY MOUNTAIN INST.*, <http://www.rmi.org/> (last visited Aug. 28, 2014).

78. See *supra* note 71. Under the assumption that one kWh is equal to approximately 3,412 BTUs, 250 trillion BTUs would equal over 73.2 billion kWh.

tial sector alone.<sup>79</sup> The commercial sector presents a similar opportunity with the possibility of saving approximately 270 trillion end-use BTUs annually by 2020.<sup>80</sup> If executed at scale, a holistic approach to energy efficiency delivered across more than 100 million buildings and billions of devices could potentially abate 1.1 gigatons of greenhouse gases<sup>81</sup> annually.<sup>82</sup>

Beyond producing harmful emissions and exacerbating climate change, the world's reliance on fossil fuels also results in negative costs to sustainable development, including impacts to human health, energy security, and global and national economies.<sup>83</sup> The reality is that essentially every step in the energy cycle exacts environmental and human costs, particularly the extraction of raw materials, land utilization, transportation, equipment and infrastructure manufacturing, energy conversion, and waste management.<sup>84</sup> Coal mining produces multiple adverse effects on human health because surface and strip mining can pollute surface and groundwater with acid mine drainage and toxic substances, killing fish and wildlife as well.<sup>85</sup> Coal-fired electric power plants produce a number of carcinogens such as mercury, lead, and dioxins, in addition to releasing carbon dioxide.<sup>86</sup> Exposure to arsenic, a known human carcinogen posing serious health effects, can also occur due to its presence in industrial processes such as petroleum refining and semiconductor manufacturing.<sup>87</sup>

Similarly, oil exploration and drilling has the potential to create serious health and environmental problems, including habitat disruption and the loss of wilderness and other natural areas.<sup>88</sup> Estimates indicate that almost a billion gallons of oil are spilled into oceans and waterways

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79. HANNAH CHOI GRANADE ET AL., MCKINSEY & CO., UNLOCKING ENERGY EFFICIENCY IN THE U.S. ECONOMY (2009), available at [http://www.mckinsey.com/client\\_service/electric\\_power\\_and\\_natural\\_gas/latest\\_thinking/unlocking\\_energy\\_efficiency\\_in\\_the\\_us\\_economy](http://www.mckinsey.com/client_service/electric_power_and_natural_gas/latest_thinking/unlocking_energy_efficiency_in_the_us_economy).

80. DORIS ET AL., *supra* note 62, at 10.

81. A "gigaton" is "a unit of weight equivalent to one billion metric tons or 2.2 trillion pounds." GRANADE ET AL., *supra* note 79, at 112. Considering that 2.13 gigatons of carbon translate to 1 ppm per volume of atmosphere carbon dioxide, an annual abatement of 1.1 gigatons of carbon would equal an approximate annual reduction of 1.94 ppm per volume of atmosphere carbon dioxide. *Conversion Tables*, CARBON DIOXIDE INFO. ANALYSIS CTR., <http://cdiac.ornl.gov/pns/convert.html#3> (last modified Sept. 26, 2012) (internal citations omitted).

82. GRANADE ET AL., *supra* note 79, at iii.

83. George (Rock) Pring et al., *The Impact of Energy on Health, Environment, and Sustainable Development: The TANSTAAFL Problem*, in BEYOND THE CARBON ECONOMY: ENERGY LAW IN TRANSITION 13, 13 (Donald N. Zillman et al. eds., 2008).

84. *Id.* at 15.

85. *Id.* at 19.

86. *Id.* at 19–20.

87. ROBERT V. PERCIVAL ET AL., ENVIRONMENTAL REGULATION: LAW, SCIENCE, AND POLICY 284 (7th ed. 2013).

88. Pring et al., *supra* note 83, at 20–21.

every year.<sup>89</sup> British Petroleum's Deepwater Horizon oil spill in 2010 was responsible for discharging approximately 4.1 million barrels of oil into the Gulf of Mexico, with recent studies indicating that tuna embryos exposed to the crude oil are developing heart and other deformities, killing and shortening the lives of developing fish.<sup>90</sup> The scientists conducting the study emphasized that the discovery of petroleum's "cardio-toxic impact on vertebrate hearts" would most likely apply to humans as well, whose heart development is very similar to that of large predator fish such as tuna, swordfish, and marlin.<sup>91</sup>

The negative environmental impacts of natural gas are similar to those of oil in terms of the exploration, drilling, refining, storage, and transportation phases.<sup>92</sup> As shale gas is typically found in dense, low-permeability rock, drillers must use a mixture of water, sand, and a variety of chemicals to open up fissures in the rock, allowing the natural gas to escape.<sup>93</sup> This process, known as hydraulic fracturing, may utilize chemicals such as boric acid, sodium tetraborate decahydrate, ethylene glycol, and monoethylamine, which are hazardous in their undiluted forms and can cause kidney, liver, heart, blood, and brain damage upon prolonged or repeated exposure.<sup>94</sup> If that were not enough, hydraulic fracturing can lead to the contamination of tap water, farmland, and forests, and can possibly even cause earthquakes.<sup>95</sup>

## 2. ECONOMIC BENEFITS OF ENERGY EFFICIENCY

More energy efficient buildings are not only beneficial to the environment, but can also provide tangible economic benefits. Office buildings with a "green rating"<sup>96</sup> command rental rates that are approximately 3% higher per square foot than otherwise identical buildings, while the selling prices of these green buildings are higher by approximately

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89. *Id.* at 21.

90. Michael Wines, *Fish Embryos Exposed to Oil from BP Spill Develop Deformities, a Study Finds*, N.Y. TIMES, Mar. 25, 2014, at A12, available at [http://www.nytimes.com/2014/03/25/us/fish-embryos-exposed-to-oil-from-bp-spill-develop-deformities-a-study-finds.html?\\_r=0](http://www.nytimes.com/2014/03/25/us/fish-embryos-exposed-to-oil-from-bp-spill-develop-deformities-a-study-finds.html?_r=0).

91. *Id.*

92. Pring et al., *supra* note 83, at 22.

93. FRANK R. SPELLMAN, ENVIRONMENTAL IMPACTS OF HYDRAULIC FRACTURING 2-3 (2013).

94. *Id.* at 133-34.

95. *Id.* at 3-4.

96. Piet Eichholtz et al., *Doing Well By Doing Good? Green Office Buildings* 4, 8-11 (Ctr. for the Study of Energy Mkts., Working Paper No. 192, 2009), available at <http://www.ucei.berkeley.edu/PDF/csemwp192.pdf> (describing the sample of buildings for this study as "a national sample of U.S. office buildings which have been evaluated for energy efficiency by one of two leading agencies," specifically the ENERGY STAR program through the Environmental Protection Agency and the LEED rating system through the United States Green Building Council). See description of the ENERGY STAR program *infra* note 100. See overview of the LEED rating system *infra* Part IV.A.

16%.<sup>97</sup> Moreover, the incremental value of such a building is estimated to be roughly \$5.5 million more than the value of a comparable unrated building.<sup>98</sup> With one dollar of energy savings yielding approximately \$18.32 in increased market value for these buildings, the evidence indeed suggests that the increment to the market value of a building certified as “green” reflects more than merely an intangible labeling effect.<sup>99</sup>

As of 2008, some 840,000 ENERGY STAR<sup>100</sup>-qualified homes constructed in the United States saved consumers nearly \$200 million annually in utility bills.<sup>101</sup> The Weatherization Assistance Program,<sup>102</sup> which fully funds and deploys energy-saving measures in low-income houses, is responsible for weatherizing over 6.2 million homes across the United States over the past thirty-two years, typically reducing heating and cooling bills by 32%.<sup>103</sup> A 2012 report found that enrolling the entire U.S. multi-family housing sector in a utility program, thereby achieving energy efficiency improvements of 15% for electricity and 30% for natural gas, would create savings of over \$3.3 billion in annual utility bills for building owners and tenants.<sup>104</sup>

All told, the gross energy savings that can be achieved through greater energy efficiency could potentially offer \$1.2 trillion in present value to the U.S. economy.<sup>105</sup> While reducing the amount of energy we use is but one clear-cut way to save money, the truth remains that, in one way or another, “energy efficiency means money back in your pocket.”<sup>106</sup>

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97. *Id.* at 3.

98. *Id.* at 23.

99. *Id.* at 4, 31.

100. ENERGY STAR is a voluntary program established by the U.S. Environmental Protection Agency that helps businesses and individuals save money and protect the climate through superior energy efficiency. *See About, ENERGY STAR*, [http://www.energystar.gov/index.cfm?c=about.ab\\_index](http://www.energystar.gov/index.cfm?c=about.ab_index) (last visited Aug. 28, 2014).

101. ENERGY EFFICIENCY TRENDS IN RESIDENTIAL AND COMMERCIAL BUILDINGS, *supra* note 62, at 18 (citing *ENERGY STAR® Overview of 2007 Achievements*, U.S. ENVTL. PROT. AGENCY, <http://www.epa.gov/appdstar/pdf/2007overview.pdf> (last visited Sept. 15, 2014)).

102. *See* discussion *infra* Part IV.A.

103. GRANADE ET AL., *supra* note 79, at 40–41.

104. ANDREA KRUKOWSKI & ANDREW C. BURR, INST. FOR MKT. TRANSFORMATION, ENERGY TRANSPARENCY IN THE MULTIFAMILY BUILDING SECTOR: ASSESSING ENERGY BENCHMARKING AND DISCLOSURE POLICIES 10 (2012), available at [http://www.imt.org/uploads/resources/files/Energy\\_Trans\\_MFSector\\_IMT\\_Final.pdf](http://www.imt.org/uploads/resources/files/Energy_Trans_MFSector_IMT_Final.pdf).

105. GRANADE ET AL., *supra* note 79, at iii.

106. Chu, *supra* note 1.

### III. FOUNDATIONS OF BEHAVIORAL ECONOMICS IN ENERGY EFFICIENCY

So, the question is, how can we get the people in this room, and across the globe, to start paying attention to the energy we're using and start wasting less of it? . . . Well, if something is inconvenient, even if we believe in it, moral suasion, financial incentives, don't do much to move us—but social pressure, that's powerful stuff, and harnessed correctly, it can be a powerful force for good. In fact, it already is.<sup>107</sup>

We have already seen that the economic and environmental advantages of energy efficiency stand to benefit the United States in a quantifiably extraordinary way. This begs the question: If the incentives to becoming more energy efficient are so apparent and within our grasp, what is keeping us from pursuing any and all avenues toward becoming more energy efficient?

Energy consumption and energy efficient investment are inevitably intertwined with consumer decision-making and behavior.<sup>108</sup> For this reason, any conversation regarding which policies best encourage the United States population to become more energy efficient should begin with an understanding of certain fundamental aspects of human behavior. Specifically, we must focus our attention on those behaviors that inform the decision-making processes we unconsciously experience every minute of every day. It is also for this reason that any potential solutions must go beyond merely creating financial incentives, such as subsidies or tax credits,<sup>109</sup> and beyond alternative routes, such as passively educating consumers on how much money can realistically be saved through greater energy efficiency.<sup>110</sup> As such, behavioral analysis is particularly promising in this area of law due to the fact that non-market behavior is frequently involved.<sup>111</sup>

Considering the fact that people tend to use less energy when they

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107. Alex Laskey, How Behavioral Science Can Lower Your Energy Bill, Address at TED talks (Feb. 2013), *available at* [http://www.ted.com/talks/alex\\_laskey\\_how\\_behavioral\\_science\\_can\\_lower\\_your\\_energy\\_bill](http://www.ted.com/talks/alex_laskey_how_behavioral_science_can_lower_your_energy_bill).

108. Pollitt & Shaorshadze, *supra* note 17, at 2.

109. *Id.* at 3 (“Traditionally, economics has focused on how changes in prices affect behaviour. Research in behavioural economics and psychology has demonstrated that non-pecuniary interventions compare favourably to monetary interventions in changing consumer behavior.”). For a detailed discussion of how better tax policy can lead us to a cleaner energy future in the context of providing greater financing opportunities for renewable energy technologies, see Felix Mormann, *Beyond Tax Credits: Smarter Tax Policy for a Cleaner, More Democratic Energy Future*, 31 *YALE J. ON REG.* 303 (2014).

110. Pollitt & Shaorshadze, *supra* note 17, at 13 (“[B]ehavioural economics finds that not only is the information important, but also the way it is presented or framed.”).

111. Christine Jolls, Cass R. Sunstein & Richard Thaler, *A Behavioral Approach to Law and Economics*, 50 *STAN. L. REV.* 1471, 1473 (1998).

learn that they actually use more energy than others who are similarly situated,<sup>112</sup> an understanding of behavioral economics can be a valuable tool in designing the best possible policies for increasing the energy efficiency of buildings in the United States. Accordingly, as compared to traditional economic analysis, behavioral economics provides us with the unique opportunity to model and predict human behavior relevant to the law—but with more accurate assumptions about human behavior and more accurate predictions and prescriptions about the law.<sup>113</sup>

### A. *Behavioral Economics—Defined*

If a conveniently succinct and thorough explanation of behavioral economics happens to exist, it is simply that behavioral economics “uses insights from psychology to increase the explanatory power of economics.”<sup>114</sup> While neoclassical economic theory assumes that agents will maximize their expected utility,<sup>115</sup> experimental settings and other empirical observations show that behavior often deviates from what traditional economic models would predict.<sup>116</sup> Thus, consider again the fact that humans are not just irrational, but that they are “predictably irrational” to the point that our irrational behaviors are not random anomalies at all, but that these irrational behaviors are both systematic and predictable.<sup>117</sup>

This perspective can be a valuable lens through which we can better inform ourselves in order to design more effective policies by taking into account how individuals evaluate options, make decisions, and ultimately alter their own behavior. If reducing the amount of energy we consume requires some combination of making an upfront investment in energy efficiency and altering our normal behaviors and decision-making processes, understanding key aspects of human behavior should be of the utmost importance when designing policies aimed toward making our buildings more energy efficient and reducing our overall energy consumption.

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112. Cass R. Sunstein, *Empirically Informed Regulation*, 78 U. CHI. L. REV. 1349, 1408 (2011); see also Pollitt & Shaorshadze, *supra* note 17, at 12 (describing experiments in which experimenters left door hangers on 271 homes in San Marcos, California, containing energy conservation messages; the door hangers that compared a given household’s energy demand to that of their neighbors resulted in 10% more reduction in energy demand than the door hangers containing tips on conserving energy).

113. Jolls, Sunstein & Thaler, *supra* note 111, at 1474.

114. Pollitt & Shaorshadze, *supra* note 17, at 2.

115. *Id.*

116. *Id.*

117. ARIELY, *supra* note 18, at xx.

### B. Behavioral Economics—Applied

According to the traditional economist's interpretation of energy efficiency, an energy efficient measure should be installed or a product should be purchased if the present cost of that particular activity is less than the discounted present value of the costs saved through reduced energy use.<sup>118</sup> Consider, however, the previously quoted statistic that the gross energy savings from greater energy efficiency could total approximately \$1.2 trillion in present value<sup>119</sup> to the United States economy.<sup>120</sup> Attaining those savings would require an initial upfront investment of roughly \$520 billion, excluding program costs<sup>121</sup> such as administration costs, incentives paid to program administrators, costs or benefits of other resources, and non-resource costs or benefits.<sup>122</sup>

Thus, the net present value ("NPV") of this potential investment would more realistically be somewhere in the area of \$680 billion.<sup>123</sup> To anyone who has ever earned 3 to 4% on a certificate of deposit account—and thought that was a phenomenal deal—the thought of foregoing a potential 30.8% rate of return on such an investment seems almost unthinkable. Ironically enough, the manner in which individuals evaluate their options and process that information to reach an ultimate decision helps explain some of the core reasons why we do not routinely pursue such lucrative and beneficial investments.

#### 1. THE ENDOWMENT EFFECT

Initially, it is important to note that traditional economic theory assumes that individuals, while being either risk averse or risk neutral, will still place an equal value on losses and gains of the same amount.<sup>124</sup> Intuitively, this seems like a reasonable conclusion. If the respective amounts of the gain and the loss were exactly the same, then a rational

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118. Brandon Hofmeister, *Bridging the Gap: Using Social Psychology to Design Market Interventions to Overcome the Energy Efficiency Gap in Residential Energy Markets*, 19 SOUTHEASTERN ENVTL. L.J. 1, 12 (2010).

119. See *supra* note 105 and accompanying text. See GRANADE ET AL., *supra* note 79, at v ("In modeling the national potential for greater energy efficiency, we focused our analysis on identifying what we call the 'NPV-positive' potential for energy efficiency. We defined 'NPV-positive' to include direct energy, operating, and maintenance cost savings over the equipment's useful life, net of equipment and installation costs, regardless of who invests in the efficiency measure or receives the benefits."); see also *id.* at 2 n.1 ("By 'NPV-positive' we mean the present value of energy, operation, and maintenance cost savings that accrue over the life time of the measure are equal to or greater than the upfront investment to deploy that measure when discounted at an appropriate discount rate.").

120. *Id.* at iii.

121. *Id.* at vii.

122. *Id.* at 3 n.3.

123. *Id.* at n.9.

124. Pollitt & Shaorshadze, *supra* note 17, at 5.

individual would have no problem viewing the gains and losses as having equal value. Yet, in reality, because individuals have a tendency to weigh losses far more heavily than they weigh their gains, framing consequences in terms of losses instead of gains is likely to be a more effective approach in changing behavior.<sup>125</sup> This tendency of humans to value losses more than gains is known as loss aversion.<sup>126</sup> One key example of the principle of loss aversion is the endowment effect, in which humans value the things that they already own much more than those things that they do not own.<sup>127</sup>

Various experiments have studied and analyzed just how the endowment effect occurs in everyday situations.<sup>128</sup> Such experiments illustrate, in practical terms, how the endowment effect refers to that extra value that individuals tend to attach to the goods they already own or the services they already receive.<sup>129</sup> The endowment point essentially serves as a reference point for individuals; they tend to experience a “kink in the valuation around this point.”<sup>130</sup> In this regard, it is understandable that those energy efficiency measures that actually generate enough savings to offset their incremental costs still represent approximately 50% of the total energy efficiency opportunity in the residential sector and roughly 70% in the commercial sector in the United States.<sup>131</sup> At a higher level, when we consider that the residential sector accounts for 35% of the end-use energy<sup>132</sup> efficiency potential, while the commercial sector accounts for 25%, understanding how such a barrier affects actors within these sectors is of paramount importance.

The endowment effect can also be viewed as a status quo bias, or a

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125. Jolls, Sunstein & Thaler, *supra* note 111, at 1536.

126. Hofmeister, *supra* note 118, at 20.

127. *Id.*; see also Daniel Kahneman et al., *Experimental Tests of the Endowment Effect and the Coase Theorem*, 98 J. POL. ECON. 1325, 1348 (1990) (“[T]he value that an individual assigns to such objects as mugs, pens, binoculars, and chocolate bars appears to increase substantially as soon as that individual is given the object.”).

128. See, e.g., Jolls, Sunstein & Thaler, *supra* note 111, at 1483–84 (discussing an experiment in which students who were given mugs asked more than twice as much to sell that mug as those who did not receive a mug were willing to pay); see also ARIELY, *supra* note 18, at 130–33 (discussing how students at Duke University who received a ticket to the NCAA Men’s Final Four basketball tournament through the university’s lottery system were willing to sell their tickets for about \$2,400 per ticket, while those who did not receive a ticket through the lottery system were willing to pay approximately \$170 for one).

129. Pollitt & Shaorshadze, *supra* note 17, at 5.

130. *Id.*

131. GRANADE ET AL., *supra* note 79, at 3.

132. *Id.* at iv n.4 (“End-use, or ‘site,’ energy refers to energy consumed in industrial, business, and residential settings, e.g., providing light, heating and cooling spaces, running motors and electronic devices, and powering industrial processes. By contrast, primary, or ‘source,’ energy represents energy in the form it is first accounted . . . before transformation to secondary or tertiary forms (e.g., electricity).”).

situation where individuals seek to maintain the then-existing status quo rather than changing their behavior or decision-making patterns.<sup>133</sup> As such, the endowment effect can even extend beyond goods, reaching our individual ideas and behavioral patterns.<sup>134</sup> This explains why people can be reluctant to give up their established beliefs, even when confronted with new evidence contrary to those beliefs.<sup>135</sup>

Fortunately, this endowment effect cycle can be broken, and agents can learn to let go of their attachments in order to minimize the endowment effect.<sup>136</sup> For example, in the context of the stock market, more experienced and more informed traders are less susceptible to the endowment effect than less informed, newer traders because more experienced traders are better able to buy and sell without getting attached to their asset portfolios.<sup>137</sup> The fact that we can overcome this cognitive barrier and become less susceptible to the endowment effect is a particularly fortunate prospect given the fact that it is so difficult to dislodge our established beliefs and attachments.<sup>138</sup>

If we accept this idea that decision-makers are more influenced by losses than they are by gains, then the most effective message for enticing consumers to adopt more energy efficient measures would be to stress the idea that money is being wasted or lost by missing an opportunity to save energy, rather than by simply endorsing energy-saving behavior and emphasizing the potential gains that lie therein.<sup>139</sup> Most likely, the force of such messages will have to be commensurate with the relative strength of individuals' established beliefs and behavioral patterns as well.

## 2. SALIENCE OF INFORMATION, THE REBOUND EFFECT, AND THE POWER OF DISCLOSURE

Consider, for a moment, just how often the average person stops to think about the amount of energy his or her home consumes, or how many times during a week the average office worker shuts down his or

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133. JOHN MALCOLM DOWLING & YAP CHIN-FANG, MODERN DEVELOPMENTS IN BEHAVIORAL ECONOMICS 63 (2007).

134. *Id.* at 66; *see also* ARIELY, *supra* note 18, at 137–38 (“Ownership is not limited to material things. It can also apply to points of view. Once we take ownership of an idea . . . what do we do? We love it perhaps more than we should. We prize it more than it is worth. And most frequently, we have trouble letting go of it because we can’t stand the idea of its loss.”).

135. DOWLING & CHIN-FANG, *supra* note 133, at 66.

136. *Id.*

137. *Id.*; ARIELY, *supra* note 18, at 138 (“There is no known cure for the ills of ownership. As Adam Smith said, it is woven into our lives. But being aware of it might help.”).

138. DOWLING & CHIN-FANG, *supra* note 133, at 95.

139. Pollitt & Shaorshadze, *supra* note 17, at 13; Hofmeister, *supra* note 118, at 75 (“Framing energy efficiency as avoiding losses as opposed to producing gains is likely more effective.”).

her computer before leaving the office for the evening, or even over the weekend. In the former hypothetical, energy costs are typically salient—i.e., noticeable or important—only once a month to consumers, typically when they receive the energy bill for the month.<sup>140</sup> In the latter hypothetical, because each individual office worker will presumably never see or have access to the electricity bill for the building in which his or her office is located, those energy costs are virtually unknown. As we know too well, “out of sight” inevitably means “out of mind.”<sup>141</sup>

A lack of salience can be a rather serious type of market failure, one that has the potential to produce individual and social harm.<sup>142</sup> This stems from the idea that attention is a scarce resource, and that individuals typically can only pay attention to a limited number of things such that when some things are not salient, we ignore them, even if it is to our detriment to do so.<sup>143</sup> In the context of energy efficiency, a prime example of the cognitive barrier of saliency exists in the context of investing in wall insulation.<sup>144</sup> We cannot see the insulation within the walls of our homes, and the value of wall insulation actually does not even extend beyond the economic benefits of reduced energy usage and an increase in the value of our homes,<sup>145</sup> all of which hardly seems apparent to the average consumer on a regular basis.

The benefits of investing in home insulation—or, conversely, the costs of not investing in home insulation—are much less salient than purchase prices, constituting “shrouded attributes” to which consumers typically do not pay much attention.<sup>146</sup> A lack of attention to energy costs carries significant implications for how to better design regulatory policy, including potentially adopting measures for the increased provi-

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140. Sunstein, *supra* note 112, at 1406–07.

141. See, e.g., Stephen Spiller, *Out of Sight, Out of Mind*, PSYCHOLOGY TODAY (Aug. 6, 2012), <http://www.psychologytoday.com/blog/costly-choices/201208/out-sight-out-mind> (“[S]ome people are concerned that they don’t pay enough attention to the tradeoffs they face.”).

142. Cass R. Sunstein, *The Storrs Lectures: Behavioral Economics and Paternalism*, 122 YALE L.J. 1826, 1846 (2013) [hereinafter *The Storrs Lectures*].

143. *Id.*; see also James R. Bettman et al., *Constructive Consumer Choice Processes*, 25 J. CONSUMER RES. 187, 193 (1998) (“[T]he fact that consumers have limited processing capacity means that they generally cannot process all of the available information in a particular situation. Hence, selectivity is necessary, and which information is selected for processing can have a major impact on choice. . . . [I]t is critical to understand the determinants of the focus of attention, since many contingent choice effects are brought about by making salient different aspects of the choice environment.”); CHRISTOPHER CHABRIS & DANIEL SIMONS, *THE INVISIBLE GORILLA: AND OTHER WAYS OUR INTUITIONS DECEIVE US* 7 (2010) (describing “the powerful and pervasive influence of the *illusion of attention*” in which “we know how vividly we see some aspects of our world, but we are completely unaware of those aspects of our world that fall outside of that current focus of attention”).

144. Hofmeister, *supra* note 118, at 53.

145. *Id.*

146. Sunstein, *supra* note 112, at 1355.

sion of information regarding energy usage.<sup>147</sup>

Yet, we must be aware of the anomalous result that may occur when we actually adopt more energy efficient measures in our lives. If we do not regularly see the benefits of our energy efficient actions, it becomes much more difficult to realize the rewards of our efforts. While we are currently able to estimate the potential savings from improved energy efficiency measures through basic engineering models, the actual energy savings generally fall short of these engineering estimates.<sup>148</sup> One possible explanation for this result is that improvements in energy efficiency may actually encourage greater energy use, leading to a behavioral response known as the energy efficiency “rebound effect.”<sup>149</sup>

At first glance, this seems to make intuitive sense. For example, we have all probably fallen victim to the pattern of exercising during the day, only to yield to the temptation of helping ourselves to an extra serving of dinner or dessert, telling ourselves that we really deserve it after expending that extra energy during our morning jog or after-work gym session. In the end, we likely end up consuming more calories than we expended, thereby experiencing self-defeating behavior despite our well-intentioned efforts to the contrary.

Similarly, by utilizing more energy efficient light bulbs or other appliances in our homes, or by working in a highly energy efficient building, we may actually be more tempted to leave the lights on a bit longer or to be more careless about our energy consumption habits around the office. Yet, in both instances, such an anomaly may be avoided by actually seeing the difference between the number of calories we expend and consume in one day, as well as the amount of energy we actually save through energy efficient behavior. In this sense, not only will we know that our efforts are paying off, but we will also be able to reap the benefits of the sacrifices we have sowed.

It should be noted that the evidence does not support the idea that energy efficiency improvements routinely lead to an economy-wide increase in energy consumption.<sup>150</sup> Nevertheless, the rebound effect does—at the very least—strengthen the idea that making information about our energy consumption more salient and readily available is vital to ensuring that we systematically reduce our energy consumption on a

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147. *Id.*

148. STEVEN SORREL, UK ENERGY RESEARCH CTR., *THE REBOUND EFFECT: AN ASSESSMENT OF THE EVIDENCE FOR ECONOMY-WIDE ENERGY SAVINGS FROM IMPROVED ENERGY EFFICIENCY*, at v (2007), available at <http://www.ukerc.ac.uk/Downloads/PDF/07/0710ReboundEffect/0710ReboundEffectReport.pdf>; see also GRANADE ET AL., *supra* note 79, at 33 (“Rebound effects explain why actual energy savings fall short of expected savings.”).

149. SORREL, *supra* note 148, at v.

150. *Id.* at 83.

regular basis—which, after all, is the ultimate goal. Let us suppose that this tendency for energy efficient measures to produce a false sense of security does exist, whereby we actually consume more energy despite our investment in energy efficiency. This alone does not mean that we should completely avoid energy efficiency at the risk of encountering the catch-22 type of situation exemplified by the rebound effect. Instead, the solution should be in the form of making accurate energy consumption information more salient and readily available to decision-makers at every level so that we can avoid the rebound effect altogether.

It has already been noted that if people learn that they are using more energy than similarly situated others, their energy use may decline as a result of the pressures exerted by others' social practices and norms.<sup>151</sup> Like well-designed disclosure policies that attempt to clearly convey key information when necessary,<sup>152</sup> we should be able to completely avoid the rebound effect by ensuring that consumers have easy access to energy consumption information and data on a more regular basis. Similarly, building owners, tenants, and homeowners can avoid the rebound effect by having better access to how much energy or money they are saving instead of simply writing a check each month for that particular utilities bill. For residential consumers, this could be achieved by simply requiring that all utility companies include the previous month's payment on each monthly bill, a comparison between the current and previous month's energy costs, and a "year-to-date" illustration of how energy costs fluctuate throughout the months of the year.

Making such information more salient via effective disclosure and benchmarking policies<sup>153</sup> would likely go a long way toward making people more aware of their energy consumption habits. For example, in the multi-family housing sector, many multi-family building owners and operators have never had to benchmark the energy performance of their buildings, preventing property markets from valuing energy efficiency and severely undermining public and private efforts to increase the energy efficiency of multi-family housing buildings.<sup>154</sup> Accordingly, benchmarking and disclosure requirements constitute market-based policy tools that can overcome the informational gaps responsible for limiting energy efficiency awareness and investment.<sup>155</sup>

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151. Sunstein, *supra* note 112, at 1408.

152. *Id.* at 1417.

153. The process of comparatively assessing the energy performance of a property is known as benchmarking, while a requirement to make energy performance metrics available to the marketplace is known as disclosure. KRUKOWSKI & BURR, *supra* note 104, at 2.

154. *Id.* at 1.

155. *Id.* at 2.

### 3. CAPITAL CONSTRAINTS AND DISCOUNT RATES

A discussion regarding a push for more energy efficient measures or altering our behaviors to become more energy efficient would not be complete without addressing one crucial, yet unfortunately universal, truth: Becoming more energy efficient involves costs—and a lot of them.

To provide an illustration of just how individuals view the costs associated with energy efficiency, consider how 50% of consumers looking to purchase a new refrigerator are not willing to pay \$40 more upfront for a refrigerator that would actually generate \$22 in savings per year on their energy bills.<sup>156</sup> Most consumers either have better uses at that time for the \$40, or just do not think about what \$22 next year means.<sup>157</sup> Economists use a discount rate to quantify this type of behavior, where the discount rate is a percentage by which tomorrow's dollars are converted into today's dollars, meaning that the higher the discount rate, the less the future dollars are worth.<sup>158</sup>

Individuals tend to exhibit a high discount rate for future cost savings, but a small discount rate for any outlay of large, initial investments.<sup>159</sup> With energy efficiency, this poses a significant problem because “100% of the cost of efficiency is paid before any savings are realized.”<sup>160</sup> To compound this problem, the benefits of energy efficiency are stretched out over the next several years following the initial investment in energy efficiency.<sup>161</sup> So, in our refrigerator example above, even though much more than \$40 will be saved over the lifetime of the refrigerator, it is rather clear why individuals may not be jumping at the chance to wait almost two years before their extra \$40 investment in purchasing a more energy efficient refrigerator pays off.

To put this into the context of energy efficiency on the national scale, consider again that the gross energy savings from greater energy efficiency could total approximately \$1.2 trillion in present value to the U.S. economy<sup>162</sup> but would require an initial upfront investment of almost \$520 billion.<sup>163</sup> The reason why every individual is not pursuing such measures likely has to do with the fact that the initial upfront

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156. James Mandel, *Want Solar on My Roof? Go Ahead and Pay Me for It. Seriously. Here's How.*, ROCKY MOUNTAIN INST. (Aug. 21, 2013), [http://blog.rmi.org/blog\\_2013\\_08\\_21\\_want\\_solar\\_on\\_my\\_roof\\_pay\\_me\\_for\\_it](http://blog.rmi.org/blog_2013_08_21_want_solar_on_my_roof_pay_me_for_it).

157. *Id.*

158. *Id.*

159. Pollitt & Shaorshadze, *supra* note 17, at 14.

160. PETER FOX-PENNER, SMART POWER 143 (2010).

161. *Id.* at 140.

162. GRANADE ET AL., *supra* note 79, at iii.

163. *Id.* at vii.

investment, which will generally lead to greater energy savings and a relatively attractive return on that investment, is simply valued to be much greater at the present moment than the savings that could potentially be achieved at some point in the future.

Thus, it is apparent that where immediate costs and long-term benefits exist, as is typically true for investing in energy efficiency, our desire to avoid the immediate loss stemming from an upfront initial investment will result in an overall suboptimal investment in energy efficiency.<sup>164</sup> Adding to this problem is the fact that residential customers typically expect a two to three year payback period for household investments in energy efficiency,<sup>165</sup> while commercial customers typically expect an average payback period of 3.6 years.<sup>166</sup> Again, going back to the refrigerator example, even when the initial extra \$40 for a more energy efficient refrigerator might well be recouped within two years, for roughly half of the consumers who may be in the market for a new household refrigerator, the potential future recoup is still just not enough to justify the extra initial investment.

Consider for a moment how these ideas can affect the decision-making of certain profit-seeking actors. Capital constraints can preclude firms from making cost-effective investments in energy efficiency while overlooking the existence of the bottom-line savings resulting from improved energy efficiency simply because companies “do not consider

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164. Hofmeister, *supra* note 118, at 26; *see also* STEVEN FAWKES, ENERGY EFFICIENCY: THE DEFINITIVE GUIDE TO THE CHEAPEST, CLEANEST, FASTEST SOURCE OF ENERGY 160 (2013) (“Although the lack of finance is often cited as a major barrier to investing in energy efficiency, the real problem is not lack of finance per se, but rather a lack of structures that address investor concerns and therefore would enable funds with the optimum cost of capital to flow into energy efficiency projects. . . . [T]here is no shortage of investors in the world looking for stable low-risk returns, and the risk-return profile of energy efficiency projects should be attractive to many investors.”); *see also* Namrita Kapur et al., *Show Me the Money: Energy Efficiency Financing Barriers and Opportunities*, ENVTL. DEF. FUND (July 2011), [http://www.edf.org/sites/default/files/11860\\_EnergyEfficiencyFinancingBarriersandOpportunities\\_July%202011.pdf](http://www.edf.org/sites/default/files/11860_EnergyEfficiencyFinancingBarriersandOpportunities_July%202011.pdf) (“In order for an outside investor to justify financing a company’s initial energy efficiency capital investment, he or she requires a considerable degree of confidence that the resulting energy-cost savings will occur and deliver a reasonable return. While energy cost-savings are quite reliable for many energy efficiency investments, few players or mechanisms currently exist to measure and verify these savings . . . . Until this data is more widely available, investors will continue to regard energy efficiency as inherently risky—preventing a broad expansion of this asset class.”); *see also* David March, *Why Manufacturing Companies Are Not Profiting from Energy Efficiency*, CONTROL ENGINEERING (Apr. 12, 2013), <http://www.controleng.com/single-article/why-manufacturing-companies-are-not-profiting-from-energy-efficiency/4a53fe499b18e5747fb20ab6e07f9fa8.html> (“[T]he risk-return profile of energy efficiency investments shows that they have a rate of return similar to equity investments in small to medium sized firms, but with a risk profile mimicking Treasury bills . . . .”).

165. GRANADE ET AL., *supra* note 79, at 9.

166. *Id.* at 58.

energy efficiency to be a core activity” of their firms.<sup>167</sup> This is painfully true for one key group: utilities. The current business model for utilities is based on the simple idea of selling more power rather than less in order to achieve maximum profits.<sup>168</sup> The utility industry’s fundamental business and regulatory models encourage energy sales—not savings.<sup>169</sup> Thus, utilities provide us with an instructive—and a rather ironic—illustration of the importance in recognizing the challenge of capital constraints and how we view costs when attempting to design an expansive approach to achieving greater energy efficiency in the United States.

#### 4. PATERNALISM AND GOVERNMENT INTERVENTION: MANDATORY STANDARDS AND DEFAULT RULES

Given the seemingly unavoidable pitfalls present in consumers’ decision-making processes in regard to pursuing and adopting more energy efficient measures, it stands to reason that some sort of government intervention may be necessary. One possible way is through the more expansive adoption of stronger building efficiency standards.<sup>170</sup> In certain sectors where the potential for energy efficiency is high, some type of a mandatory standard may be warranted in order to expedite the process of capturing that potential.<sup>171</sup> This is particularly true where end-users’ or manufacturers’ awareness of and attention to that potential is low.<sup>172</sup> While mandatory standards may go a long way toward ensuring greater energy efficiency despite behavioral market failures, the problem is that all forms of paternalism endanger liberty—even those that stem from an understanding of behavioral market failures.<sup>173</sup>

Perhaps the best illustration of the idea that paternalism and government intervention threaten individual liberty is Congresswoman Michele Bachmann’s<sup>174</sup> attempt to pass the Light Bulb Freedom of Choice Act.<sup>175</sup> This legislation purported to repeal two sections of the

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167. Sachs, *supra* note 9, at 1651 (citing Michael P. Vandenbergh et al., *Implementing the Behavioral Wedge: Designing and Adopting Effective Carbon Emissions Reduction Programs*, 40 ENVTL. L. REP. 10547, 10554 (2010)).

168. FOX-PENNER, *supra* note 160, at 151.

169. *Id.* at 154.

170. Clifford Krauss, *A New Enforcer in Buildings, the Energy Inspector*, N.Y. TIMES, July 18, 2009, at A1, available at [http://www.nytimes.com/2009/07/18/business/energy-environment/18codes.html?pagewanted=all&\\_r=0](http://www.nytimes.com/2009/07/18/business/energy-environment/18codes.html?pagewanted=all&_r=0) (“Yet today, the energy requirements in building codes remain weak across half the country, and at least seven states have virtually no rules.”).

171. GRANADE ET AL., *supra* note 79, at x.

172. *Id.*

173. *The Storrs Lectures*, *supra* note 142, at 1881.

174. Michele Bachmann represents the 6th District of Minnesota in the House of Representatives. MICHELE BACHMANN, <http://bachmann.house.gov/> (last visited Sept. 2, 2014).

175. Light Bulb Freedom of Choice Act, H.R. 849, 112th Cong. (2011), available at <http://www.gpo.gov/fdsys/pkg/BILLS-112hr849ih/pdf/BILLS-112hr849ih.pdf>.

Energy Independence and Security Act of 2007, aimed toward creating standards for more energy efficient incandescent light bulbs being used in lamps in the United States.<sup>176</sup> In her attempt, Congresswoman Bachmann exhibited a strong stance against paternalism, bluntly stating in a press release, “[t]he government has no business telling an individual what kind of light bulb to buy.”<sup>177</sup>

Regardless of whether one agrees or disagrees with this ultimately unsuccessful attempt to limit government intervention into the types of light bulbs United States’ citizens use to light their lamps, Bachmann’s efforts lead us to an interesting point. Without some sort of a pre-commitment, individuals often fail to reach long-term goals, instead falling for temptations stemming from procrastination and a lack of self-control related to immediate and delayed gratification.<sup>178</sup> Yet, when an authoritative “external voice” is present and giving orders, we will listen.<sup>179</sup> According to Professor Dan Ariely,<sup>180</sup> “[s]ometimes we strongly support regulations that restrain our self-destructive behaviors, and at other times we have equally strong feelings about our personal freedom. Either way, it’s always a trade off.”<sup>181</sup>

As a result, perhaps the best course of action for achieving greater energy efficiency—and, perhaps the best compromise between authoritative mandates and complete autonomy—would be to give people the opportunity or the choice<sup>182</sup> to commit up front to their preferred path of action.<sup>183</sup>

Nevertheless, given what we have seen thus far about the cognitive barriers that prevent many people from taking and investing in more energy efficient measures, an objectively stronger hand may be necessary in this context. Stronger, more effective mandatory rules may be

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176. See Energy Independence and Security Act of 2007, Pub. L. No. 110-140, §§ 321–322, 121 Stat. 1492, 1573–89.

177. Press Release, Michele Bachmann, Bachmann Reintroduces Light Bulb Freedom of Choice Act (Mar. 2, 2011), available at <http://bachmann.house.gov/press-release/bachmann-reintroduces-light-bulb-freedom-choice-act>.

178. ARIELY, *supra* note 18, at 116–17.

179. *Id.*

180. Dan Ariely, author of PREDICTABLY IRRATIONAL, *supra* note 18, is the James B. Duke Professor of Psychology and Behavioral Economics at Duke University’s Fuqua School of Business. Dan Ariely, DUKE: FUQUA SCHOOL BUS., [http://www.fuqua.duke.edu/faculty\\_research/faculty\\_directory/ariely/](http://www.fuqua.duke.edu/faculty_research/faculty_directory/ariely/) (last visited Sept. 2, 2014).

181. ARIELY, *supra* note 18, at 118; see also Sachs, *supra* note 9, at 1667 (“All climate change mitigation policies involve trade-offs.”).

182. Sunstein, *supra* note 112, at 1400 (“An alternative approach, sometimes worth serious consideration, is to avoid any default rule and to require active choices. Under this approach, people are required to make an actual choice among the various options; they are not defaulted into any particular alternative.”).

183. ARIELY, *supra* note 18, at 117.

warranted to guide us toward a more energy efficient path, particularly in the context of investing in and adopting more expansive standards for buildings with greater energy efficiency.<sup>184</sup> States that have adopted strong building standards<sup>185</sup> have reported that modern code-compliant buildings use 75% less power than a building of the same size that was constructed before adopting the codes.<sup>186</sup> We may have to accept that the risk of individuals falling victim to their inherent cognitive weaknesses justifies a more aggressive approach by adopting more expansive building codes and mandatory standards.

It is possible that decision-makers, if given the opportunity, would choose on their own to adopt the same measures that are required by modern building efficiency codes. Due to the power of inertia, people will tend to continue to act in accordance with the established status quo rather than change their behaviors.<sup>187</sup> Self-consciously and well-chosen default rules<sup>188</sup> by individuals, or even by private or public institutions, could actually operate as commitment devices for changing behavior.<sup>189</sup> A well-crafted default rule can actually also act as a valuable reference point for people's decisions because individuals tend to dislike losses from that reference point.<sup>190</sup> Consider the following from Professor Cass R. Sunstein:<sup>191</sup>

If, for example, the default rule favors energy-efficient light bulbs, then the loss (in terms of reduced efficiency) may loom large and people will continue to purchase energy-efficient light bulbs. But if the default rule favors less efficient (and initially less expensive) light bulbs, then the loss in terms of upfront costs may loom large, and

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184. Sachs, *supra* note 9, at 1652 (“Some form of government intervention is justifiable to correct market failures and overcome these hurdles to energy efficiency.”); Barry Barton, *The Law of Energy Efficiency*, in *BEYOND THE CARBON ECONOMY: ENERGY LAW IN TRANSITION*, *supra* note 83, at 61, 65 (“The barriers that cause the energy efficiency gap to open up . . . are generally (though not universally) considered to justify policies and legal measures to encourage energy efficiency.”).

185. *Wide Variation in Energy Codes*, N.Y. TIMES (July 18, 2009), <http://www.nytimes.com/imagepages/2009/07/18/business/energy-environment/18codesGrfx.ready.html> (providing a map of the United States illustrating the states that have adopted a residential energy code and the respective stringency of each state's code).

186. FOX-PENNER, *supra* note 160, at 147.

187. Sunstein, *supra* note 112, at 1397.

188. Ian Ayres & Robert Gertner, *Filling Gaps in Incomplete Contracts: An Economic Theory of Default Rules*, 99 YALE L.J. 87, 91 (1989) (“Default rules have alternatively been termed background, backstop, enabling, fallback, gap-filling, off-the-rack, opt-in, opt-out, preformulated, present, presumptive, standby, standard-form and suppletory rules.”).

189. Sunstein, *supra* note 112, at 1397.

190. *Id.* at 1398.

191. Cass R. Sunstein, in addition to authoring and editing multiple, informative works cited throughout this article, is the Robert Walmsley University Professor at Harvard Law School. Cass R. Sunstein, HARV. L. SCHOOL, <http://www.law.harvard.edu/faculty/directory/10871/Sunstein> (last visited Sept. 2, 2014).

there will be a tendency to favor less efficient light bulbs.<sup>192</sup>

At least in the case of default rules, parties have some semblance of a choice and have the ability to contract around or waive the requirements of such a rule.<sup>193</sup> By contrast, mandatory standards or “immutable” rules cannot be contracted around or changed by agreement—they govern even if parties attempt to contract around them.<sup>194</sup>

Thus, we are left with two viable options. On the one hand, we can utilize default rules to alter the reference points of individual decision-makers and hope that they will make better decisions regarding energy efficiency while preserving some measure of individual autonomy. On the other hand, mandatory standards can offer that external authority, ensuring that energy efficient decisions are made, but at the cost of individual autonomy. In either event, given the cognitive and behavioral barriers discussed thus far, it suffices to say that individual decision-makers, on their own, simply cannot make the best possible decisions regarding energy efficiency. As such, it may be that, to avoid these behavioral market failures, the appropriate response lies in utilizing, among other mechanisms, default rules<sup>195</sup> and mandatory standards.

#### IV. CASE STUDIES

[W]hy a focus on such profound energy efficiency? For starters, we care a lot about eliminating wasted energy, and that’s what most building energy consumption is: waste. But this is about more than simple waste. Done well and timed right, eliminating that waste makes good money. Further—and maybe most importantly—a highly efficient building (whether new or upgraded) is more comfortable, healthier, enables higher productivity, and generally entices people to stay in it longer.<sup>196</sup>

##### A. *A Brief Overview of Energy Efficiency Policies for Buildings in the United States*

The implementation of building energy efficiency policies in the United States is best viewed from two ends of the same spectrum: policies and programs aimed toward making dwellings occupied by low-income individuals more energy efficient, and policies and programs

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192. Sunstein, *supra* note 112, at 1398.

193. Ayres & Gertner, *supra* note 188, at 87.

194. *Id.*

195. *The Storrs Lectures*, *supra* note 142, at 1898–99.

196. Elaine Gallagher Adams & Robert Hutchinson, *A Multi-Pronged Approach to Building Efficiency*, ROCKY MOUNTAIN INST. (Dec. 11, 2013), [http://blog.rmi.org/blog\\_2013\\_12\\_11\\_Building\\_Momentum](http://blog.rmi.org/blog_2013_12_11_Building_Momentum).

aimed toward making office buildings and other buildings more energy efficient.

In the Energy Conservation in Existing Buildings Act of 1976, Congress found that a “fast, cost-effective, and environmentally sound way” to reduce the country’s dependence on imported energy supplies would be to encourage major programs implementing energy conservation measures in dwelling units.<sup>197</sup> Congress found that the existing efforts in place to encourage these measures had been inadequate.<sup>198</sup> Specifically, many dwellings owned or occupied<sup>199</sup> by low-income people were found to be energy inefficient;<sup>200</sup> at the same time, those low-income dwellers were also the ones who could least afford to adopt the necessary measures to improve the energy efficiency of those inefficient dwellings.<sup>201</sup> Finding that the weatherization of such dwellings would simultaneously lower shelter costs, save energy, and reduce future energy capacity requirements,<sup>202</sup> Congress set forth, in part, to accomplish the following:

It is, therefore, the purpose of this part to develop and implement a weatherization assistance program to increase the energy efficiency of dwellings owned or occupied by low-income persons, reduce their total residential energy expenditures, and improve their health and safety, especially low-income persons who are particularly vulnerable, such as the elderly, the handicapped, and children.<sup>203</sup>

The American Recovery and Reinvestment Act of 2009 made \$5 billion available to the Weatherization Assistance Program,<sup>204</sup> which helps to permanently reduce low-income residents’ monthly utility bills by helping pay for one-time energy efficiency upgrades to their residences, rather than continuously subsidizing the residents’ monthly utility bills.<sup>205</sup> This is a particularly instructive example of how government

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197. 42 U.S.C. § 6861(a)(1) (2012).

198. *Id.* § 6861(a)(2).

199. The distinction between owners and occupiers is an important one. One notable market failure is that the interests of landlords who purchase energy-using appliances often diverge from the interests of the tenants who actually pay the energy costs. Sachs, *supra* note 9, at 1650. Thus, under such “split-incentive conditions,” energy is consumed by end users who have little control over the efficiency of the products they use on a daily basis. *Id.* at 1650–51. Going beyond energy-using appliances, if landlords are responsible for expending the capital costs of energy efficiency measures while the ongoing energy costs are borne by tenants, this dynamic can create a fundamental asymmetry in the incentives to invest in energy efficiency. Hofmeister, *supra* note 118, at 14.

200. 42 U.S.C. § 6861(a)(2)(A).

201. *Id.* § 6861(a)(2)(B).

202. *Id.* § 6861(a)(3).

203. *Id.* § 6861(b).

204. American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, div. A, tit. IV, 123 Stat. 115, 139 (2009).

205. DORIS ET AL., *supra* note 62, at 18.

intervention can overcome the nearly impenetrable barrier of capital constraints in certain situations. Estimates show that low-income households for fiscal year 2010 typically incurred an average annual energy expenditure of \$1,800, but only earned an average income of \$18,624, meaning that such households spent approximately 10% of their income on energy expenditures.<sup>206</sup>

By fully funding and deploying energy-saving measures in low-income houses, the Weatherization Assistance Program effectively bypasses all barriers preventing individuals from adopting more energy efficient measures<sup>207</sup>—particularly and especially, capital constraints and behavioral barriers. The program has weatherized more than 6.4 million homes over the past thirty-three years, reducing annual energy bills by an average of about \$437<sup>208</sup> and generating annual savings of roughly 100 trillion end-use BTUs.<sup>209</sup>

At the other end of the spectrum, the United States Green Building Council (“USGBC”) is an organization comprised of builders, environmentalists, corporations, and others who are attempting to “transform . . . the building landscape.”<sup>210</sup> Perhaps most notably, the USGBC developed the Leadership in Energy & Environmental Design (“LEED”) Green Building Rating System, a framework for “identifying, implementing, and measuring” the design, construction, operation, and maintenance of green buildings.<sup>211</sup>

“The LEED Green Building Rating System is voluntary and consensus-based,” and it evaluates a building’s environmental performance over the building’s entire life cycle, thereby “providing a definitive standard for what constitutes a ‘green building’ in terms of its design, construction, and operation.”<sup>212</sup> LEED evaluation and certification includes, but goes well beyond, mere energy efficiency. New building design and construction projects require measures such as water use reduction, refrigerant management, storage and collection of recyclables, and envi-

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206. JOEL F. EISENBERG, OAK RIDGE NAT’L LAB., WEATHERIZATION ASSISTANCE PROGRAM TECHNICAL MEMORANDUM BACKGROUND DATA AND STATISTICS 5 (2010), available at [http://weatherization.ornl.gov/pdfs/ORNL\\_TM-2010-66.pdf](http://weatherization.ornl.gov/pdfs/ORNL_TM-2010-66.pdf).

207. GRANADE ET AL., *supra* note 79, at 40.

208. Office of Energy Efficiency & Renewable Energy, *Weatherization Assistance Program*, ENERGY.GOV, <http://www1.eere.energy.gov/wip/wap.html> (last visited Sept. 2, 2014).

209. GRANADE ET AL., *supra* note 79, at 40.

210. *About USGBC*, U.S. GREEN BLDG. COUNCIL, <http://www.usgbc.org/about> (last visited Sept. 2, 2014).

211. U.S. GREEN BLDG. COUNCIL, FOUNDATIONS OF LEED § II(1) (2009) [hereinafter FOUNDATIONS OF LEED], available at <http://www.usgbc.org/sites/default/files/Foundations-of-LEED.pdf>.

212. *Id.* § III(5).

ronmental tobacco smoke control.<sup>213</sup> LEED credits may be awarded for additional measures that address access to quality transit, rainwater management, light pollution reduction, and others.<sup>214</sup>

The Green Building Certification Institute, a separately incorporated entity supported by the USGBC, is responsible for the registration and certification of building projects.<sup>215</sup> The LEED Green Building Rating System is based on a 100-point scale, with a rating of “Certified” being awarded to those projects with 40–49 points at one end, and a rating of “Platinum” being awarded to projects receiving 80 or more points at the other end, with ratings of “Silver” (50–59 points) and “Gold” (60–79 points) forming the middle of the scale.<sup>216</sup> Additionally, the USGBC has estimated that LEED certification increases a building’s value by 10.9% for new construction projects and by 6.8% for already existing sites.<sup>217</sup>

#### B. *Energy Efficiency Policies at the Municipal Level in the State of California*

The State of California consumes approximately 11–19% less energy per capita than the United States average.<sup>218</sup> In 2012, California’s per capita energy consumption ranked 49th in the nation, with its low use of energy being partly attributable to its mild climate and energy efficiency programs.<sup>219</sup>

California understands that energy efficiency standards can overcome existing market barriers for appliances and buildings.<sup>220</sup> To that

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213. *LEED Credit Library*, U.S. GREEN BLDG. COUNCIL, <http://www.usgbc.org/credits/new-construction/v4> (last visited Sept. 2, 2014).

214. *Id.*

215. FOUNDATIONS OF LEED, *supra* note 211, § II(5).

216. *Id.* § II(5)(ii).

217. Ahmad Faruqi & Eric Shultz, *Demand Growth and the New Normal*, PUB. UTIL. FORTNIGHTLY, Dec. 2012, at 22, 26, available at [http://brattle.com/system/news/pdfs/000/000/075/original/Demand\\_Growth\\_and\\_the\\_New\\_Normal\\_Faruqi\\_Shultz\\_PUF\\_Dec\\_2012.pdf?1377791285](http://brattle.com/system/news/pdfs/000/000/075/original/Demand_Growth_and_the_New_Normal_Faruqi_Shultz_PUF_Dec_2012.pdf?1377791285).

218. GRANADE ET AL., *supra* note 79, at 37.

219. *California State Energy Profile*, U.S. ENERGY INFO. ADMIN., <http://www.eia.gov/state/print.cfm?sid=CA> (last visited Sept. 6, 2014). It should also be noted, however, that while California’s households use 31% less energy than the U.S. average, spending on electricity by California households is closer to the national average because of higher electricity prices in the state. *Household Energy Use in California*, U.S. ENERGY INFO. ADMIN., [http://www.eia.gov/consumption/residential/reports/2009/state\\_briefs/pdf/CA.pdf](http://www.eia.gov/consumption/residential/reports/2009/state_briefs/pdf/CA.pdf) (last visited Sept. 6, 2014). Consider, for example, that in July 2014, Los Angeles households paid 21.5 cents per kWh, which was 50.3% higher than the U.S. average of 14.3 cents per kWh. News Release, Bureau of Labor Statistics, U.S. Dept. of Labor, Average Energy Prices—Los Angeles-Riverside-Orange County (Oct. 27, 2014), available at [http://www.bls.gov/ro9/cpilosa\\_energy.pdf](http://www.bls.gov/ro9/cpilosa_energy.pdf).

220. CAL. ENERGY COMM’N, INTEGRATED POLICY REPORT 28 (2013), available at <http://www.energy.ca.gov/2013publications/CEC-100-2013-001/CEC-100-2013-001-CMF.pdf>.

end, the state helps ensure that cost-effective efficiency features are incorporated into each of California's buildings during construction, when the features are most cost-effective.<sup>221</sup> Since their inception in 1975, California's building and appliance efficiency standards have saved California's consumers over \$75 billion on their electricity bills.<sup>222</sup> California has also established a loading order throughout the state that calls for utilizing efficiency as a first step toward meeting new electricity needs.<sup>223</sup> Among other strategies, California recommends a number of mandatory approaches toward achieving greater statewide energy efficiency. Such approaches include implementing a public energy usage disclosure program for the State's largest commercial and municipal buildings, as well as requiring the disclosure of energy performance ratings on existing residential and nonresidential buildings.<sup>224</sup>

Accordingly, California provides a valuable starting point for analyzing multiple aspects of building energy efficiency policies currently in existence at the municipal level. In total, four California cities will be examined: San Francisco, Berkeley, San José, and Los Angeles.

#### 1. SAN FRANCISCO, CALIFORNIA

Simply informing individuals about how their energy usage translates into environmental costs is an effective policy mechanism that is sufficient enough to increase energy efficient behavior.<sup>225</sup> Similarly, as previously noted, making individuals and building owners more informed about their energy consumption levels can potentially serve as a valuable tool in encouraging more energy efficient behavior.<sup>226</sup>

San Francisco requires non-residential building owners to utilize the "ENERGY STAR Portfolio Manager®"<sup>227</sup> to track the total energy use of each non-residential building, as well as to obtain an ENERGY STAR Portfolio Manager Energy Performance Rating for such buildings.<sup>228</sup> Additionally, non-residential building owners whose buildings

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221. *Id.*

222. *Id.*

223. *Id.* at 27.

224. *Id.* at 34.

225. Hofmeister, *supra* note 118, at 44.

226. *See* discussion *supra* Part III.B.2.

227. The ENERGY STAR Portfolio Manager is an online tool developed by the Environmental Protection Agency to measure and track energy consumption and greenhouse gas emissions, and it can also be used to securely benchmark the performance of one building or a portfolio of buildings. *Use Portfolio Manager*, ENERGY STAR, <http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager> (last visited Sept. 2, 2014).

228. S.F., CAL., MUNICIPAL ENVIRONMENT CODE ch. 20, § 2002(e) (2014), available at [http://www.amlegal.com/nxt/gateway.dll/California/environment/environmentcode?f=templates\\$fn=default.htm\\$3.0\\$vid=amlegal:sanfrancisco\\_ca\\$sync=1](http://www.amlegal.com/nxt/gateway.dll/California/environment/environmentcode?f=templates$fn=default.htm$3.0$vid=amlegal:sanfrancisco_ca$sync=1).

have a gross area of 10,000 square feet or greater are required to conduct comprehensive energy efficiency audits<sup>229</sup> for each building<sup>230</sup> on an annual basis.<sup>231</sup> Non-residential building owners whose buildings have greater than 10,000 gross square feet must also file an “Annual Energy Benchmark Summary Report”<sup>232</sup> with the San Francisco Department of the Environment.<sup>233</sup>

While the purpose of benchmarking and disclosure is to ensure that building owners and the public are aware of their buildings’ energy consumption, to some this may seem like a rather intrusive policy mechanism that intrudes into building owners’ affairs regarding the amount of energy being consumed in their buildings.<sup>234</sup> However real these concerns may be, San Francisco allays any such concerns by requiring the Department of the Environment to maintain the confidentiality of the information submitted by building owners as long as the owner has informed the Department in writing that such information “is confidential business information of the owner or of a building tenant.”<sup>235</sup>

One benefit of targeting municipalities for better building energy

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229. Energy efficiency audit reports shall include an estimate of the approximate energy savings, avoided energy cost, and costs to implement retro-commissioning and retrofit measures available to the owner. *Id.* § 2002(d)(2)–(3). The audit report must also include one of the following: a list of all retro-commissioning and retrofit measures available to the owner with a simple payback of not more than five years; a list of all retro-commissioning and retrofit measures available to the owner with a positive net present value; or an integrated package of retro-commissioning and retrofit measures that in combination will equal or exceed the total combined reduction in energy consumption of implementing all retrofit and retro-commissioning measures with a simple payback of not more than five years. *Id.* § 2002(d)(4).

230. *Id.* § 2002(a).

231. *Id.* § 2004(a)(1)–(3).

232. “Annual Energy Benchmark Summary” is defined to mean “a report to the Department of Environment summarizing the annual energy performance of a whole building for purposes of verifying compliance with this chapter, tracking improvement, motivating improved energy performance, targeting incentives and resources, and enabling comparison to similar facilities.” *Id.* § 2001(1). Data required in the Annual Energy Benchmark Summary includes the descriptive information of the building to track compliance with the ordinance, and also requires energy benchmark information, which may include the following: the ENERGY STAR Portfolio Manager Energy Performance Rating for the building; the nonresidential building energy rating established by the State of California; the weather-normalized energy use intensity per unit area per year for the building; the energy use intensity per unit area per year for the building; the annual carbon dioxide equivalent emissions due to energy use for the building; and other descriptive information required by the ENERGY STAR Portfolio Manager. *Id.* § 2003(a)(1)–(2).

233. *Id.* § 2003(a).

234. While any possible Fourth Amendment issues and privacy concerns that may be associated with requiring individuals and building owners to disclose the amount of energy consumed within a home or other building fall outside the scope of this article, suffice it to say that such an issue is a real one. *See, e.g.,* *Kyllo v. United States*, 533 U.S. 27 (2001) (holding, by a 5-4 decision, that the use of a thermal-imaging device aimed at a private home to detect amounts of heat within areas of the home constituted an unlawful search in violation of the Fourth Amendment).

235. S.F., CAL., MUNICIPAL ENVIRONMENT CODE ch. 20, § 2005(a).

efficiency policies is that local governments can lead by example, thereby promoting high efficiency certification of their public and private buildings.<sup>236</sup> Additionally, local jurisdictions can actually strengthen the market for energy efficiency by encouraging or mandating high performance buildings.<sup>237</sup> In light of this, it is commendable to see that San Francisco requires that the LEED Green Building Rating System be used to certify the environmental design of the city's municipal construction projects.<sup>238</sup> Any municipal construction project of 5,000 square feet or greater is required to receive a LEED "Gold" certification by the Green Building Certification Institute.<sup>239</sup> If the construction project in question is less than 5,000 square feet, or if the project does not meet the minimum eligibility requirements for LEED certification, the city department sponsoring the construction project still must "prepare and submit a conceptual design phase LEED Scorecard"<sup>240</sup> for informational and reporting purposes.<sup>241</sup>

In 2012, the 446 benchmarked facilities in San Francisco (including San Francisco International Airport) used 72% of all the electricity, natural gas, and steam used by San Francisco's municipal facilities.<sup>242</sup> As of the end of 2012, the overall energy use intensity ("EUI")<sup>243</sup> of benchmarked facilities in San Francisco improved by 3.6% compared to 2011, and by 4.4% compared to 2009.<sup>244</sup> In 2012, the overall EUI of the 445 benchmarked facilities (excluding San Francisco International Airport) was 74.74 kBtu of on-site energy per square foot of building, representing an improvement from the 2011 EUI of 77.53.<sup>245</sup>

Of the municipal facilities eligible for an ENERGY STAR rating, almost 80% of those buildings outperformed the national median for

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236. DORIS ET AL., *supra* note 62, at 9.

237. *Id.*

238. S.F., CAL., MUNICIPAL ENVIRONMENT CODE ch. 7, § 705(b) (2014).

239. *Id.*

240. See generally *LEED For Commercial Interiors Project Scorecard*, U.S. GREEN BLDG. COUNCIL, <http://www.usgbc.org/Docs/Archive/General/Docs6090.pdf> (last visited Sept. 15, 2014).

241. S.F., CAL., MUNICIPAL ENVIRONMENT CODE ch. 7, § 705(e).

242. S.F. PUB. UTIL. COMM'N, 2012 ENERGY BENCHMARKING REPORT: SAN FRANCISCO MUNICIPAL BUILDINGS 11 (2013), available at <http://sfwater.org/modules/showdocument.aspx?documentid=4139>.

243. EUI expresses a building's energy use as a function of its size or other characteristics, and is typically expressed as energy per square foot per year. *What Is Energy Use Intensity (EUI)?*, U.S. ENVTL. PROT. AGENCY, <http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/understand-metrics/what-energy> (last visited Aug. 28, 2014). The EUI is calculated by dividing the total energy consumed by the building in one year by the total gross floor area of the building. *Id.* In San Francisco's *Energy Benchmarking Report*, the EUI for each facility is represented in kBtu of total on-site energy, per square foot of building area. S.F. PUB. UTIL. COMM'N, *supra* note 242, at 16.

244. S.F. PUB. UTIL. COMM'N, *supra* note 242, at 5.

245. *Id.* at 10, 12.

similar buildings, and eleven city facilities performed in the top 25% nationwide.<sup>246</sup> Additionally, the average 2012 carbon footprint<sup>247</sup> of the benchmarked facilities, calculated to be approximately 5.26 pounds of carbon dioxide emissions per square foot, improved by 5.1% from 2011, and by 7.0% from 2009.<sup>248</sup>

As of 2011, the total electricity usage in San Francisco reached approximately 6,000 gigawatt hours (“GWh”) per year.<sup>249</sup> San Francisco’s municipal facilities represent 17% of San Francisco’s total energy usage,<sup>250</sup> with the residential sector and the commercial sector representing 23% and 35% of total electric energy usage, respectively.<sup>251</sup> Greenhouse gas emissions from the electric sector account for roughly 24% of San Francisco’s total greenhouse gas emissions.<sup>252</sup>

In 2010, peak demand for electricity in San Francisco fell more than 15% compared to what had been projected in the 2002 Electricity Resource Plan.<sup>253</sup> This decrease resulted in large part from the extensive energy efficiency efforts undertaken by San Francisco’s Department of the Environment, the San Francisco Public Utilities Commission, Pacific Gas & Electric (“PG&E”),<sup>254</sup> and San Francisco’s residents and businesses.<sup>255</sup> In fact, PG&E had projected to spend upwards of \$214 million in 2011 to help fund its energy efficiency and low-income energy efficiency and assistance programs.<sup>256</sup>

While unfortunately limited to non-residential buildings, San Francisco provides a fantastic example of how to design energy efficiency policies for buildings where energy usage information is made more

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246. *Id.* at 5.

247. A carbon footprint is the “total amount of greenhouse gases that are emitted into the atmosphere each year by a person, family, building, organization, or company.” *Glossary of Climate Change Terms*, U.S. ENVTL. PROT. AGENCY, <http://www.epa.gov/climatechange/glossary.html#C> (last visited Sept. 2, 2014).

248. S.F. PUB. UTIL. COMM’N, *supra* note 242, at 5.

249. S.F. PUB. UTIL. COMM’N, SAN FRANCISCO’S 2011 UPDATED ELECTRICITY RESOURCE PLAN 36 (2011) [hereinafter S.F. 2011 UPDATED ELECTRICITY RESOURCE PLAN], available at <http://sfwater.org/Modules/ShowDocument.aspx?documentID=40>. Additionally, 1kWh of electricity translates into approximately 0.5 pounds of carbon dioxide equivalent. CITY OF BERKELEY, CLIMATE ACTION PLAN 14 (2009) [hereinafter BERKELEY CLIMATE ACTION PLAN], available at [http://www.cityofberkeley.info/uploadedFiles/Planning\\_and\\_Development/Level\\_3\\_-\\_Energy\\_and\\_Sustainable\\_Development/Berkeley%20Climate%20Action%20Plan.pdf](http://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/Berkeley%20Climate%20Action%20Plan.pdf).

250. S.F. 2011 UPDATED ELECTRICITY RESOURCE PLAN, *supra* note 249, at 1.

251. *Id.* at 38.

252. *Id.* at 39.

253. *Id.* at 3.

254. PG&E, incorporated in California in 1905 and based in San Francisco, is currently “one of the largest combination natural gas and electric utilities in the United States.” *Company Profile*, PAC. GAS & ELEC. CO., <http://www.pge.com/en/about/company/profile/index.page?> (last visited Aug. 28, 2014).

255. S.F. 2011 UPDATED ELECTRICITY RESOURCE PLAN, *supra* note 249, at 3.

256. *Id.* at 47.

apparent to building owners, and how required regular disclosure of that information can be accomplished in an appropriate and minimally intrusive manner.

## 2. BERKELEY, CALIFORNIA

Since April 1994,<sup>257</sup> the city of Berkeley, California, has required that multiple energy conservation measures be installed in commercial buildings upon the sale or renovation of a particular building, including, but not limited to, time clock controls for heating, ventilation, and air conditioning (“HVAC”) systems based on building occupancy requirements, insulation of hot and chilled water piping, and ceiling insulation for buildings with three stories or fewer.<sup>258</sup> Additionally, prior to the sale or major renovation of a commercial building, the building owner must commission an energy audit of the building to determine the cost and energy savings of each required measure under local ordinance § 19.72.090.<sup>259</sup> While the text of Berkeley’s ordinance does not mandate what specific information these energy audits require, the city has compiled a handy guide for anyone interested in performing a self-audit to assess compliance with Berkeley Municipal Code § 19.72.<sup>260</sup> The guide directs the self-auditor’s attention to a number of energy efficient measures, such as faulty thermostats;<sup>261</sup> the existence of time clocks;<sup>262</sup> leaky air ducts;<sup>263</sup> pipe insulation;<sup>264</sup> temperature and insulation of hot water;<sup>265</sup> and interior and exterior lighting.<sup>266</sup>

Similarly, prior to the sale or exchange of any residential structure or unit, the seller must provide that structure or unit with multiple energy conservation measures as established by Berkeley’s Municipal Code.<sup>267</sup> These measures include, but are not limited to, installing ceiling insulation; insulating domestic storage water heaters with external insulation blankets; replacing incandescent light bulbs in common areas with more energy efficient lamps; and installing approved weather strip-

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257. BERKELEY, CAL., COMMERCIAL BUILDINGS—ENERGY CONSERVATION MEASURES § 19.72.180 (2014), available at <http://codepublishing.com/ca/berkeley/>.

258. *Id.* § 19.72.090(A).

259. *Id.* § 19.72.030.

260. See generally CITY OF BERKELEY, PERFORMING A SELF-AUDIT FOR CECO (2011), available at [http://www.ci.berkeley.ca.us/uploadedFiles/Online\\_Service\\_Center/Planning/CECO%20self%20audit\\_current.pdf](http://www.ci.berkeley.ca.us/uploadedFiles/Online_Service_Center/Planning/CECO%20self%20audit_current.pdf).

261. *Id.* at 6.

262. *Id.* at 7.

263. *Id.* at 9.

264. *Id.* at 12.

265. *Id.* at 19–20.

266. *Id.* at 26–29.

267. BERKELEY, CAL., RESIDENTIAL ENERGY CONSERVATION ORDINANCE § 19.16.050(A) (2014).

ping on exterior doors.<sup>268</sup>

Berkeley adopted and incorporated the 2013 California Energy Code into its municipal code, which took effect on July 1, 2014.<sup>269</sup> Thus, newly constructed nonresidential and high-rise residential buildings in Berkeley must now meet mandatory minimum insulation requirements for the roofs, walls, and floors of such buildings.<sup>270</sup> Newly constructed low-rise residential buildings are also subject to mandatory requirements pertaining to ceiling and wall insulation.<sup>271</sup> Builders of these residential buildings must also ensure that 50% of the total wattage of permanently installed kitchen lighting is high efficacy<sup>272</sup> lighting<sup>273</sup> and that bathroom lighting also features high efficacy lighting and vacancy sensors.<sup>274</sup> Non-residential and high-rise residential buildings are also subject to a wide array of mandatory requirements for lighting systems.<sup>275</sup> One requirement is that the lighting power in buildings larger than 10,000 square feet must be capable of being automatically reduced in response to a demand response signal, such that the building's total lighting power can be lowered by a minimum of 15% below the building's total installed lighting power.<sup>276</sup>

Berkeley has provided a great example of municipal leadership by ensuring that its public buildings and facilities utilize energy efficient technologies to cut costs and reduce greenhouse gas emissions. By simply upgrading the lighting in one of the city's buildings located at 1947 Center Street, the city expects to save approximately \$9,000 per year in energy costs, reduce electricity consumption by 64,000 kWh, and reduce annual greenhouse gas emissions by 15 metric tons.<sup>277</sup> Additionally, by merely replacing the red and green traffic lights and orange pedestrian signal lights with energy efficient light-emitting diodes ("LEDs") at its 127 intersections, Berkeley saves \$143,000 per year in taxpayer money and reduces annual greenhouse gas emissions by roughly 225 metric tons.<sup>278</sup>

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268. *Id.* § 19.16.050(B).

269. BERKELEY, CAL., ENERGY CODE § 19.36.010 (2014); CAL. CODE REGS., tit. 24, pt. 6 (2013).

270. CAL. CODE REGS., tit. 24, § 120.7(a)–(c) (2013).

271. *Id.* § 150.0 (a), (c).

272. "High-efficacy lamps" include lamps with a minimum efficacy of 60 lumens per watt for lamps over 40 watts; 50 lumens per watt for lamps with 15 to 40 watts; and 40 lumens per watt for lamps 15 watts or less. INT'L ENERGY CONSERVATION CODE, *supra* note 75, at 6.

273. CAL. CODE REGS., tit. 24, pt. 6, § 150.0(k)(3)(A).

274. *Id.* § 150.0(k)(5)(A)–(B).

275. *See, e.g., id.* §§ 130.0–130.5 (establishing mandatory lighting system requirements for nonresidential, high-rise residential, and hotel/motel occupancies).

276. *Id.* § 130.1(e).

277. BERKELEY CLIMATE ACTION PLAN, *supra* note 249, at 80.

278. *Id.*

As if that were not enough, Berkeley actually takes proactive steps to ensure that energy efficiency behaviors take place in its offices. By utilizing sleep settings on the employee computers in the City's Department of Information Technology, Berkeley reduces government energy consumption by 238,680 kWh per year.<sup>279</sup> This leads to an annual reduction of 116,950 pounds of carbon dioxide equivalent ("CO<sub>2e</sub>")<sup>280</sup> and puts almost \$32,500 in annual cost savings back into the city's pockets.<sup>281</sup>

Considering Berkeley largely relies on California for the development and design of its building standards and codes, it seems that Berkeley thought that implementing a wide variety of mandatory standards and requirements across all aspects of building components provided the best method for ensuring that Berkeley's buildings made the best possible use of energy resources. Thus, the City of Berkeley does not utilize its own comprehensive policy mechanisms requiring the benchmarking or disclosure of energy consumption from its building owners. Berkeley did, however, launch the Energy Smart Awards, honoring its businesses that take the lead in emphasizing energy management in order to encourage more businesses to do the same.<sup>282</sup> Building owners who receive an ENERGY STAR benchmarking score can view their energy consumption results, compare building energy consumption among other similar buildings, and will be recognized by the City of Berkeley, with twenty-nine entities being so recognized in 2014.<sup>283</sup>

Berkeley's actions demonstrate an understanding that behavioral change underlies the potential success of its goals, including more energy efficient homes, businesses, public buildings, and institutions.<sup>284</sup> To achieve those ends, Berkeley strives to utilize targeted education and social marketing for its residents, businesses, and institutions.<sup>285</sup> One way this is accomplished is through conducting a home energy analysis for property owners to determine where energy is being wasted and how

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279. *Id.* at 81.

280. CO<sub>2e</sub> is a "metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP)." U.S. ENVTL. PROT. AGENCY, *supra* note 247. "Emissions are aggregated and reported in terms of carbon dioxide equivalent units, or CO<sub>2e</sub>. Converting all greenhouse gas emissions to carbon dioxide equivalent units allows for the consideration of different greenhouse gases in comparable terms." BERKELEY CLIMATE ACTION PLAN, *supra* note 249, at 13 n.3.

281. BERKELEY CLIMATE ACTION PLAN, *supra* note 249, at 81.

282. CITY OF BERKELEY, ANNUAL REPORT 3 (2013), available at [http://www.ci.berkeley.ca.us/uploadedFiles/City\\_Manager/Level\\_3\\_-\\_General/2013%20Annual%20Report\\_Web%20Version\\_FINAL.pdf](http://www.ci.berkeley.ca.us/uploadedFiles/City_Manager/Level_3_-_General/2013%20Annual%20Report_Web%20Version_FINAL.pdf).

283. *Benchmarking Buildings & Berkeley's Energy Smart Awards*, CITY OF BERKELEY, [http://www.ci.berkeley.ca.us/benchmarking\\_buildings/](http://www.ci.berkeley.ca.us/benchmarking_buildings/) (last visited Aug. 28, 2014).

284. BERKELEY CLIMATE ACTION PLAN, *supra* note 249, at 55.

285. *Id.*

future waste can be cost-effectively eliminated.<sup>286</sup> Afterward, the city connects those residents to resources and trained service providers who can implement those energy upgrades.<sup>287</sup>

Electricity and natural gas consumption by Berkeley's homes, businesses, industries, and public institutions produce over 310,000 metric tons of CO<sub>2e</sub> per year.<sup>288</sup> Berkeley's community-wide greenhouse gas emissions totaled 575,889 metric tons of CO<sub>2e</sub> in 2005, an amount equal to 106,000 sedans traveling 12,000 miles per year.<sup>289</sup> Residential energy consumption alone accounts for roughly 47% of the greenhouse gas emissions associated with energy consumption by Berkeley's buildings,<sup>290</sup> while commercial energy consumption accounts for 52% of greenhouse gas emissions.<sup>291</sup>

Between 2000 and 2011, Berkeley's homes, businesses, and institutions experienced a 13% decrease in greenhouse gas emissions resulting from energy consumption.<sup>292</sup> While significant reductions in the consumption of residential electricity, residential natural gas, and commercial electricity are largely responsible for driving this trend, commercial natural gas consumption actually increased approximately 18% since 2000.<sup>293</sup> As a result of the changes in the mix of energy resources used to produce electricity, the greenhouse gas emissions produced per kWh of electricity consumed dropped by 35% between 2000 and 2011.<sup>294</sup> This figure is not only an attractive data point, but it also reflects the mix of energy sources used to produce electricity in 2011, including renewable energy sources.<sup>295</sup>

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286. *Id.* at 62.

287. *Id.*

288. *Id.* at 54.

289. *Id.* at 13.

290. CITY OF BERKELEY, OFFICE OF ENERGY & SUSTAINABLE DEV., BERKELEY CLIMATE ACTION PLAN: TRACKING OUR PROGRESS; BUILDING ENERGY USE—RESIDENTIAL (2013), available at [http://www.ci.berkeley.ca.us/uploadedFiles/Planning\\_and\\_Development/Level\\_3\\_-\\_Energy\\_and\\_Sustainable\\_Development/Res%20energy%20See-It.pdf](http://www.ci.berkeley.ca.us/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/Res%20energy%20See-It.pdf).

291. CITY OF BERKELEY, OFFICE OF ENERGY & SUSTAINABLE DEV., BERKELEY CLIMATE ACTION PLAN: TRACKING OUR PROGRESS; BUILDING ENERGY USE—COMMERCIAL (2013), available at [http://www.ci.berkeley.ca.us/uploadedFiles/Planning\\_and\\_Development/Level\\_3\\_-\\_Energy\\_and\\_Sustainable\\_Development/Comm%20energy%20See-It.pdf](http://www.ci.berkeley.ca.us/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/Comm%20energy%20See-It.pdf).

292. CITY OF BERKELEY, OFFICE OF ENERGY & SUSTAINABLE DEV., BERKELEY CLIMATE ACTION PLAN: TRACKING OUR PROGRESS; BUILDING ENERGY USE—COMMUNITY-WIDE GREENHOUSE GAS TREND (2013), available at [http://www.ci.berkeley.ca.us/uploadedFiles/Planning\\_and\\_Development/Level\\_3\\_-\\_Energy\\_and\\_Sustainable\\_Development/GHG%20CAP.pdf](http://www.ci.berkeley.ca.us/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/GHG%20CAP.pdf).

293. *Id.*

294. *Id.*

295. *Id.*; Cal. Pub. Util. Comm'n, *RPS Program Overview*, CA.Gov, <http://www.cpuc.ca.gov/PUC/energy/Renewables/overview.htm> (last visited Sept. 8, 2014) (describing California's Renewables Portfolio Standard, a program requiring investor-owned utilities, electric service

Nevertheless, Berkeley has achieved an impressive decrease in greenhouse gas emissions from the residential and commercial sectors, dropping from 358,830 metric tons of CO<sub>2e</sub> in 2000, to 310,345 metric tons of CO<sub>2e</sub> in 2005—a nearly 14% decrease.<sup>296</sup> Part of this reduction has been attributed to the increased energy efficiency measures being used in Berkeley's homes and businesses.<sup>297</sup> Regardless, even if just at the margins, the city of Berkeley is taking concerted strides toward reducing the amount of energy its citizens consume.

### 3. SAN JOSÉ, CALIFORNIA

San José, California, uses over 11.2 billion kWh of energy every year, translating to approximately 2.3 million metric tons of carbon dioxide.<sup>298</sup> Additionally, its buildings consume 70% of the city's electricity and account for 40% of total carbon dioxide emissions.<sup>299</sup> Yet, San José likely provides the least comprehensive set of energy efficiency policies among the four cities examined in this article. Chapter 17.84 of the San José Municipal Code, *Green Building Regulations for Private Development*, requires that high-rise residential projects, or residential buildings 75 feet or taller,<sup>300</sup> achieve a minimum LEED certification rating of "Certified" from the USGBC,<sup>301</sup> the lowest possible rating on the LEED scale.<sup>302</sup> Non-residential buildings with a gross floor area of 25,000 square feet or more, and that are under 75 feet tall, must receive a minimum LEED rating of "Silver."<sup>303</sup> It is important to note, however, that these requirements, as indicated by Chapter 17.84's title, only apply to private buildings. No similar requirements exist in the San José Municipal Code for municipal and other public buildings.

Nevertheless, in the *Envision San José 2040 General Plan*, the City of San José expresses, among many other things, a wide variety of goals

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providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 33% of total procurement by 2020).

296. BERKELEY CLIMATE ACTION PLAN, *supra* note 249, at 14.

297. *Id.* at 13–14. This period also included the California energy crisis in 2000; surveys conducted show that many consumers utilized energy efficiency during that time in order to reduce energy costs. *Id.*

298. San José Green Vision, *Energy*, CITY OF SAN JOSÉ, <https://www.sanjoseca.gov/DocumentCenter/View/2147> (last visited Sept. 15, 2014).

299. San José Green Vision, *Green Building*, CITY OF SAN JOSÉ, <https://www.sanjoseca.gov/DocumentCenter/View/2149> (last visited Sept. 15, 2014).

300. SAN JOSÉ, CAL., GREEN BUILDING REGULATIONS FOR PRIVATE DEVELOPMENT, tit. 17, §§ 17.84.109–.110 (2013), available at [http://sanjose.amlegal.com/nxt/gateway.dll/California/sanjose\\_ca/sanjosemunicipalcode?f=templates\\$fn=default.htm\\$3.0\\$vid=amlegal:sanjose\\_ca](http://sanjose.amlegal.com/nxt/gateway.dll/California/sanjose_ca/sanjosemunicipalcode?f=templates$fn=default.htm$3.0$vid=amlegal:sanjose_ca).

301. *Id.* § 17.84.220(C).

302. FOUNDATIONS OF LEED, *supra* note 211, § III(5)(ii).

303. GREEN BUILDING REGULATIONS FOR PRIVATE DEVELOPMENT, tit. 17, §§ 17.84.112, .121, .220(B).

pertaining to the development and implementation of environmental policies, and provides a vision and comprehensive roadmap to guide the city through 2040.<sup>304</sup> One such goal is the city's focus on "Green Building Policy Leadership," designed to promote green building practices by establishing and implementing policies that encourage and reward builders and designers who utilize new or innovative green building techniques.<sup>305</sup>

By 2040, San José hopes to have 100 million square feet of new or retrofitted green buildings by ensuring that all projects are consistent with or exceed the requirements in San José's Green Building Ordinance<sup>306</sup> and by fostering awareness of the environmental and economic benefits of green building practices.<sup>307</sup> In practice, San José hopes to develop programs encouraging individuals or businesses to undertake green building retrofits through incentives, such as tax credits or financing opportunities, and to document and report on new and retrofitted green building construction in order to ascertain progress toward the city's goal of 50 million square feet of green buildings by 2022 and 100 million square feet by 2040.<sup>308</sup>

Granted, these policies and plans set forth the ideal vision and intended path to be taken by the City of San José without much specificity; however, even such ideal plans may simply not be enough to spur increased construction of more energy efficient buildings. Consider the fact that San José, in part, intends to utilize tax credits or financing opportunities to incentivize individuals and businesses to undertake measures for green building upgrades.<sup>309</sup> Local governments have recently begun providing energy efficiency assistance through a new type of program known as municipal energy financing.<sup>310</sup> In these programs, property owners can borrow at low rates for energy efficiency improvements, while the loans are secured by property tax liens that take precedence over mortgages and other claims.<sup>311</sup>

Certain types of these programs, known as Property Assessed Clean Energy ("PACE") by the Federal Housing Finance Agency ("FHFA"), seek to foster lending for retrofits of residential or commercial properties through a tax assessment regime, and in many of these programs, the

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304. *Envision San José 2040 General Plan*, CITY OF SAN JOSÉ, at 2 (Aug. 2007), <https://www.sanjoseca.gov/DocumentCenter/Home/View/474>.

305. *Id.* ch. 3, at 3.

306. *See, e.g.*, GREEN BUILDING REGULATIONS FOR PRIVATE DEVELOPMENT, tit. 17, §§ 17.84.109–.110, § 17.84.220(C), §§ 17.84.112, .121, .220(B).

307. *Envision San José 2040 General Plan*, *supra* note 304, at 3–4.

308. *Id.* ch. 3, at 4.

309. *Id.*

310. FOX-PENNER, *supra* note 160, at 149.

311. *Id.*

loans acquire a priority lien over existing mortgages.<sup>312</sup> This has led the FHFA to urge state and local governments to reconsider and even halt these programs until various concerns could be addressed.<sup>313</sup> Specifically, the FHFA noted that PACE programs significantly alter the traditional mortgage lending practice and that they present a significant risk to lenders and to valuations of mortgage-backed securities.<sup>314</sup>

The FHFA subsequently directed Fannie Mae and Freddie Mac to undertake various prudential actions in order to protect the safe and sound operations of PACE programs with first liens.<sup>315</sup> Shortly thereafter, on August 31, 2010, Fannie Mae and Freddie Mac, citing the FHFA's statement, announced to lenders that they would not purchase mortgages that were secured by properties encumbered by PACE obligations.<sup>316</sup> As a result, the State of California, Sonoma and Placer Counties, the City of Palm Desert, and the Sierra Club sued the FHFA, Fannie Mae, and Freddie Mac for their actions, which allegedly "thwarted certain federally funded, state and locally administered initiatives" known as PACE programs.<sup>317</sup> The United States District Court for the Northern District of California found that the FHFA's directives on PACE obligations amounted to substantive rulemaking rather than an interpretation of the rules, and required that the notice and comment process be followed under the Administrative Procedure Act.<sup>318</sup> The United States Court of Appeals for the Ninth Circuit, however, vacated the district court's order and dismissed the case, concluding that the FHFA's decision to stop purchasing mortgages on PACE-encumbered properties constituted a lawful exercise of its statutory authority.<sup>319</sup>

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312. Statement, Fed. Hous. Fin. Agency, FHFA Statement on Certain Energy Retrofit Loan Programs (July 6, 2010), <http://www.fhfa.gov/Media/PublicAffairs/Pages/FHFA-Statement-on-Certain-Energy-Retrofit-Loan-Programs.aspx>; see also Enterprise Underwriting Standards, 77 Fed. Reg. 36086 (proposed June 15, 2012) (to be codified at 12 C.F.R. pt. 1254) [hereinafter Enterprise Underwriting Standards], available at <http://www.gpo.gov/fdsys/pkg/FR-2012-06-15/pdf/2012-14724.pdf> ("PACE programs involve local governments providing property-secured financing to property owners for the purchase of energy-related home improvement projects.").

313. Statement, Fed. Hous. Fin. Agency, *supra* note 312.

314. *Id.* This has affected other California municipalities as well. For example, San Francisco created a PACE bond financing program known as GreenFinanceSF that would have provided \$150 million in long-term loans to help cover the costs of installing energy efficiency and renewable energy technologies. S.F. 2011 UPDATED ELECTRICITY RESOURCE PLAN, *supra* note 249, at 46. Implementation of the program has been temporarily suspended as a result of the uncertainty of the ability of the homeowner to repay any secured mortgages. *Id.* Additionally, Fannie Mae and Freddie Mac have refused to guarantee mortgages on those homes that utilize GreenFinanceSF financing. *Id.*

315. Statement, Fed. Hous. Fin. Agency, *supra* note 312.

316. *People ex rel. Harris v. Fed. Hous. Fin. Agency*, 894 F. Supp. 2d 1205, 1214 (N.D. Cal. 2012).

317. *Id.* at 1208.

318. *Id.* at 1223; Enterprise Underwriting Standards, *supra* note 312, at 36086.

319. *Cnty. of Sonoma v. Fed. Hous. Fin. Agency*, 710 F.3d 987, 989 (9th Cir. 2013).

Again, bearing in mind that San José's plans for incentivizing its citizens to adopt more energy efficient building practices do not contain any sort of specific policy initiatives or objectives, the foregoing should at least raise a red flag when it comes to San José's expressed intent to "[d]evelop programs that encourage individuals or businesses to complete green building retrofits for their properties through incentives such as . . . financing opportunities."<sup>320</sup> Aside from the fact that monetary incentives are likely not enough to encourage the adoption of more energy efficient behavior, utilizing financing incentives, such as PACE programs, could pose an even larger barrier to increased energy efficiency in the city of San José.

#### 4. LOS ANGELES, CALIFORNIA

In substance, the Los Angeles Green Building Code mostly resembles Berkeley's municipal code in that many energy efficiency measures are expressed in mandatory technical requirements for various buildings.<sup>321</sup> Nevertheless, Los Angeles has also undertaken a significant expressed commitment to reduce its buildings' energy consumption.

In 2011, the Obama Administration launched the Better Buildings Challenge, which seeks to improve the energy efficiency of commercial, institutional, and multi-family buildings across the United States by 20% or more by 2021.<sup>322</sup> Organizations that commit to the Better Buildings Challenge agree to improve the energy efficiency of their buildings by conducting energy efficiency assessments, showcasing energy efficiency projects, and reporting results and performance data on cost-effective approaches for saving energy.<sup>323</sup> The City of Los Angeles was among the initial partners committing to the Better Buildings Challenge, agreeing to provide data on its energy savings and to share its efficiency strategies, which would serve as models for other organizations.<sup>324</sup>

Shortly thereafter, in October 2011, then-mayor Antonio Villaraigosa launched the Los Angeles Commercial Building Performance Partnership (the "LACBPP"), a program designed to help commercial

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320. *Envision San José 2040 General Plan*, *supra* note 304, at 4.

321. See generally L.A., CAL., GREEN BUILDING CODE, ch. IX, art. 9 (2014), available at [http://www.amlegal.com/nxt/gateway.dll/California/lamc/municipalcode?f=templates\\$fn=default.htm\\$3.0\\$vid=amlegal:losangeles\\_ca\\_mc](http://www.amlegal.com/nxt/gateway.dll/California/lamc/municipalcode?f=templates$fn=default.htm$3.0$vid=amlegal:losangeles_ca_mc) (setting forth a wide variety of mandatory and voluntary technical requirements and other measures for various buildings within Los Angeles).

322. See generally U.S. DEP'T OF ENERGY, BETTER BUILDINGS CHALLENGE OVERVIEW, available at [http://www4.eere.energy.gov/challenge/sites/default/files/uploaded-files/BBChallengeProgramOverviewFinal\\_0.pdf](http://www4.eere.energy.gov/challenge/sites/default/files/uploaded-files/BBChallengeProgramOverviewFinal_0.pdf).

323. *Id.*

324. U.S. Dep't of Energy, *Obama Administration Announces 14 Initial Partners in the Better Buildings Challenge*, ENERGY.GOV (June 30, 2011, 12:00 AM), <http://energy.gov/articles/obama-administration-announces-14-initial-partners-better-buildings-challenge>.

properties' owners make their buildings more energy efficient, simultaneously saving tenants money and stimulating the local economy.<sup>325</sup> Through the LACBPP, buildings owners are able to access free energy assessments, along with competitive financing to cover up to 100% of the cost of energy upgrades.<sup>326</sup> Early stages of the LACBPP encompassed over 12 million square feet of commercial building space, covering buildings ranging from less than 10,000 square feet to buildings with more than one million square feet.<sup>327</sup> In total, Los Angeles committed to a 20% energy intensity reduction goal<sup>328</sup> by 2020, covering 30 million square feet of projects.<sup>329</sup> Since December 2010, the Los Angeles General Services Department has initiated more than fifty projects, representing an investment of \$16 million over approximately one million square feet of space.<sup>330</sup> Additionally, the LACBPP has initiated energy audits covering more than 35 million square feet of commercial space since June 2011.<sup>331</sup>

Los Angeles' buildings are already reaping the benefits of energy efficiency through the Better Buildings Challenge. The Los Angeles Central Library, a 500,000 square foot building capable of using the equivalent of 600 households' annual electricity usage each year, received new energy efficient bulbs, an updated HVAC system, and a new cool roof<sup>332</sup> through the Better Buildings Challenge.<sup>333</sup> As a result,

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325. Press Release, Clinton Foundation, Mayor Villaraigosa, The Clinton Climate Initiative and C40 Announce First-of-its-Kind Program in the Country to Retrofit Commercial Buildings (Oct. 12, 2011), <http://www.clintonfoundation.org/main/news-and-media/press-releases-and-statements/press-release-mayor-villaraigosa-the-clinton-climate-initiative-and-c40-announce.html>.

326. *Id.*

327. *Id.*

328. "Energy intensity is defined as the ratio of energy consumption to some measure of demand for energy services." *Energy Efficiency Measurement Discussion*, U.S. ENERGY INFO. ADMIN., [http://www.eia.gov/emeu/efficiency/measure\\_discussion.htm](http://www.eia.gov/emeu/efficiency/measure_discussion.htm) (last modified Feb. 6, 2003); see also GRANADE ET AL., *supra* note 79, at 17 ("Residential and commercial energy intensity are normalized based on BTUs per square foot of space, while industrial intensity is based on BTUs per real dollar of GDP output.").

329. U.S. Dep't of Energy, *Better Buildings Challenge, Los Angeles, CA*, ENERGY.GOV, <http://www4.eere.energy.gov/challenge/partners/better-buildings/los-angeles> (last visited Aug. 26, 2014).

330. *Id.*

331. *Id.*

332. "A high solar reflectance—or albedo—is the most important characteristic of a cool roof as it helps to reflect sunlight and heat away from a building, reducing roof temperatures. A high thermal emittance also plays a role, particularly in climates that are warm and sunny. Together, these properties help roofs to absorb less heat and stay up to 50–60°F (28–33°C) cooler than conventional materials during peak summer weather." *Cool Roofs*, U.S. ENVTL. PROT. AGENCY, <http://www.epa.gov/heatisland/mitigation/coolroofs.htm#1> (last visited Sept. 2, 2014).

333. U.S. Dep't of Energy, *Los Angeles Recognized for Leadership in Energy Efficiency, Better Buildings Challenge*, ENERGY.GOV (Jan. 29, 2014, 12:00 PM), <http://www.energy.gov/articles/los-angeles-recognized-leadership-energy-efficiency-better-buildings-challenge>.

the library is projected to save upwards of \$175,000 in energy costs every year.<sup>334</sup> Similarly, the Advance Paper Box Company is currently renovating its plant's buildings in South Los Angeles, with capital upgrades including an HVAC system with new ducts, a cool roof, and efficient lighting.<sup>335</sup> In 2014 alone, these upgrades are projected to save the company \$79,000 in annual energy costs and reduce annual energy usage by 59,000 BTUs per square foot.<sup>336</sup> At a project size of 65,000 square feet, these upgrades have the potential to save approximately 3.835 billion BTUs of energy in a single year, which is equivalent to well over 1.1 million kWh.<sup>337</sup> As a matter of perspective, it would require roughly 1.2 million pounds of coal to generate the amount of energy<sup>338</sup> saved each year through the efforts undertaken on this single Better Buildings Challenge project.

Rather than pursuing a wide array of mandates and technical requirements, perhaps Los Angeles opted to heed the words of Professor Dan Ariely and commit up-front to a scheme by setting forth a pre-established goal, then designing policies with that goal in mind.<sup>339</sup> To a certain extent, it is too early to tell whether the Better Buildings Challenge and the LACBPP will be a success. Nevertheless, it is clear that the City of Los Angeles has decided to pre-commit to a goal, and has since made significant strides toward attaining that goal.

## V. POLICY PRESCRIPTIONS

*I'm like everyone else—I see the world in terms of what I would like to see happen, not what actually does.*<sup>340</sup>

If nothing else, this article sought to illustrate that the goal of becoming a more energy efficient society cannot be attained simply through one policy mechanism or one targeted change in human behavior. There are many mechanisms we can use and many avenues we can pursue in order to attain our goals. In any event, the processes by which we seek to attain such goals must, at some level, address particular facets of human behavior and utilize those policy mechanisms that best take into account those behaviors.

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334. *Id.*

335. *City of Los Angeles, Advance Paper Box—Energy Upgrade Project*, U.S. DEP'T OF ENERGY, <http://www4.eere.energy.gov/challenge/showcase/los-angeles> (last visited Aug. 28, 2014).

336. *Id.*

337. *Energy Units*, *supra* note 71 (one kWh is equal to approximately 3,412 BTUs).

338. *How Much Coal, Natural Gas, or Petroleum Is Used to Generate a Kilowatt-hour of Electricity?*, U.S. ENERGY INFO. ADMIN., <http://www.eia.gov/tools/faqs/faq.cfm?id=667&t=2> (last visited Sept. 8, 2014) (noting that it would require 1.09 pounds of coal to generate one kWh).

339. ARIELY, *supra* note 18, at 117.

340. PAULO COELHO, *THE ALCHEMIST* 40 (Alan R. Clarke trans., HarperCollins 1993) (1988).

Disclosure has to play some sort of role in designing policies geared toward making our buildings more energy efficient. As we have seen, providing energy-saving information and feedback on energy consumption is successful in eliciting behavioral changes.<sup>341</sup> Additionally, making information on energy usage more salient can help ensure that we do not “rebound” and end up consuming more energy simply because we are adopting energy efficient measures in our daily lives.<sup>342</sup> Merely knowing that we are using less energy is not enough. Rather, we must be aware of our efforts and capitalize on them in order to fully realize the environmental and economic benefits associated with energy efficiency.

Furthermore, adopting a comprehensive set of building codes and standards would certainly eliminate many of the cognitive barriers to energy efficiency because consumers simply would not be able to choose inefficient homes or buildings if they were not offered in the market.<sup>343</sup> Mandatory standards and codes would also encourage manufacturers to provide greater energy efficiency to consumers, especially in those contexts where energy efficiency may not be at the forefront of consumers’ minds.<sup>344</sup> While arguably intrusive, it is hard to ignore the value in having building owners construct more energy efficient buildings because inefficient building practices are no longer being available in the market. California’s mandatory building and appliance standards alone have saved its citizens over \$75 billion in electricity since 1975.<sup>345</sup> Just imagining the benefits from extrapolating similar standards to a national or global scale is enough to cause one to stop and think further about such an enormous opportunity.

As such, the municipal or local level could be an effective starting point for designing and implementing these energy efficiency policies. While local governments are unfortunately constrained by smaller budgets and limited by the geographical jurisdictions over which they can enforce policies, they are better able to design policies that meet the specific needs of their particular communities as compared to federal or state authorities.<sup>346</sup> Despite the obstacles presented by lower budgets at the local level, local governments can still influence building efficiency through non-financial incentives. For example, Arlington, Virginia, grants density and/or height bonuses to buildings achieving LEED certi-

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341. Pollitt & Shaorshadze, *supra* note 17, at 12.

342. See discussion *supra* Part III.B.2.

343. Pollitt & Shaorshadze, *supra* note 17, at 16.

344. *Id.*

345. CAL. ENERGY COMM’N, *supra* note 220, at 28.

346. DORIS ET AL., *supra* note 62, at 2.

fication.<sup>347</sup> The four California cities examined in this article not only provide us with practical methodologies to attain greater energy efficiency, but they also demonstrate how cities can lead by example, utilizing their own knowledge and resources to make a positive impact. We can all learn something from Berkeley's efforts to replace its old, inefficient traffic lights and turn off its own computers,<sup>348</sup> as well as Los Angeles' stated commitment to energy efficiency and the attendant pursuit of those goals in the distinct context of that commitment.<sup>349</sup>

Furthermore, the policies initiated at local levels can demonstrate how similar policies can be employed throughout other jurisdictions. The four case studies examined in this article should provide policymakers, building owners, and individual decision-makers the examples and analysis necessary to understand that greater energy efficiency provides a multitude of opportunities and diverse solutions to be implemented at every level of government and targeted at every possible actor.

## VI. CONCLUSION

Becoming a more energy efficient society does not mean that we need to sacrifice the luxuries of modern society, shuffling around our homes huddled in parkas rather than turning on the heat when the temperature drops. Sacrificing such amenities is not necessarily the best—and certainly not the most desirable—way to become more energy efficient.

Nevertheless, *some* sacrifice will be necessary. We must take the time to understand the underlying concepts of human behavior and think about how our innate behavioral processes inform each and every decision relating to energy efficiency. Few could doubt that capital constraints inhibit greater investment in energy efficiency, but making ourselves aware of how our minds perceive those constraints is what can potentially encourage greater investment. Every decision-maker must stop and take the time to understand the behavioral and cognitive barriers that stand in our way of becoming more energy efficient. Then—and only then—will we be capable of circumventing those obstacles and head full sprint toward the potential benefits that lie therein. After all, failure is not fatal, but failure to change might be.<sup>350</sup>

The sacrifice, then, must be to make a fundamental shift in how we perceive the opportunity—not the problem—of climate change, and

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347. *Id.* at 18.

348. See discussion *supra* Part IV.B.2.

349. See discussion *supra* Part IV.B.4.

350. JOHN R. WOODEN & STEVE JAMISON, WOODEN: A LIFETIME OF OBSERVATIONS AND REFLECTIONS ON AND OFF THE COURT 96 (1997).

determine what steps we must take to capitalize on that opportunity. From beginning to end, one idea has been, and continues to be, the most apt illustration of the situation at hand, embodying the great potential before us as well as the sense of urgency inherent in such a prospect: “This is our opportunity to shape our energy destiny, and we must seize it.”<sup>351</sup>

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351. Chu, *supra* note 1.