

## CLI BACKGROUND PAPER NO. 4

# Extending Intergenerational Equity in Electricity Regulation to Account for Climate Change Effects

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### I. Introduction

The adverse effects of global climate change may not affect the daily lives of billions of people until twenty to thirty years in the future. Current generations may see neither the need for, nor the justice of, addressing these adverse effects in the present. Yet in many fields, actions that will have consequences in future decades are explicitly taken into consideration. Some of these fields include financial and engineering sectors that are often thought of as “traditional” or “conservative” in their rationales and practices. For example, the field of electricity generation, often described as one of the most capital intensive industries in America, is managed and regulated with emphasis on reliability and conservative technical assumptions. That sector’s consideration of “intergenerational equity” is long-standing, explicit, and widespread. An examination of the bases and elements of intergenerational equity in electricity regulation offers insight into how regulators and investors can account for the climate change effects of electricity generation.

Electricity is regulated both in terms of the rates allowed for the sale of electricity and in terms of the planning and permitting of new electricity generation, transmission, and distribution facilities. This paper focuses mainly on regulation of electricity rates and on the regulatory processes governing new generation construction. For regulatory purposes, electricity sales fall into two classes, retail and wholesale. Retail sales are sales that occur from a regulated utility to an end user, such as a residential consumer or industrial plant. Wholesale transactions occur between two utilities, who do not use the electricity themselves, but re-sell it to an end user. Wholesale transactions are commonly referred to as “sale for re-sale.” These classifications are significant in that they determine whether the transaction is regulated by state or federal agencies. The Federal Power Act of 1935 granted the Federal Energy Regulatory Commission (FERC) jurisdiction to regulate wholesale rates,<sup>1</sup> and left retail rate regulation to the individual states.<sup>2</sup>

Generation is the function of producing electricity, some examples of generation facilities are wind farms and nuclear power plants. In contrast to rate regulation, permitting of new electricity generation is generally solely a function of state government. The one very important exception to this rule is the regulation of nuclear generation, which is under the jurisdiction of the federal Nuclear Regulatory Commission (NRC).<sup>3</sup> States have very limited grounds on which they can veto any nuclear construction that is approved by the NRC and they may not approve any nuclear facility that does

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<sup>1</sup> 16 U.S.C. § 824(b) (providing FERC (known then as the Federal Power Commission) jurisdiction over the “sale of electric energy at wholesale in interstate commerce”).

<sup>2</sup> TIMOTHY J. BRENNAN, KAREN L. PALMER, & SALVADOR A. MARTINEZ, *ALTERNATING CURRENTS: ELECTRICITY MARKETS AND PUBLIC POLICY* 27 (2002) (“[State public utility commissions] have been responsible for regulating the distribution and retail sales of electricity.”).

<sup>3</sup> 42 U.S.C. § 5843(b).

not have NRC approval. In sum, both federal and state regulators have some control over the rates of electricity sales and over the construction of new facilities. The following paper draws on intergenerational equity concepts applied by state and federal regulators in regulatory decisions covering both rates and construction permitting.

The reason that intergenerational equity is of such great importance in electricity regulation stems from the long life expectancies of various power sources. Coal plants have a life expectancy of fifty years. Natural gas plants have a life expectancy of three to six decades. Nuclear plants have been licensed for forty years. In reality, however, these design expectations are routinely extended far into the future, and many believe that large generating units may be in the ground for a century. Nevertheless, power plants are built with funding from investors, who have a financial expectation of a thirty to sixty year investment recovery period. Regulators, in establishing appropriate rates for sales of electricity from these plants, have a responsibility to match the investment recovery period to the life expectancy of the plant.

In setting electricity rates that allow for the recovery of investments in the electric generating facilities, regulators must also be conscious of the impact on the rate payers, and that is where the notion of intergenerational equity plays in to various aspects of ratemaking decisions. One of the fundamental goals of ratemaking as a whole is ensuring “that costs associated with electric power plants [are] paid by the ratepayers who benefit from the plant.”<sup>4</sup> This goal implies that regulators must attempt to ensure temporal equity between rate payers. Regulators use the term intergenerational equity to refer to this particular goal.<sup>5</sup> As one commentator explained, regulators use the term intergenerational equity when attempting to match costs “to the period in which the service is provided that [gave] rise to the cost.”<sup>6</sup> Thus, costs that accrue over the life of the plant should be allocated evenly among all customers, both present and future.

Over thirty state public service boards discuss intergenerational equity in their decisions in electricity cases.<sup>7</sup> Intergenerational equity is neither a test nor a requirement; rather, regulators use it as a factor when balancing issues that have some effect on either current customers or future customers. The kinds of issues that raise intergenerational equity concerns are those that either benefit future customers at the expense of current customers, or burden future customers in order to subsidize current customers. Intergenerational equity concerns are apparent in various parts of the ratemaking process. In certain contexts, intergenerational equity is applied implicitly, and in other cases regulators explicitly cite intergenerational equity as a driving concern. The following examples reveal how intergenerational equity is alive in various aspects of ratemaking and in some permitting decisions for new power plants. These examples serve to explain how the existing legal framework of electricity regulation accounts for the interests of future generations, and point the way to an argument that new power plant permitting decisions should account for the future costs of greenhouse gas emissions.

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<sup>4</sup> Kentucky Utility Co. v. F.E.R.C., 760 F.2d 1321, 1324 n.4 (C.A.D.C. 1985) (“[the] ‘used and useful’ principle, enunciated by the Supreme Court in *Smyth v. Ames*, 169 U.S. 466 (1889), has stood as a bedrock principle of utility rate regulation.”).

<sup>5</sup> Sean P. Madden, Note, *Takings Clause Analysis of Utility Ratemaking Decisions: Measuring Hope’s Investor Interest Factor*, 58 Fordham L. Rev. 427 (1989).

<sup>6</sup> James Norris, *Postretirement Benefits: Accounting and Rate Policy*, 141 PUB. UTIL. FORTNIGHTLY 46, 47 (1993).

<sup>7</sup> See, e.g., In re Electricity Energy Adjustment Clause, 2008 WL 376892 (Iowa U.B., Feb 07, 2008) (“The Board believes that the [energy adjustment clause] rules should be reexamined in light of the new emissions allowances and concerns regarding intergenerational equity.”); In re Wisconsin Elec. Power Co., 260 P.U.R.4th 169, 2007 WL 2846904 (Wis.P.S.C., Sep 25, 2007) (“As the Commission stated in its order approving the sale of KNPP, allowing ratepayers to recapture a portion of the decommissioning dollars ‘is an immediate financial benefit to consumers’ and ‘will also promote intergenerational equity by avoiding the possibility of a long delay before any refunds are made.’”); In re Florida Power & Light Co., 2005 WL 1000256 (Fla.P.S.C., Apr 19, 2005) (“These three parts act together to allow FPL over time to recover the full costs of storm restoration, while at the same time balancing potentially competing customer interests: as small an ongoing impact on customer bills as possible; minimal volatility of “rate shock” in customer bills because the reserve is insufficient; and intergenerational equity.”).

## II. Depreciation: An Accounting Mechanism to Defer Costs to Match Future Benefits

Since power plants are expected to be financially useful for at least three decades, intergenerational equity concerns dictate that a portion of the costs incurred during the construction of the plant should be deferred into the future. In order to do so, traditional ratemaking uses accounting principles, either depreciation<sup>8</sup> or amortization<sup>9</sup>, to ensure that investors receive a fair return on their investment and that customers pay for the cost of power they actually consume.

It is important to understand the distinction between depreciation of the value of the property, and depreciation as an accounting tool, because the two uses of depreciation serve different purposes. In *Principles of Public Utility Rates*, often described as the fundamental text for utility ratemaking, Bonbright explains that “the deduction for depreciation as a negative term in the rate base does not purport to measure the loss in value actually sustained . . . What it represents is the amortized costs of the assets in the sense of that part of the costs which has already been charged,”<sup>10</sup> and is thus distinct from the portion of the cost not yet recovered, which remains to be charged to future customers. “‘Cost minus depreciation’ is therefore a shorthand expression for costs remaining to be amortized by future charges to operation and hence indirectly by future charges against the consumers of public utility service.”<sup>11</sup> The substantive effect of these technical accounting terms is that a portion of the large original investment costs is recovered not from those paying for electricity at the time of investment, but rather from those paying for electricity in the decades following the investment (i.e., from those who benefit from the value of the plant in future years).<sup>12</sup> The principle that those who benefit from the existence of the plant should pay its costs is a specific example of achieving intergenerational equity through a very traditional accounting mechanism.<sup>13</sup>

## III. Explicit Applications of Intergenerational Equity Principle

### A. Allowance for Funds Used During Construction & Construction Work in Progress

Another intergenerational equity issue that arises in electricity regulation is that the capital necessary to build a power plant is required three to ten years before the plant is actually “useful,” or operational. Thus, there is a fundamental mismatch between the time in which the cost of building the power plant is incurred and the time at which the benefits of the plant accrue. Utilities argue that they should be permitted to recover capital construction costs immediately since the costs of borrowing money to build the power plant are already being incurred. If regulators permit a utility to begin

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<sup>8</sup> In utility ratemaking, depreciation means the loss of value of an asset from physical deterioration “caused by wear and tear from operation, decay from the passage of time, and damage or destruction from accidents.” GLENN L. JOHNSON & JAMES A. GENTRY, FINNEY AND MILLER’S PRINCIPLES OF ACCOUNTING: INTERMEDIATION 402 (7th ed. 1974).

<sup>9</sup> Amortization is traditionally used in the accounting of intangible assets to capture their decline in value over the course of its useful life. FIN. ACCOUNTING STANDARDS BD., STATEMENT OF FINANCIAL ACCOUNTING STANDARDS NO. 142: GOODWILL AND OTHER INTANGIBLE ASSETS 10–11 (June 2001). Although the amortization and depreciation have different purposes—depreciation describes decline in value of a tangible assets and amortization to capture the decline in value of an intangible asset—they have the same net result: capturing the value of an assets over the course of its known or expected life.

<sup>10</sup> JAMES C. BONBRIGHT, ALBERT L. DANIELSEN, & DAVID R. KAMERSCHEN, PRINCIPLES OF PUBLIC UTILITY RATES 270 (2nd Ed. 1988).

<sup>11</sup> Id.

<sup>12</sup> See BONBRIGHT, et al., *supra* note 10, at 273 (“In this way, the attempt is made to apportion the costs of the assets among the years during which they perform service instead of charging them in lumps either to the year of acquisition or to the year of retirement.”).

<sup>13</sup> See *In re Missouri Pub. Serv. Comm’n*, 1998 WL 222959 (Mo. P.S.B., Mar. 18, 1998) (“UtiliCorp states depreciation expense should, to the extent possible, match either the consumption of the facilities or the revenues generated by the facilities. The matching concept is also an essential element of the basic regulatory philosophy of intergenerational equity.”).

to recover the cost of building a power plant before the plant is actually operational, however, current customers are forced to subsidize future customers' consumption.<sup>14</sup>

Regulators and courts have decided that utilities, in most cases, are permitted to charge customers for at least some of the capital costs associated with the construction of a power plant prior to the plant's operation.<sup>15</sup> These decisions strike a balance between two different methods for calculating and allocating construction capital costs. One method, the allowance for funds used during construction (AFUDC), does not actually permit the utility to recover construction costs until after the plant is operational.<sup>16</sup> Instead, AFUDC permits the utility to maintain an accounting of the construction capital plus accrued interest, both of which are later added to the total cost of the plant after it becomes operational.<sup>17</sup> Under this method, there is no intergenerational equity issue because customers only pay for construction costs once the plant is operational. On the other hand, while the utility does eventually collect construction costs and interests, it does not do so until much later, which can impose a significant financial burden on the utility.<sup>18</sup> Furthermore, since the construction costs are accruing interest, it raises the overall cost of the plant.<sup>19</sup>

The construction work in progress (CWIP) charge is more controversial from an intergenerational equity perspective.<sup>20</sup> Although CWIP accounts for all of the same costs as the AFUDC method, there is an important difference: under CWIP current customers pay construction capital costs before the plant is operational.<sup>21</sup> Future customers benefit since they are not paying the full construction costs of the plant and avoid paying interest that accrues under the AFUDC method. However, current customers are paying for a plant that does not directly benefit them since the plant is not currently producing electricity.

An example will help highlight the differences for intergenerational equity between the two recovery methods. Assume that a new power plant will take ten years to construct and that it will cost \$1 million each year for a total cost of \$10 million. Under the AFUDC approach, investors have a right to collect the entire \$10 million after the power plant is operational. So at the end of year one, \$1 million dollars is recorded. At the end of year two, another million is added as well as interest on the first year's million. At the end of year three, another million is added, plus a second year's interest on the first million, and one year's interest on the second million. This continues for ten years, so that nine years of interest has accumulated on the first year's million, eight years of interest on the second year's million, and so on. At the end of ten years when the plant is operational, the \$10 million plus accumulated interest is added into the utility's base of assets and averaged over the expected useful life of the plant for ratemaking purposes. In the same scenario, but under the CWIP approach, the first year's million is added into the utility's accounting for the purposes of present ratemaking at

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<sup>14</sup> See BONBRIGHT, et al., *supra* note 10, at 253 (explaining the customer's view of CWIP charges).

<sup>15</sup> See Charles F. Phillips, Jr., *The Regulation of Public Utilities* 324 n. 154 (1984) ("many commissions began to permit all or part of the CWIP in the rate base."); see also *Re Potomac Elec. Power Co.*, 258 P.U.R. 4th 463, 464 (Md.P.S.B. July 19, 2007) ("[The board] finds that its long-standing policy [of allowing CWIPS] protects utilities against rate obsolescence, while promoting equity between current and former customers.").

<sup>16</sup> See BONBRIGHT, et al., *supra* note 10, at 246.

<sup>17</sup> *Id.*

<sup>18</sup> See Anil K. Makhija & Howard E. Thompson, *The Ratepayer and Stockholder Under Alternative Regulatory Policies*, 62 *LAND ECON.* 119, 121–22 (1986) (discussing the intergenerational equity aspects of the CWIP and AFUDC debate).

<sup>19</sup> See *id.* at 121 (explaining that later ratepayers are "pay[ing] returns on an inflated rate base once the plant comes on line.").

<sup>20</sup> See BONBRIGHT, et al., *supra* note 10, at 246 (quoting Howe and Rasmussen's (1982, p.92) summary of "the present sound and fury surrounding how company funds committed prior to a plant going on streams should be handled . . .").

<sup>21</sup> *Id.*, at 249–251.

the end of year one, thus no interest accrues. However, rate payers who are not receiving power from the plant are paying for its year one construction costs.

Although an intergenerational equity issue arises, many state public utility commissions as well as the Federal Energy Regulatory Commission permit some recovery through the CWIP method.<sup>22</sup> The reasons are largely practical. As Bonbright explains, utilities began to permit CWIP charges “because of the hard times confronting utilities in the 1980s—involving significant cash flow, earnings, and” questions over whether utilities could satisfactorily pay their debts.<sup>23</sup> In recent years, questions have arisen over whether utilities still need CWIP charges since the industry as a whole is in better financial shape. Indeed, some states have strict limits on when utilities may recover construction costs under the CWIP methodology.<sup>24</sup> Utilities continue to argue that they need the upfront payment in order to remain in good financial standing, otherwise they are forced to use additional external financing.<sup>25</sup> The need for additional financing increases the overall capital costs of the project, thus increasing its risk. The long-term effect of preventing recovery under CWIP is that utilities have a more difficult time financing large projects in the future.<sup>26</sup> In sum, utility regulators must work to balance the utilities’ present financial needs for CWIP against the fact that CWIP is not as true to the intergenerational equity principles that guide electricity rate regulation.

## B. Decommissioning Funds

Decommissioning is the process by which power plants are shut down, dismantled, and cleaned up at the end of their useful lives. Nuclear plant decommissioning is an especially important issue because of the degree of toxicity and danger to human health and the environment associated with nuclear waste. Many think of nuclear waste as the spent fuel, such as uranium and plutonium rods, but there are several other parts of the plant that come into contact with radioactive waste and must therefore be cleaned and stored during decommissioning. For instance, the power plant’s nuclear reactor, where the neutron bombardment takes place, must be given time to decay before humans can even enter the reactor. The plant’s piping systems must also be cleaned and stored since the pipes carry radioactive water that has been used in the reactor. Nuclear plant decommissioning then is the cleaning, dismantling, and storage/disposal of the parts of a nuclear power plant contaminated with radioactive waste. Decommissioning costs are not known with a high level of certainty at the beginning of the plant’s operating life, especially since the industry has had little experience decommissioning nuclear power plants. While scientists do know a great deal about uranium and plutonium decay, they cannot predict with perfect accuracy how long it will take the build up of such elements to decay in the reactors.<sup>27</sup> Additionally, the costs must be up-dated on a regular basis to reflect inflation. To date, thirteen nuclear power plants have been retired and are in some stage of decommissioning.<sup>28</sup>

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<sup>22</sup> See *Mid-Tex Elec. Coop. Inc. v. FERC*, 773 F.2d 327, 334 (C.A.D.C. 1985) (holding that FERC could permit utilities to recover up to 50% of their construction costs through the construction while in progress method).

<sup>23</sup> See BONBRIGHT, et al., *supra* note 10, at 250; see also Makhija & Thompson, *supra* note 18, at 120 (explaining that even though the utility did not begin to recover capital costs until after the plant was operational, they still included the capitalized cost as a credit to net income and therefore ran into significant cash flow problems).

<sup>24</sup> See, e.g., 16 TEX. ADMIN. CODE § 25.231(c)(2)(D) (2008) (permitting the construction while in progress method under “exceptional circumstances”); FLA. ADMIN. CODE ANN. R. 25–6.0141(1)–(2) (2008) (setting forth the circumstances for when CWIP and AFUDC are permitted); 170 IND. ADMIN. CODE 4–6–1(e) (allowing CWIP for “balances of all work orders for qualified pollution control property”) (2008).

<sup>25</sup> See BONBRIGHT, et al., *supra* note 10, at 252.

<sup>26</sup> *Id.*

<sup>27</sup> See Caldicott, *supra* note 31, at 53–60 (summarizing the half-life times of the radioactive elements).

<sup>28</sup> See U.S. Nuclear Regulatory Commission, Fact Sheet: Decommissioning Nuclear Power Plants 4–5 (2008), available at <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/decommissioning.pdf> (providing a list of retired nuclear power plants).

The federal government estimates that decommissioning costs for all nuclear power plants is upwards of \$30 billion dollars.<sup>29</sup> Since the cost of decommissioning is so significant and the process itself is so essential, the Nuclear Regulatory Commission (NRC) requires nuclear power plant owners to provide “reasonable assurances” that they will be able to pay estimated decommissioning costs.<sup>30</sup> Plant owners must ensure that they will have collected and set aside sufficient funding from all customers over the life of the plant to fund decommissioning costs. The NRC has formulated detailed regulations on the types of financial assurances owners must provide<sup>31</sup> and on calculating the cost of decommissioning.<sup>32</sup> These NRC requirements thus force nuclear power plant owners to establish decommissioning funds that are funded during the life of the nuclear plant. In this way, decommissioning funds are an attempt to prevent the intergenerational inequity that would arise if decommissioning costs had to be covered by the generation that existed at the end of a nuclear plant’s useful life. A decommissioning fund accelerates costs to match current benefits so that those who benefit are the same as those who pay for the costs of the good that they consume.

The foregoing examples illustrate how the utility industry has long recognized the concept of intergenerational equity when assigning the costs of power plants among customers. At times intergenerational equity means deferring costs that are presently incurred, such as power plant construction costs, to the generation who realizes the benefits of the project. Other times it means accelerating the otherwise future costs of a project so that the present generation, who is reaping the benefits of the project, will pay for their benefits, such as the case of nuclear power plant decommissioning. Controlling greenhouse gases requires that utilities presently incur the costs of pollution control technology now to avoid future environmental harm. While none of the examples above provide a perfect model for the way regulators can ensure justice between generations, they do provide a reveal a longstanding tradition of ensuring temporal equity between benefits and costs in the field of utility regulation. These examples also serve as a starting point for a sound legal framework to impose the future costs of climate change on the generations that are currently benefiting from anthropogenic sources of greenhouse gases.

#### IV. Intergenerational Aspects of Carbon Dioxide.

I am breathing, working, and playing in my great-great-grandmothers’, and my great-grandmothers’, and my grandmothers’ and my mother’s carbon dioxide. Looking forward, my niece, and my grand-niece, and my great-grand-niece, and probably my great-great-grand-niece (assuming the species lasts that long) will be breathing the CO<sub>2</sub> produced by my Toyota Camry (which, ironically, I inherited from my grandmother) today. Unfortunately, CO<sub>2</sub> emissions are not the kind of link you want tying your family’s generations together. But given that CO<sub>2</sub> has those intergenerational effects, and given that we will at best slow, not eliminate, our carbon emissions, we should take steps to extend the intergenerational equity principles that are already so prevalent in electricity regulation to the costs and benefits of CO<sub>2</sub> emissions.

Electricity generation is responsible for at least one-third of the anthropogenic carbon dioxide emissions in the United States.<sup>33</sup> The expected lifetime of a coal-fired power plant is far less than the 100–1,000 year atmospheric lifetime

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<sup>29</sup> GAO, NUCLEAR REGULATION: BETTER OVERSIGHT NEEDED TO ENSURE ACCUMULATION OF FUNDS TO DECOMMISSION NUCLEAR POWER PLANTS 2 (1999), available at <http://www.gao.gov/archive/1999/rc99075.pdf> (noting that \$14 billion is unaccounted for).

<sup>30</sup> NUCLEAR REGULATORY COMMISSION, CONSOLIDATED NMSS DECOMMISSIONING GUIDANCE: FINANCIAL ASSURANCE, RECORDKEEPING AND TIMELINESS (2003).

<sup>31</sup> NRC Financial Assurances & Recordkeeping Regulations, 10 C.F.R. §§ 30.35, 40.36, 70.25, 72.30 (2003).

<sup>32</sup> *Id.*

<sup>33</sup> See U.S. ENVIRONMENTAL PROTECTION AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS 1990–2005 Table ES–3 (2007) (stating that the electric power sector is responsible for 33% of total U.S. emissions and 41% of U.S. emissions from fossil

of CO<sub>2</sub>. Consequently, electricity production for even the first generation of that plant's beneficiaries will create CO<sub>2</sub> emissions that will remain in the earth's atmosphere long after the plant ceases to produce power. Similarly, the power plant's carbon dioxide emissions will far outlive even the last generation of the power plant's customers. Thus, even if those second or third generation beneficiaries begin to pay some of the climate change costs of the plant's carbon dioxide emissions, the full sum of the costs will be borne by generations who never enjoyed the benefits of the power plant. These intergenerational inequities should be included in utility regulators' decision making processes when they consider developers' applications for new electricity generation.

## V. Implementing the Intergenerational Costs of Carbon Dioxide Emissions in Utility Decisions.

New electricity generation in the United States is permitted and approved at the level of state government. Each state has a quasi-judiciary regulatory body, usually known as the Public Utility Commission (PUC) or Public Service Board (PSB), whose many responsibilities include certification of new power plants and rate setting for electricity sales to end users. These agencies' duties are imposed by statute, and the governing statutes also dictate the issues that the PUC is obligated and authorized to consider when certifying new plants and setting rates. A PUC's own decisions, including rulemakings, and the decisions of state appellate courts ruling on appeals from PUC decisions, further develop the legal framework within which the PUC and the regulated entities within the state operate.

Most PUC enabling statutes authorize or require the state's PUC to consider the environmental effects of its decisions.<sup>34</sup> Some states specifically provide for realization of environmental goals in rate setting, not just plant certification, decisions.<sup>35</sup> States have also chosen to impose surcharges on all electricity rates to fund environmental programs, "support the use of renewable resources, and to promote energy efficiency and conservation."<sup>36</sup> Some PUCs are subject to state environmental policy or quality acts, which are state-level versions of the National Environmental Policy Act of 1999 (NEPA).<sup>37</sup> NEPA and its state counterparts require environmental assessments of all major government actions, and, when the actions will have significant environmental consequences, then the involved agencies must produce full environmental impact statements and scope out alternative government actions to minimize adverse environmental effects.<sup>38</sup> In sum, environmental review of electricity generation projects is now a common part of the existing regulatory structure, and many PUCs have the authority to consider environmental goals in rate setting, or are required to assign part of an electricity charge to a fund that furthers environmental goals.

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fuel combustion), available at <http://www.epa.gov/climatechange/emissions/downloads06/07CR.pdf>. Consulting the U.S. Energy Information Administration statistics of total carbon dioxide emissions for the residential, commercial, industrial, transportation, and electricity sectors from 2005 puts the emissions from the electricity sector closer to one-half of total emissions. DOE/EIA-0573(2006), available at <http://www.eia.doe.gov/oiaf/1605/ggrpt/carbon.html> (carbon dioxide emissions generated from all of these sectors for 2005 was approximately 6,398 million metric tons, and electricity-related emissions totaled approximately 3,070 million metric tons. Note that the electricity sector total reported here results from adding the electricity related emissions from the industrial and transportation sectors (667.3 and 4.9 million metric tons, respectively) to the total emissions attributed to the electricity sector). See also REDUCING U.S. GREENHOUSE GAS EMISSIONS: HOW MUCH AT WHAT COST? McKinsey & Company, U.S. Greenhouse Gas Abatement Mapping Initiative, Executive Report (December 2007), 7, Exhibit 3 (showing total U.S. carbon dioxide emissions for 2005, with electricity and heat accounting for 47% of the total), available at [http://www.mckinsey.com/client-service/ccsi/pdf/US\\_ghg\\_final\\_report.pdf](http://www.mckinsey.com/client-service/ccsi/pdf/US_ghg_final_report.pdf).

<sup>34</sup> Michael Dworkin et. al., *Revisiting the Environmental Duties of Public Utility Commissions*, 7 Vt. J. Env. L. 1, 3 (2006).

<sup>35</sup> *Id.* at 7.

<sup>36</sup> *Id.*

<sup>37</sup> *Id.* at 4.

<sup>38</sup> *Id.*; 42 U.S.C. § 4332(2)(C).

A recent statistical study shows that there is a significant relationship between giving PUCs the authority to consider the environmental impacts of electricity generation and slowing the growth of carbon dioxide emissions from power plants.<sup>39</sup> Sautter and Switzer's study compared the growth in carbon dioxide emissions from in-state power sources between states where PUCs have statutory duties to consider environmental impacts of electricity projects and states where PUCs have no such duties. Their results show that states where environmental impacts are not considered exhibited a three year growth rate in carbon dioxide emissions that was seven times greater than the growth rate in states with environmental considerations.<sup>40</sup> As the study makes clear, this slowing of the growth of carbon dioxide emissions was achieved even though none of the state laws and regulations respecting environmental considerations mentions climate change or greenhouse gases.

By tying together these themes in electric utility regulation, a strong case can be made that the legal framework exists for PUCs to begin implementing the future costs of carbon dioxide emissions in today's power plant decisions. And PUC proceedings are an important area of focus in today's fight against climate change. The first generation of nuclear power, and the most recent generation of coal-fired power plants, are both reaching the ends of their useful life spans. At the same time, nationwide demand for electricity is still growing, despite efforts in some areas to increase electric efficiency and conservation measures.<sup>41</sup> Consequently, developers are planning over 160 new coal-fired power plants across the United States.<sup>42</sup> To successfully oppose coal-fired power plants, advocates must overcome the reigning economic reality that generating electricity from coal plants is relatively inexpensive.<sup>43</sup> The economics of coal places coal generation in a favorable position in PUC proceedings where the commissions have a legal obligation to consider the public interest in their decisions. Opponents of new coal-fired generation must, therefore, be able to make strong arguments, based in existing law, for denial of the necessary certification.<sup>44</sup>

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<sup>39</sup> John A. Sautter & Christina Switzer, *A Change in Climate? How State Regulators Are Making Decisions in Response to Global Warming*, 21 *ELECTRICITY J.* 38 (2008).

<sup>40</sup> *Id.* at 41.

<sup>41</sup> The authors recognize that demand for electricity in China, India, and other developing nations is increasing at an even greater rate than in the U.S. *WORLD ENERGY OUTLOOK 2007 EXECUTIVE SUMMARY*, 3–4, International Energy Agency (OECD/IEA 2007), available at <http://www.iea.org/Textbase/npsum/WEO2007SUM.pdf>. Given the global nature of the causes and effects of climate change, the principles discussed here could have helpful effects in other countries' decision making, but it is important to recognize that these principles are grounded in existing U.S. utility law.

<sup>42</sup> Some planned plants have already been canceled due at least in part to regulatory uncertainty. "Don't Get Burned: The Risks Of Investing In New Coal-Fired Generation," 9, Prepared for the Interfaith Center on Corporate Responsibility by Synapse Energy Economics, Inc. (2008), available at <http://www.synapse-energy.com/Downloads/SynapseReport.2008-02.ICCR.Don%27t-Get-Burned-Risks-of-New-Coal.07-014.pdf>.

<sup>43</sup> *THE COST OF GENERATING ELECTRICITY: A COMMENTARY ON A STUDY CARRIED OUT BY PB POWER FOR THE ROYAL ACADEMY OF ENGINEERING*, 2 (2004), available at [http://www.eusustel.be/public/documents\\_publ/links\\_to\\_docs/cost/cost\\_generation\\_commentary.pdf](http://www.eusustel.be/public/documents_publ/links_to_docs/cost/cost_generation_commentary.pdf) (showing the cost of coal-fired generation as approximately half the cost of wind and wave generation). See also International Energy Agency, available at <http://www.iea.org/textbase/npsum/ElecCostSUM.pdf> (stating that coal plants produce power at a cost of \$25-\$50/MWh compared to wind generation at \$35-\$95/MWh and solar at \$150/MWh).

<sup>44</sup> The October 2007 decision of the Kansas State Department of Health and the Environment to deny an air quality permit to a proposed coal-fired generation facility is an excellent example of government action that tries to account for the costs of CO<sub>2</sub> emissions in decision making. Press Release, Kansas Dept. of Health & the Environment, *KDHE Denies Sunflower Electric Air Quality Permit*, Oct. 18, 2007, available at [http://www.kdheks.gov/news/web\\_archives/2007/10182007a.htm](http://www.kdheks.gov/news/web_archives/2007/10182007a.htm). While the Department of Health and Environment is not the state PUC, the principles behind its decision are similar to those advocated here for PUCs. As discussed above, many state PUCs, in addition to the state environmental agencies, now have authority to address environmental concerns. Dworkin et. al., *supra* note 34 at 1.

PUCs have the duty to regulate in the public interest, which means that they must account for public economic concerns. Indeed, PUCs are commonly (though incorrectly) conceived of as “solely economic regulators.”<sup>45</sup> In reality, PUCs balance a number of often competing public interests, including the economic interests of different sub-groups of the public, as well as environmental and health concerns. A widely adopted standard for PUC decision-making is the “least-cost” standard. Even though some states expressly order PUCs to consider environmental costs in the least-cost evaluation,<sup>46</sup> it remains true that environmental costs are more difficult to quantify than economic costs. Furthermore, as of 2006, the PUCs of twenty states had no statutory obligation to consider environmental consequences in certification of new electric facilities.<sup>47</sup> Consequently, a proposed power plant promising very low consumer electricity rates enters the regulatory ring with a distinct advantage in the certification process.

Coal is a plentiful domestic fuel and the technology for generating electricity from coal is now well-developed.<sup>48</sup> Alternative generation sources, such as wind, solar, or wave, are in various stages of technological development and improvement, but are all still more expensive than coal because of the cost of the technologies (the fuels, obviously, are free).<sup>49</sup> As long as carbon dioxide remains an externalized cost of electricity generation, coal’s economic advantages may remain in place for the foreseeable future. Certainly, a carbon tax or carbon cap has the potential to change the paradigm, but commentators suggest that the price of carbon has to be higher than current legislative proposals would put it in order to substantially affect U.S. CO<sub>2</sub> emission rates.<sup>50</sup> Thus, even if the federal government begins to internalize the cost of CO<sub>2</sub> emissions tomorrow, it is unlikely that those beginnings will promptly make a real impact on private decision making. As long as the government-imposed cost of emitting CO<sub>2</sub> remains lower than the cost of preventing the emissions—by adopting new technology or switching to alternative fuels—the rational economic actor will continue to emit. But if utility regulators are called on to use their authority and duty to consider the environmental impacts of their decisions, and pair those considerations with the principle of intergenerational equity, then new coal-fired generation should become a much less attractive option, even on an economic basis.

Some argue that the costs of climate change are too uncertain to be estimated for the purposes of on-the-ground-decision making about necessary goods like electricity. However, PUCs need not calculate the costs of climate change effects in order to place a price tag on CO<sub>2</sub> emissions. Instead, PUCs can simply require that coal plant

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<sup>45</sup> Dworkin et. al., *supra* note 34 at 1; *see also* BONBRIGHT, et al., *supra* note 10, at 72–73 (noting that it is “frequently found in the literature of rate theory, that this theory is concerned solely with the *economic* principles of ratemaking, or solely with considerations of economic efficiency or *economic* welfare”) (emphasis in original).

<sup>46</sup> *See* Vermont’s statute addressing utility planning, which requires electric and gas utilities to meet “the public’s need for energy services . . . at the lowest present value life cycle cost, including environmental and economic costs.” 30 V.S.A. § 218c(a)(1) (2000).

<sup>47</sup> Dworkin et. al., *supra* note 34 at 3.

<sup>48</sup> JOSEPH TOMAIN, *ENERGY LAW IN A NUTSHELL*, 224 (Thomson West 2004).

<sup>49</sup> *See, i.e.*, THE COST OF GENERATING ELECTRICITY: A COMMENTARY ON A STUDY CARRIED OUT BY P&B POWER FOR THE ROYAL ACADEMY OF ENGINEERING, 2 (2004), *available at* [http://www.eusustel.be/public/documents\\_publ/links\\_to\\_docs/cost/cost\\_generation\\_commentary.pdf](http://www.eusustel.be/public/documents_publ/links_to_docs/cost/cost_generation_commentary.pdf); World Energy Assessment Overview: 2004 Update, Table 7, 50 (United Nations Development Programme), *available at* [http://www.undp.org/energy/docs/WEAOU\\_part\\_IV.pdf](http://www.undp.org/energy/docs/WEAOU_part_IV.pdf) (comparing 2004 prices of electricity generation for various renewable sources with projected future costs).

<sup>50</sup> *Cf.* Adam Newcomer et. al. “Short Run Effects of a Price on Carbon Dioxide Emissions from U.S. Electric Generators” ENVIRON. SCI. TECHNOL., 42(9), 3139-3144 (2008) (citing literature finding that a \$35-\$50/ton price for carbon dioxide emissions would be necessary to produce significant investment in new technology to reduce carbon emissions, and finding that a \$35/ton price, if imposed instantaneously, could produce a 10% decrease in emissions from electricity generation even before new technologies would be developed or deployed) and the Lieberman-Warner bill, S.2191, which would initially set the cost of carbon at \$10/ton, increasing to \$30/ton by 2024 and to \$45/ton by 2030. “The Lieberman-Warner Climate Security Act—S.2191 Modeling Results from the National Energy Modeling System—*Preliminary Results*” Jonathan Banks, Clean Air Task Force (January 2008), 8, *available at* <http://lieberman.senate.gov/documents/catflwca.pdf>.

construction includes the technology necessary to capture CO<sub>2</sub> emissions and transport the emissions to a permanent (non-atmospheric) disposal facility. Further, PUCs should require financial and technological assurances that the plant will be able to dispose of the captured carbon in a way that will prevent it from reaching the atmosphere, i.e., through geological or deep ocean sequestration. Conceptually, this is similar to requiring nuclear plant owners to dedicate funds for decommissioning the plants and to requiring wind generation owners to accomplish restoration of wind turbine sites.<sup>51</sup> In each case, substantial pre-funding may be required before plant operation, and funds are “topped off” from operating revenues when estimated closure costs are recalculated (roughly annually).<sup>52</sup>

The above-described approach to internalizing the costs associated with carbon dioxide emissions has several advantages. First, requiring plants to capture and sequester CO<sub>2</sub> emissions will actually stop the main environmental harm instead of just allowing a successful developer to pay for the privilege of polluting. Second, by using the cost of preventing the emissions as a substitute for calculating the cost of the harms caused by emissions, regulators can avoid a long fight over the difficulty of quantifying potential future harms. Finally, the costs of carbon capture and sequestration are far from negligible, and would be enough to increase the cost of coal-fired electricity above that of some alternative fuels for electricity generation.<sup>53</sup>

In sum, by combining (1) the well-established principle of intergenerational equity and (2) PUCs’ authority to account for the environmental effects of their decisions, PUCs currently have the power to require electricity generation sources to account for the future costs of carbon dioxide emissions during the life of the power plant. PUCs can exercise this authority after a finding of fact to the effect that CO<sub>2</sub> emissions have a harmful effect on the environment through climate change processes, and that climate change poses a significant environmental threat to future generations. Once these factors are realized, regulators can use intergenerational equity principles to impose the appropriate technological conditions on the plant.

## VI. Conclusion.

Not surprisingly, those who work and live in the present welcome the efforts to defer costs and oppose efforts to accelerate them.<sup>54</sup> The examples provided in Parts II and III illustrate both scenarios: depreciation allows the current generation to defer some of the costs of a power plant that will serve several generations to those generations, and nuclear plant decommissioning funds force current generations to pay for the future costs of safely closing the nuclear power plant that presently supplies its electricity. The decommissioning example is strikingly similar to the hypothetical situation of recognizing (and paying) today the costs that emitting greenhouse gases will impose on future generations. Another similarity with the decommissioning example is found in our current political fight over curbing or paying for greenhouse gas emissions—the battle to require pre-funding for future nuclear decommissioning costs evoked comparable passions. The hope is that today’s struggle will be equally successful in bringing lawmakers and regulators to recognize that as a matter of intellectual honesty or economics, the underlying principle of temporally matching costs with benefits is important, legitimate, and widely recognized in electricity regulation.

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<sup>51</sup> *Supra* at 6, n.27, 28; *see, i.e.*, ND ST 49-02-27 (empowering the PUC to establish rules governing the decommissioning of wind energy facilities, specifically addressing estimated costs, a schedule for updating those cost estimates, and ensuring that funds for decommissioning will be available).

<sup>52</sup> *Id.*

<sup>53</sup> The Intergovernmental Panel on Climate Change estimated that CCS would cost \$20—\$290 for every metric ton of carbon captured and sequestered. For electricity generation in particular, CCS costs would raise the cost of electricity by \$0.01-0.04/kWh. WORKING GROUP III OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, IPCC SPECIAL REPORT ON CARBON DIOXIDE CAPTURE AND STORAGE (Cambridge Univ. Press 2005), 11, *available at* <http://www.ipcc.ch/ipccreports/special-reports.htm>.

<sup>54</sup> As the classic cartoon character Wimpy said to Popeye, “I will gladly pay you Tuesday for a cheeseburger today.” [EHC Disclaimer: Michael insisted on this note—it is one of his favorite quotes.]