STRANDED ASSETS AND EFFICIENT PRICING FOR REGULATED UTILITIES: A FEDERAL TAX SOLUTION

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Abstract

Most businesses recoup their investments in property, plant, and equipment from the income they earn from using those assets. When changes in markets, technology, or regulations reduce income from those assets or increase operating costs, businesses may not recover their full investments in those "stranded assets." Unregulated firms generally contain these risks by diversifying assets and income streams, procuring insurance, or engaging in hedging transactions. Public utilities, however, must obtain a regulator's permission both to manage these risks and to pass the costs of those assets forward to consumers. Globally, over $20 trillion in global fossil fuel assets may be stranded as countries pass climate change legislation. To date, investor and consumer concerns about stranded costs have delayed the adoption of carbon pricing schemes, spurred the rejection of greenhouse gas regulation altogether, and formed the basis for bankruptcy filings, takings litigation, and demands for relief.

This article makes four contributions. First, it clarifies that under the existing tax and regulatory rules, the economic benefits of substantial tax subsidies are currently being passed forward to consumers, artificially reducing fossil fuel electricity rates, encouraging waste, and increasing emissions. Second, it quantifies the extent of stranded assets held by public utilities in the United States, pulling data on unrecovered capital from the securities filings of the fifteen largest firms in the country. Third, it argues that U.S. tax measures have left fewer assets to be stranded, identifying $110 billion in "accumulated deferred income taxes" or "ADIT," the tax savings from deferral, as a source of recovery. Finally, the article proposes a change in tax and regulatory policy that will enhance efficiency, remove one of the supports for carbon lock-in, and help manage the threat of stranded assets, smoothing the transition to a carbon-neutral economy.

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I. INTRODUCTION: TAX SUBSIDIES, STRANDED ASSETS, CARBON LOCK-IN, AND WHY THEY MATTER

Stranded assets are fixed assets, property, plant, and equipment, that are rendered noncompetitive or nonoperational as a result of a change in the market. New government regulations, changes in the interpretation and application of existing law, technological breakthroughs that alter access to existing resources or provide an alternative product that competes with the asset, changes in social norms and consumer choices, and environmental changes may all render existing assets less valuable.[1] Consequently, assets may suffer from unexpected early write-offs, negative revaluations, or conversion from assets to liabilities.[2]

Firms transacting in unregulated markets generally undertake a variety of measures to manage these kinds of risks, such as investing in a more diversified set of assets, generating new income streams, engaging in hedging transactions, or procuring insurance. Regulated industries, however, have traditionally been constrained in taking these measures. Public utilities are actually privately owned by investors.[3] The utilities receive a return based on rates set by regulators; they are permitted to pass the costs of assets through to customers incrementally over the "service life" of those assets, the period the assets are anticipated to be used.[4] For regulated utilities to recover their investments in assets that have been impaired or prematurely retired, regulators must authorize the utility to pass the costs of those stranded assets through to consumers.[5] Ratepayers are naturally averse to paying for assets that may no longer be operational, generating electricity, or providing heating services, and public service commissions have the primary goal of protecting the interests of ratepayers. Consequently, when sharp changes in energy or environmental policies occur, investors in regulated utilities bear greater risk than investors in an unregulated or deregulated market.

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[1] *See* ATIF ANSAR, BEN CALDICOTT & JAMES TILBURY, SMITH SCHOOL OF ENTERPRISE AND THE ENVIRONMENT, UNIVERSITY OF OXFORD, STRANDED ASSETS AND THE FOSSIL FUEL DIVESTMENT CAMPAIGN: WHAT DOES DIVESTMENT MEAN FOR THE VALUATION OF FOSSIL FUEL ASSETS? 2 (2013). *See also* James Saft, *The Age of Stranded Assets Isn't Just About Climate Change*, REUTERS (July 13, 2017, 4:16 pm), https://www.reuters.com/article/us-markets-saft/the-age-of-stranded-assets-isnt-just-about-climate-change-james-saft-idUSKBN19Y2SV [https://perma.cc/N39Q-7TL5].

[2] *See* ANSAR, *supra* note 1, at 9.

[3] *See* LINCOLN DAVIES, ALEXANDRA KLASS, HARI M. OSOFSKY, JOSEPH P. TOMAIN, & ELIZABETH WILSON, ENERGY LAW AND POLICY 264 (2d ed. 2018). The law designates these investor-owned utilities as "public utilities" because they have a legal obligation to serve the public. *Id.* When investor-owned utilities first developed they were vertically integrated, owning and operating all of the components necessary to generate electricity and to distribute it to consumers. *Id.* Under the regulatory compact, investor-owned utilities were granted a monopoly— the exclusive right to serve a designated geographic area in exchange for government regulation of its prices or utility rates and an obligation to serve every customer within that area. *Id.* at 265-66. The country designed its national energy infrastructure, including its regulatory system, to serve these large central power stations *Id.* at 259. This model of electricity production and regulation remains largely the same today as it was over 100 years ago. *Id.* Currently there are over 200 investor-operated utilities; they generate approximately 70% of the electricity in the United States. *Id.* at 264.

[4] *See infra* Parts II.A. and II.B.1.

[5] With the consent of regulators, however, the utility may pass through to its rate-paying customers any remaining unrecovered capital costs of decommissioned or prematurely retired assets. *See* Parts III.A. and C. *infra*.

Today, the power sector is recognized as a primary contributor to climate change and air pollution, responsible for nearly one-third of greenhouse gas emissions.[6] There is widespread public acknowledgement that climate change is occurring[7] and that the federal government should act to address it.[8] Nevertheless, despite the clear economic gains, health benefits, and environmental advantages to employing alternative energy resources and other carbon-saving technologies, the transition to a carbon-neutral economy has been incremental at best.[9]

Unfortunately, the United States, along with many other industrial economies, has been locked into a carbon-based economy by legal and financial systems that evolved to serve fossil

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[6] *See* Greenhouse Gas Emissions, Sources of Greenhouse Gas Emissions, U.S. ENVIRONMENTAL PROTECTION AGENCY, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions [https://perma.cc/V49x-e6jx] (last updated Sept. 13, 2019) (Statistics showing electricity was responsible for 27.5% of 2017 greenhouse gas emissions; "Electricity production generates the second largest share of greenhouse gas emissions. Approximately 62.9% of our electricity comes from burning fossil fuels, mostly coal and natural gas."). Mercury and Air Toxics Standards, Cleaner Power Plants, U.S. ENVIRONMENTAL PROTECTION AGENCY, https://www.epa.gov/mats/cleaner-power-plants [https://perma.cc/J55U-T6CT] (last updated Mar. 4, 2019) (The power sector is also responsible for 50% of mercury emissions, 75% of acid gas emissions, and 20 to 60% of toxic metals emissions in the United States, providing additional reasons for regulation) .

[7] *See* YALE PROGRAM ON CLIMATE CHANGE COMMC'N, CLIMATE CHANGE IN THE AMERICAN MIND 5 (Dec. 2018), https://climatecommunication.yale.edu/wp-content/uploads/2019/01/Climate-Change-American-Mind-December-2018.pdf [https://perma.cc/4u46-d8ct] (reporting that 73% agree that climate change is occurring) ; Brian Kennedy, *Most Americans Say Climate Change Affects Their Local Community, Including Two-Thirds Living Near Coast*, PEW RESEARCH CTR. (May 16, 2018), https://www.pewresearch.org/fact-tank/2018/05/16/most-americans-say-climate-change-affects-their-local-community-including-two-thirds-living-near-coast/ [https://perma.cc/xe5k-tx89].

[8] *See, e.g.*, *Is the Public Willing to Pay to Help Fix Climate Change?*, ASSOC. PRESS NORC CTR. FOR PUB. AFFAIRS RESEARCH, http://www.apnorc.org/projects/Pages/Is-the-Public-Willing-to-Pay-to-Help-Fix-Climate-Change-.aspx [https://perma.cc/85dd-mrx3] (November 2018 poll results indicating that 71% of Americans agree that climate change is occurring); *Where Americans Stand On Energy & Climate*, Energy Policy Inst. at the University of Chicago, http://www.apnorc.org/projects/Documents/EPIC_infographic.pdf [https://perma.cc/7LBE-LYGV] (Infographic developed from November 2018 poll indicating that 83% of those agreeing that climate change is occurring are in favor of government action to address the problem); Cary Funk, *et al., Majorities See Government Efforts to Protect the Environment as Insufficient*, PEW RESEARCH CTR. 2, 5 (May 14, 2018) https://www.pewresearch.org/science/wp-content/uploads/sites/16/2018/05/PS_2018.05.14_energyclimate_FINAL.pdf [https://perma.cc/rr5t-xqnt] (reporting that 67% see government action on climate change as inadequate).

[9] After decades of governmental delays in addressing the known causes of global warming, the U.S. Supreme Court issued a directive requiring the Environmental Protection Agency to address the issue. *See* Massachusetts v. Envtl. Prot. Agency, 549 U.S. 497 (2007). In 2014, the Obama Administration proposed regulations under the Clean Air Act to govern carbon emissions. *See* Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 34830 (proposed June 18, 2014) (to be codified at 40 C.F.R. pt. 60). However, the Trump Administration reversed course, issuing an executive order rescinding Obama-era Presidential and regulatory actions to address carbon emissions and ordering the Environmental Protection Agency to withdraw the Clean Power Plan regulations under the Clean Air Act. *See* Exec. Order No. 13783, 82 Fed. Reg. 16093 (March 28, 2017). On October 10, 2017 the U.S. Environmental Protection Agency proposed to repeal the Clean Power Plan. *See* 82 Fed. Reg. 48035 (Oct. 16, 2017). The Trump Administration then announced a new plan to "save coal," proposing modifications to numerous environmental statutes in support of coal-fired energy production. *See* Brad Plumer, *Trump Orders a Lifeline for Struggling Coal and Nuclear Plants* N.Y. TIMES (June 1, 2018), https://www.nytimes.com/2018/06/01/climate/trump-coal-nuclear-power.html [https://perma.cc/e3ph-emyt]. On July 8, 2019, the final rule was published, repealing the Clean Power Plan and substituting the Affordable Clean Energy rule (ACE), which provides emission guidelines for greenhouse gas emissions from existing electric utility generating units. *See* Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions From Existing Electric Utility Generating Units; Revisions to Emission Guidelines Implementing Regulations, 84 Fed. Reg. 32520 (July 8, 2019) (to be codified at 40 C.F.R. pt. 60).

fuel-based energy and distribution systems.[10] Existing economic arrangements hold the current allocation of property rights and interests in place and incentivize resistance to change. Tax and regulatory systems governing public utilities encourage waste, increase emissions, and exacerbate negative environmental externalities.[11] They also foster the development of fiscal barriers, such as stranded assets, that make change costly and harmful to consumers.[12] Historically, public utilities and their investors have responded to the prospect of regulatory changes by arguing for (1) federal reimbursement for stranded assets,[13] (2) the right to pass the costs of stranded assets through to their consumers, (3) the termination of plans to alter existing energy and environmental policy,[14] and delay in implementing policy changes.[15] Economic incentives baked into the regulatory structure stall the adoption of new energy technologies and other climate change mitigation strategies, delaying the transition to a carbon-neutral economy.[16] This dynamic is known as "carbon lock-in."

Recently, environmental advocates have begun a push to retire the country's aging fleet of coal-fired power plants[17] and to terminate plans to extract known oil, gas, and coal reserves so as

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[10] *See* Gregory C. Unruh, *Understanding Carbon Lock-in*, 28 ENERGY POL'Y 817 (2000).

[11] *See* Part II, *infra*. *See also* Tracey M. Roberts, *Picking Winners and Losers: A Structural Examination of Tax Subsidies to the Energy Industry*, 41 COLUM. J. ENVTL L. 63 (2016) (describing one hundred years of tax subsidies to the fossil fuel industry, their structures, and effects).

[12] *See* Part III, *infra*.

[13] *See* Part III.A., *infra*.

[14] Fossil fuel companies have pointed to increased consumer costs from stranded assets to justify delays in implementation of climate change regulations. For example, in their comments to the Obama Administration's proposed Clean Power Plan regulations to the Clean Air Act, the Southern Company argued that the EPA's cost benefit analysis should include the increased costs to ratepayers from stranded capital investments the Clean Power Plan would force into retirement. *See* Larry Monroe Comment Letter on Proposed Rule: Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units (Dec. 1, 2014), https://www.regulations.gov/document?D=EPA-HQ-OAR-2013-0602-22907 [perma.cc/C7CK-CY7D].

[15] Concerns about harm to consumers stymies the use of some of the best tools for carbon regulation even among politicians committed to action. For example, Green New Deal did not include a proposal for carbon taxes because of perceived concerns about the economic harm to middle- and lower-income households. *See, e.g.*, Editorial Board, *Want a Green New Deal? Here's a better one.*, WASH. POST (Feb. 24, 2019), https://www.washingtonpost.com/opinions/want-a-green-new-deal-heres-a-better-one/2019/02/24/2d7e491c-36d2-11e9-af5b-b51b7ff322e9_story.html [perma.cc/JEZ6-UXH6]; Adam Wernick, *The Green New Deal doesn't include carbon pricing. Some say that's a big mistake.*, Public Radio International (Apr. 11, 2019), https://www.pri.org/stories/2019-04-11/green-new-deal-doesnt-include-carbon-pricing-some-say-thats-big-mistake [perma.cc/HV63-5K8U]; Marianne Lavelle, *Green New Deal vs. Carbon Tax: A Clash of 2 Worldviews, Both Seeking Climate Action*, INSIDE CLIMATE NEWS (March 4, 2019), https://insideclimatenews.org/news/04032019/green-new-deal-carbon-tax-compromise-climate-policy-congress-ocasio-cortez-sunrise-ccl-economists [perma.cc/Z2VA-XDXW]; Zach Coleman & Eric Wolff, *Why greens are turning away from a carbon tax*, POLITICO (Dec. 9, 2018), https://www.politico.com/story/2018/12/09/carbon-tax-climate-change-environmentalists-1052210 [perma.cc/VB9B-CQDV].

[16] *See* MARILYN A. BROWN, ET AL., OAK RIDGE NAT'L LAB., CARBON LOCK-IN: BARRIERS TO DEPLOYING CLIMATE CHANGE MITIGATION TECHNOLOGIES (2008) DOI:10.2172/1424507, https://www.osti.gov/servlets/purl/1424507 [perma.cc/9KNA-GJUM] (classifying financial/legal institutions as one of the three major barriers that foster carbon lock-in).

[17] *See, e.g.*, About Us Page of the Beyond Coal Campaign, SIERRA CLUB, https://content.sierraclub.org/coal/about-the-campaign [https://perma.cc/76A7-T9WG] (last visited Dec. 30, 2019) ("The Beyond Coal campaign's main objective is to replace dirty coal with clean energy by mobilizing grassroots activists in local communities to advocate for the retirement of old and outdated coal plants and to prevent new coal plants from being built.").

to prevent a rise in global temperatures above two degrees Celsius.[18] Nongovernmental organizations, such as the Carbon Tracker Initiative, have called for investors to divest by appealing to their financial self-interest, claiming that fossil fuel firms have failed to disclose the risk of loss associated with stranded assets should economic or regulatory conditions change.[19] Mainstream media,[20] governmental entities,[21] academic institutions,[22] and firms in the energy,[23] investment,[24] banking,[25] rating agencies,[26] accounting,[27] and insurance[28] industries have estimated

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[18] *See* Bill McKibben, *Why We Need to Keep 80 Percent of Fossil Fuels in the Ground*, YES! MAGAZINE (Feb. 2016), https://www.yesmagazine.org/issue/life-after-oil/2016/02/15/why-we-need-to-keep-80-percent-of-fossil-fuels-in-the-ground/ [https://perma.cc/PE7J-TDPD].

[19] *See* CARBON TRACKER INITIATIVE, NO COUNTRY FOR COAL GEN – BELOW 2°C AND REGULATORY RISK FOR US COAL POWER OWNERS (Sept. 13, 2017), https://www.carbontracker.org/reports/no-country-for-coal-gen-below-2c-and-regulatory-risk-for-us-coal-power-owners/ [https://perma.cc/BVC8-CUU7]; CARBON TRACKER INITIATIVE, UNBURNABLE CARBON 2013: WASTED CAPITAL AND STRANDED ASSETS (Apr. 19, 2013), https://www.carbontracker.org/reports/unburnable-carbon-wasted-capital-and-stranded-assets/ [https://perma.cc/A7EH-ZYYM].

[20] *See, e.g.*, *How to deal with worries about stranded assets*, ECONOMIST (Nov 24, 2016), https://www.economist.com/special-report/2016/11/24/how-to-deal-with-worries-about-stranded-assets [perma.cc/KY8S-8CCN]; Ambrose Evans-Pritchard, *Oil Industry Risks Trillions of "Stranded Assets on US-China Climate Deal*, TELEGRAPH (Nov. 19, 2014), https://www.telegraph.co.uk/finance/newsbysector/energy/oilandgas/11242193/Oil-industry-risks-trillions-of-stranded-assets-on-US-China-climate-deal.html [https://perma.cc/B6TT-75T8]; Alex Morales, *"Stranded Assets": Will efforts to counter warming render energy reserves worthless?,* WASH. POST (Dec. 5, 2014), https://www.washingtonpost.com/business/stranded-assets-will-efforts-to-counter-warming-render-energy-reserves-worthless/2014/12/05/ecbc73a6-7a45-11e4-9a27-6fdbc612bff8_story.html [https://perma.cc/PL38-X54A].

[21] *See, e.g.*, ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT AND FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, AGRICULTURE OUTLOOK (2012); UNITED NATIONS ENVIRONMENT PROGRAMME, GEO-5 ENVIRONMENT FOR THE FUTURE WE WANT (2012).

[22] *See, e.g.*, Oxford Sustainable Finance Programme, SMITH SCHOOL OF ENTERPRISE AND THE ENVIRONMENT, OXFORD UNIVERSITY (April 6-7, 2017), https://www.smithschool.ox.ac.uk/research/sustainable-finance/forums.html [perma.cc/BMG2-529V] ("6th Stranded Assets Forum: From disclosure to data - towards a new consensus for the future of measuring environmental risk and opportunity").

[23] *See, e.g.*, Dmitry Zhdannikov, *Shell sees no risk of 'stranded assets' as reserves life shrinks*, REUTERS (Apr. 12, 2018), https://www.reuters.com/article/us-shell-emissions-idUSKBN1HJ1FP [perma.cc/V9QH-CDND].

[24] *See, e.g.*, Peter Cripps, *BlackRock Warns on Stranded Assets*, ENVTL. FIN. (Nov. 4, 2015), https://www.environmental-finance.com/content/news/blackrock-warns-on-stranded-assets.html [https://perma.cc/9RMM-ZGET]; BLACKROCK, GLOBAL INSIGHTS, ADAPTING PORTFOLIOS TO CLIMATE CHANGE IMPLICATIONS AND STRATEGIES FOR ALL INVESTORS (Sept. 2016), https://www.blackrock.com/us/individual/literature/whitepaper/bii-climate-change-2016-us.pdf [perma.cc/H8AN-G84S].

[25] *See, e.g.*, HSBC, OIL AND CARBON REVISITED (2013), https://www.longfinance.net/documents/1133/hsbc_oilcarbon_2013.pdf [perma.cc/S8AX-7M4N]; Megan Bowman, *The Role of the Banking Industry in Facilitating Climate Change Mitigation and the Transition to a Low-Carbon Global Economy*, 27 ENV'T & PLANNING L.J. 448 (2010).

[26] *See, e.g.*, RATINGS DIRECT, STANDARD & POOR'S FINANCIAL SERVICES, WHAT A CARBON-CONSTRAINED FUTURE COULD MEAN FOR OIL COMPANIES' CREDITWORTHINESS (2013), https://www.carbontracker.org/reports/bonds-2014/ [perma.cc/2NAZ-C8F5].

[27] *See, e.g.*, ERNST & YOUNG, AUSTRALIA, STRANDED ASSETS, FROM FACT TO FICTION, LET'S TALK SUSTAINABILITY, ISSUE 4 (2015), https://www.slideshare.net/turloughguerin/ey-lets-talk-sustainability-issue-4 [https://perma.cc/26GX-BEEZ].

[28] *See, e.g.*, LLOYD'S OF LONDON, STRANDED ASSETS: THE TRANSITION TO A LOW CARBON ECONOMY, OVERVIEW FOR THE INSURANCE INDUSTRY, EMERGING RISK REPORT (2017), https://www.lloyds.com/~/media/files/news-and-insight/risk-insight/2017/stranded-assets.pdf [perma.cc/C8HR-DK86]; Matthew E. Kahn, *et al., How the Insurance*

that $20 trillion in fossil fuel assets will be stranded if greenhouse gas emissions are regulated and they have begun to discuss what might be an appropriate response.

Regulating greenhouse gas emissions will generate a variety of distributional impacts. In 1989, academics Florentin Krause, Wilfrid Bach, and Jon Koomey recognized that climate stabilization would require limits on fossil fuel combustion, and that this would render fossil fuel-based infrastructure obsolete and impact the financial markets.[29] They were among the first to argue that financial incentives would likely be necessary to make these risks acceptable to investors.[30] Given that energy incumbents have used stranded asset claims to stall the transition to cleaner, more efficient systems, the decision to allow investors to recover their stranded costs may be a rational step toward effective climate change policy. This article provides a low-cost solution to one segment of the technological-industrial complex maintaining carbon lock-in.[31] By modifying the regulatory and tax rules to change the existing incentive structures, we can dismantle the hold that fossil fuels continue to exert on the U.S. economy.

The article is organized as follows. Part II first describes the economic context that gave rise to regulation of public utilities. It then describes the ways the tax and regulatory rules combine to subsidize fossil-fuel electricity generation and to deliver discounts to consumers that encourage waste and increase emissions, locking the economy into a fossil fuel-based future. Part III briefly describes the history of past efforts to recover stranded costs. It takes a first cut at quantifying the extent of unrecovered capital for the fifteen largest public utilities in the United States and quantifies the tax savings the utilities enjoy from accelerated tax depreciation. It identifies those tax savings as an insurance pool from which investors may recover their stranded costs. It then proposes a small change to the tax and regulatory rules that will alter incentive structures and address the risk of stranded assets at little additional cost to consumers or to the U.S. taxpayer. Part IV concludes the discussion.

Industry Can Push Us to Prepare for Climate Change, HARV. BUS. REV. (Aug. 28, 2017), https://hbr.org/2017/08/how-the-insurance-industry-can-push-us-to-prepare-for-climate-change [perma.cc/M4SR-CHDF]; Evan Mills, et al., *Insurance in a Climate of Change*, 309 SCIENCE 1040 (Aug. 12, 2005), DOI:10.1126/science.1112121, https://science.sciencemag.org/content/309/5737/1040/tab-pdf [perma.cc/N5UV-A6SC].

[29] FLORENTIN KRAUSE, WILFRID BACH, & JON KOOMEY, ENERGY POLICY IN THE GREENHOUSE (1989).

[30] *Id.* More recently, energy executives, businessmen, and celebrities have called for the federal government to fund a "cash-for-coal clunkers" program to pay for the retirement of one eighth of the coal-fired power plants in the United States and accelerate the transition away from coal and toward natural gas and renewable energy. David Crane, NRG chief executive, T. Boone Pickens, an oil and gas magnate, and Ted Turner, a celebrity businessman, have promoted "a cash for oil clunkers program. Steven Mufson, *Vintage U.S. Coal-fired Power Plants Now an 'Aging Fleet of Clunkers,'* WASH. POST (June 13, 2014), https://www.washingtonpost.com/business/economy/a-dilemma-with-aging-coal-plants-retire-them-or-restore-them/2014/06/13/8914780a-f00a-11e3-914c-1fbd0614e2d4_story.html [https://perma.cc/AA5B-HQ8X]. The idea takes its name from the "cash for clunkers program" developed by the Obama Administration to support the American auto industry and to reduce vehicular emissions. The Federal government granted cash subsidies to consumers who traded their old vehicles for new fuel-efficient models. *See* Supplemental Appropriations Act, 2009, Title XIII, Pub. L. 111–32, 123 Stat. 1859.

[31] *See* Unruh, *supra* note 10, at 818.

II. TAX AND REGULATORY RULES DRIVE DISCOUNTS IN CONSUMER RATES FOR FOSSIL FUEL-BASED ENERGY

In general, when private firms invest in their physical plant, equipment, and other fixed assets ("capital"), they recover those expenses over the period those assets are used. Investor-owned public utilities for natural gas and electricity are regulated at the state level by public utility commissions or public service commissions.[32] The Federal Energy Regulatory Commission (FERC) governs the transmission and sales of energy in interstate commerce.[33] The state regulatory commissions and FERC set the rules by which public utilities may pass the costs of these assets through to their customers.[34] These rules, therefore, determine the rate at which utility investors may recover the costs of constructing those assets and placing them in service.

For decades, the depreciation rules under the federal income tax matched those for financial and regulatory depreciation in terms of timing. However, in 1954 Congress began to allow firms to recover their investments in capital more quickly under the tax depreciation rules. This mechanism, known as "accelerated depreciation," defers tax liability into the future. The tax savings from deferral are commonly described as the economic equivalent to a federally funded interest-free loan.

In the regulated utilities setting, the disparity between the regulatory and financial accounting rules that utilities use to pass operating costs (including taxes) and capital costs through to consumers and the tax accounting rules the utilities follow for determining their own tax liability ("tax/book disparity") generates a pool of tax savings.[35] The aggregate value of these tax savings is tracked in the utility firms' financial statements as "accumulated deferred income taxes" or "ADIT."[36] As of 2016, the fifteen largest public utilities reported over $110 billion in their ADIT accounts.[37] Normalization rules, developed to reconcile the tax / book disparity, require that utilities pass through the benefits of these tax savings to consumers at a gradual rate.[38] Normalization rules, by delivering tax subsidies to consumers, have reduced electricity rates.

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[32] LOWELL E. ALT, JR., ENERGY UTILITY RATE SETTING 19 (2006). States vary in ways they regulate utilities owned by municipalities and cooperatives. *Id.*

[33] Specifically, FERC governs the interstate transmission of electricity, natural gas, and oil and the wholesale sales of electricity and oil. FERC regulates natural gas storage facilities, liquefied natural gas terminals and interstate natural gas pipelines. FERC rules also cover hydroelectric projects. *Id.* at 17.

[34] *Id.* at 22-23.

[35] *Id.* at 38-39.

[36] *Id.* Tax/book disparities also arise with respect to tax credits and normalization rules also apply to tax credits. *See* DONALD W. KIEFER, ACCELERATED DEPRECIATION, THE INVESTMENT TAX CREDIT, AND THEIR REQUIRED RATEMAKING TREATMENT IN THE PUBLIC UTILITY INDUSTRY: A BACKGROUND REPORT, CONGRESSIONAL RESEARCH SERVICE, Rep. No. 87-312 S, 17-21 (Apr. 10, 1987). The analysis applied to the accelerated depreciation applies also to the earning, application, and passthrough of tax credits, though the calculations will differ. *Id.* at 23. While accelerated depreciation functions as an interest-free loan from the government, tax credits function as a grant to the utility. *Id*. at 25. Tax credits distort the rate-making process to provide a higher rate of return to investors on capital the government has provided. *Id*. at 27. For the sake of brevity and simplicity, the article omits detailed discussion of tax credits. Nevertheless, they are subject to a similar critique as set forth in Part III, and should be included as part of any recovery pool for stranded assets discussed in Part III.

[37] *See infra*, Part II.B., Table 4. The article uses figures from 2016 because utilities, responding to rate changes and other tax rule modifications in the Tax Cuts and Jobs Act of 2017, re-categorized a portion of the funds in their ADIT accounts in a variety of ways under the Uniform System of Accounts.

[38] *See infra*, Part II.C.

This part briefly outlines the history of public utility regulation, describes how the tax accounting rules began to diverge from the rules for financial and regulatory accounting, and then examines the economic effects of this divergence under the normalization rules. Finally, it critiques the regulatory rules that reconcile these differences as magnifying environmental harms.

A. A Brief Economic History of Public Utility Regulation

Before discussing how tax and regulatory rules governing public utilities contribute to carbon lock-in, it may be helpful to explain why public utilities are regulated. The energy markets in the United States developed initially as natural monopolies: the benefits, and the possibility, of competition were limited.[39] In the early years, the development of an energy utility required a high threshold investment and an established industry enjoyed declining long-term costs and increasing returns to scale.[40]

An existing utility, seeking to maximize its profit, would want to extend service to reduce its average costs.[41] It might also limit competition, and undercut a competing startup investment in an adjacent area, by extending service to that new area.[42] The first party to enter the market would thereby succeed in dominating it.[43] A vertically integrated firm, providing generation, transmission, and distribution facilities as the sole provider of electricity in a community, could charge excessively high rates, fail to provide reliable service, and discriminate in granting access to service.[44] In markets where competition exists between two or more firms, the duplication of network services, such as a utility grid, would be wasteful, since the cost of each grid would be spread over a smaller number of customers.[45] Furthermore, by the time it would take either firm to recover its investment, competition could drive one or both firms into insolvency.[46]

To protect consumers against adverse exercises of market power, states passed progressive regulation.[47] Firms sought sufficient protection to recover their initial large investments in plant,

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[39] *See* DAVIES, *supra* note 3, at 283-84 (quoting Judge Richard Posner in *Omega Satellite Products Co. v. City of Indianapolis*, 694 F.2d 119 (7th Cir. 1982)).

[40] *Id.* at 283; *See also* AMY ABEL, CONG. RESEARCH SERV., 98-419 ENR, ELECTRICITY RESTRUCTURING BACKGROUND: THE PUBLIC UTILITY REGULATORY POLICIES ACT OF 1978 AND THE ENERGY POLICY ACT OF 1992 2 (1998). The costs to construct electricity generation and transmission facilities have historically been high. *See* JOSEPH P. TOMAIN, ENDING DIRTY ENERGY POLICY 44 (2011).

[41] *See* DAVIES, *supra* note 3, at 284 (quoting Judge Richard Posner in *Omega Satellite Products Co. v. City of Indianapolis*, 694 F.2d 119 (7th Cir. 1982)).

[42] *Id.* at 3 ("At the end of the 19th century, gas and electricity companies began as small, local businesses that, due to technological limitations, served relatively small geographical areas. These businesses were local, competitive, and were unregulated. With technological improvements, those companies grew to serve more customers and, to achieve economies of scale, consolidated. That consolidation revealed two things. First, these local, growing utilities could exercise market power over their customers. Second, the firms that were already in the gas or electricity business would also exercise market power to set barriers to competition.")

[43] *Id.* at 3, 282-285. *But see* Peter Z. Grossman, *Is Anything a Natural Monopoly*, THE END OF A NATURAL MONOPOLY: DEREGULATION AND COMPETITION IN THE ELECTRIC POWER INDUSTRY, 34 (Peter Z. Grossman &Daniel H. Cole, eds. 2014).

[44] *See* DAVIES, *supra* note 3, at 282-83.

[45] *Id.* at 284-85.

[46] *Id.* at 285, 290.

[47] *See* ALT, *supra* note 32, at 17. The characteristics of a natural monopoly—
high initial capital costs, increasing returns to scale, and distribution networks, the duplication of which would be wasteful—are market imperfections that justify regulation as an economic matter. *See* DAVIES, *supra* note 3, at 289-

equipment, and distribution facilities.[48] States granted firms monopolies to induce them to incur those investments and to eliminate the risk of financial loss from competition.[49] In return, states protected consumers against monopoly practices by regulating the rates firms could charge consumers and assured quality service through nondiscrimination provisions and other service obligations.[50] This arrangement is known as the "regulatory compact."[51]

Later, when firms began to expand their electric grids and extend service across state lines, Congress passed a series of regulatory statutes to address anticompetitive behavior and other market failures occurring in interstate commerce.[52] Eventually Congress delegated regulatory authority to the Federal Power Commission, the predecessor to the Federal Energy Regulatory Commission ("FERC") to regulate hydropower and interstate electricity sales.[53] Today, in most states, public service commissions set retail intrastate gas and electricity rates[54] and, to the extent utilities provide service across state lines, they must do so in conformity with the FERC rules.[55]

B. Accounting for Fixed Costs

In general, when a business acquires an asset that will last several years and will earn income over time, it will account for that value of that asset over the period that the asset produces

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90. In addition, regulation may also be justified as affected with the public interest, since access to electricity is essential to a functioning economy. *Id.*

[48] *See* Grossman, *supra* note 43, at 41-43.

[49] *See* ALT, *supra* note 32 at 18; *See also* DAVIES, *supra* note 3, at 264, 289-90.

[50] *Id.*

[51] *See* DAVIES, *supra* note 3, at 264, 289.

[52] First, Congress passed anti-trust laws to limit the exercise of monopoly power. *See* Sherman Antitrust Act of 1890, Pub. L. __, 26 Stat. 209 (July 2, 1890) (codified as amended at 15 U.S.C. §§ 1–7), and Clayton Antitrust Act of 1914, Pub. L. 63–212, 38 Stat. 730 (Oct. 15, 1914) (codified as amended at 15 U.S.C. §§ 12–27, 29 U.S.C. §§ 52–53). Congress then began regulating natural monopolies. *See* The Interstate Commerce Act of 1887; The Public Utility Holding Company Act of 1935, 15 USC 79a et seq. (repealed), Federal Power Act, Natural Gas Act of 1938, Price-Anderson Act of 1957, Atomic Energy Act of 1964, the National Energy Act of 1978, Public Utilities Regulatory Policies Act, the Natural Gas Policy Act, the Energy Security Act of 1980. From the mid-1980s Congress and administrative agencies began taking actions to pull back on regulation and enhance competition for segments of the energy production, distribution, and sales process. However, many states have since slowed or reversed this process following price spikes for electricity and gas in 2000 and 2001. *See* ALT, *supra* note 32, at 17.

[53] Federal Water Power Act of 1920 (codified as amended at 16 U.S.C. § 12 (2018)).

[54] Twenty-one states regulate both electricity and gas markets: Alabama, Alaska, Arizona, Arkansas, Hawaii, Idaho, Kansas, Louisiana, Minnesota, Mississippi, Missouri, Nevada, North Carolina, North Dakota, Oklahoma South Carolina, Tennessee, Utah, Vermont, Washington, and Wisconsin. Twelve states regulate electricity, but have deregulated gas at least partially: Colorado, Florida, Georgia, Indiana, Iowa, Kentucky, Montana, Nebraska, New Mexico, South Dakota, West Virginia, and Wyoming. Two states regulate gas but not electricity: Delaware and Oregon. Fifteen states have deregulated both electricity and gas markets (though for some states the deregulation of gas markets is limited or offered only to certain consumer classes): California, Connecticut, Illinois, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Texas, and Virginia. Map of Deregulated Energy States & Markets (Updated 2018), https://www.electricchoice.com/map-deregulated-energy-markets/ [perma.cc/K97D-J9EY].

[55] *See* ALT, *supra* note 32, at 17. By statute, public service commissions set rates through a rate case, which is a formal, adversarial, and adjudicatory hearing. *See* DAVIES, *supra* note 3, at 291, 304. After discovery and audits are complete, and written testimony and briefs are submitted, the public service commission schedules formal hearings and comes to a decision. *See* ALT, *supra* note 32, at 19. The parties participating in the case will include the public service commission regulatory staff, representatives of the public utility firm, commercial and industrial customers, state consumer advocates, and parties representing low-income consumers. *Id.*

income. First, the asset is "capitalized," with the full cost of the asset recorded on a ledger when the asset is first used.[56] Then, a portion of the cost of the asset will be deducted each year, a "depreciation deduction," to reflect the asset's decline in value from wear and tear as it is used.[57] Under economic depreciation, the business would appraise the asset each year to determine the extent to which the asset had declined in value.[58] At the beginning of the next year, the value of the asset would be "marked to market" to reflect its new value.[59] The difference, reflecting the asset's decline in value, would be the depreciation deduction.[60] The concepts of capitalization and depreciation are used in annual accounting practices, in financial reporting, and in calculating taxes on business income. Because economic depreciation requires an annual valuation and a case by case assessment, it would be expensive and time-consuming for a business to administer and difficult for tax authorities and financial regulators to monitor.[61] Consequently, businesses, financial institutions, regulators, and taxing authorities use stylized and standardized systems to account for fixed assets.[62] In 1912, the U.S. Supreme Court affirmed the authority of public service commissions to prescribe accounting practices.[63] Today, most states require public utilities to use the uniform systems of accounts developed by the National Association of Railroad and Utilities Commissions, the Federal Energy Regulatory Commission, or the Securities and Exchange Commission.[64] As the tax system has evolved to serve new economic goals, Congress has recognized that the accounting rules for public utilities were at cross-purposes to the goals of their tax legislation.[65] In successive tax bills, Congress has conditioned public utilities' use of certain tax benefits on following normalization rules.[66] The following subsections outline those developments and their economic impacts on utilities, investors, and consumers.

1. Regulatory Accounting: FERC Rules and Rate of Return Regulation

Traditional utility regulation is designed to balance the interests of consumers in having reliable access to abundant, relatively inexpensive energy with the interests of investors in earning a profit from their significant investment in capital.[67] Under "rate of return" regulation, a public

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[56] *See* STAFF OF JOINT COMM. ON TAX'N, JCX-54-01, FEDERAL TAX PROVISIONS AFFECTING THE ELECTRIC POWER INDUSTRY 18 (2001) (Capitalization refers to the process of accounting for the costs of an asset over time rather than deducting the cost of the asset in full during the accounting period the asset was purchased).
[57] *Id.*
[58] *Id.*
[59] *Id.*
[60] *Id.*
[61] *Id.*
[62] *Id.*
[63] *See* CHARLES F. PHILLIPS, JR., REGULATION OF PUBLIC UTILITIES: THEORY AND PRACTICE, 2005 WL 998368 (1988).
[64] *Id.*
[65] *See* RICHARD E. MATHENY, TAXATION OF PUBLIC UTILITIES, §4.01 – 4.23 (2019).
[66] *Id.*
[67] *See* DAVIES, *supra* note 3, at 281. *See also Smyth v. Ames*, 169 U.S. 466 (1898) (holding that a reasonable rate is one that provides the utility with a fair return on the fair value of the property that is used to provide service); *Bluefield Water Works v. Pub. Serv. Comm'n of W. Va.*, 262 U.S. 695 (1923) (holding that a utility is entitled to a return on the assets it is using to provide service that is equal to the return earned by businesses facing comparable risks); *Sw. Bell Tel. Co. v. Missouri Pub. Serv. Comm'n*, 262 U.S. 276 (1923) (holding that reasonable capital charges would take into consideration the risk incurred and also provide enough to attract new capital); *Fed. Power Comm'n v. Hope Nat. Gas Co.*, 320 U.S. 591 (1944) (granting deference to the public service commission and holding that a utility may earn

service commission determines the amount of revenue a firm must collect to both recover the operating costs it prudently incurs to provide service and to earn a fair return on the capital investments it has made in its facilities.[68] This sum is known as the "revenue requirement."[69] The two components, cost of service and return on capital, are expressed more specifically in the following formula:

$$R = O + (V - D)r.$$ [70]

In the equation, R refers to the utility's total revenue requirement.[71] O refers to the utility's operating expenses.[72] Operating expenses normally include: (1) labor and material to operate and maintain the facilities that are used to provide service, (2) a portion of the cost of these facilities, known as "depreciation" of tangible assets and "amortization" of intangible assets under the regulatory and financial accounting rules, (3)"tax expense," an allocation of the taxes charged to the utility over time that regulators agree may be passed through to consumers, (4) the costs of the customer accounts systems and customer service personnel, administrative and general costs, and (5) uncollectible bills.[73] Operating expenses comprise the largest portion of the revenue requirement.[74] As long as the utility was prudent in incurring these expenses at the time they were made, they will be reimbursed through the rate-setting process.[75] V is the gross value of the utility's tangible and intangible property.[76] V is determined by reference to the original cost of the assets when they were first placed in service and dedicated to use.[77] D refers to the utility's accumulated depreciation — the aggregate of the costs of the assets that have been passed through to customers as part of the operating expenses.[78] D, the aggregated regulatory depreciation, is subtracted from

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revenues sufficient to cover operating expenses and a return on capital costs commensurate with businesses facing comparable risk).

[68] *See* ALT, *supra* note 32, at 18. Public service commissions may employ other methods for regulating utility rates. *See* James Ming Chen, *Price-Level Regulation and Its Reform*, 99 MARQ. L. REV. 931 (2016) (contrasting cost-of-service regulation and Ramsey pricing with price-level regulation and offering a reform alternative).

[69] *See* DAVIES, *supra* note 3, at 300.

[70] *Id.*

[71] *Id.*

[72] *Id.*

[73] *Id. See also,* ALT, *supra* note 32, at 50-54 and FERC, 18 C.F.R., pt. 101, subpts. D, and K,

[74] *See* DAVIES, *supra* note 3, at 300.

[75] *Id.* Considerations in reviewing utility expenses and investments include whether the costs were incurred to meet customer needs, whether they were necessary to provide adequate service, whether the customers would benefit, whether the costs were reasonable, whether the utility's physical plant and facilities were used and useful and whether they were consistent with an integrated resource plan that the public service commission may have mandated. *See* ALT, *supra* note 32, at 29.

[76] *See* DAVIES, *supra* note 3, at 300.

[77] FERC determines the depreciation amount by reference to the "service value" of the asset. The service value is defined as the difference between the original cost and the net salvage value of electric plant. These definitions reconcile what would otherwise appear to be differences in the regulatory and financial accounting rules. *See* FERC 18 C.F.R., pt. 101, Definitions 19, 23, 35, 36, and 37 (2002).

[78] The FERC Uniform System of Accounts provides that "[d]epreciation, as applied to depreciable electric plant, means the loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of electric plant in the course of service from causes which are known to be in current operation and against which the utility is not protected by insurance. Among the causes to be given consideration are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the art, changes in demand and requirements of public authorities." FERC 18 C.F.R. pt. 101, Definition 12 (2002).

V, the original value of those assets.[79] Each year, V – D reflects the utility's unrecovered capital investment — the portion of the facilities for which the customers have not yet paid.[80] Utilities are allowed to earn a fair return only on the unrecovered portion of their capital investments.[81] This portion, calculated as V – D, is the "rate base."[82] The value "r" stands for the rate of return the utility is allowed to earn on the rate base.[83]

FERC and state public service commissions set the rules by which regulated public utilities may pass the costs of capital through to their customers.[84] These rules therefore determine the rate at which utility investors may recover their investment in those assets. Under traditional rate of return regulation, consumers pay for an asset over the entire period the utility uses the asset (the asset's "service life").[85] Under these regulatory rules, the portion of the total cost that consumers pay each year is referred to as "depreciation."[86] However, for clarity in distinguishing the meaning of that term under the regulatory, financial, and tax accounting rules, this will be referred to as "regulatory depreciation."

Calculating annual regulatory depreciation for public utilities involves four steps: (1) identifying the total cost of the asset,[87] (2) estimating the service life of the depreciable asset,[88] (3) estimating the net salvage value of the asset,[89] and (4) identifying a depreciation system that will

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[79] *See* DAVIES, *supra* note 3, at 300.
[80] *See* EDISON ELECTRIC INSTITUTE, INTRODUCTION TO DEPRECIATION FOR PUBLIC UTILITIES AND OTHER INDUSTRIES 8 (2013) [hereinafter, EEI].
[81] *See* DAVIES, *supra* note 3, at 300.
[82] *Id*.
[83] *Id*. The firm's weighted average cost of capital, the amount it must pay to lenders and investors to acquire the funds it uses to provide utility services, provides the basis for "r". *Id.* at 302 ("The rate of return, then, reflects the interest on debt and a return to shareholders for all of the capital that they have invested. Thus, the final variable (r) represents a weighted average of the different types of investments made by the utility, calculated to attract investors."); *See also* ALT, *supra* note 32, at 40.
[84] *See* DAVIES, *supra* note 3, at 284.
[85] FERC 18 C.F.R. pt. 101, Definition 36 (2002) ("Service life means the time between the date electric plant is includible in electric plant in service, or electric plant leased to others, and the date of its retirement. If depreciation is accounted for on a production basis rather than on a time basis, then service life should be measured in terms of the appropriate unit of production.")
[86] The U.S. Supreme Court affirmed cost-based depreciation for public utilities in *Lindheimer v. Illinois Bell Telephone Company*, 292 U.S. 151 (1934), and *Federal Power Commission v. Hope Natural Gas Company*, 320 U.S. 591 (1944).
[87] FERC rules provide that "[o]riginal cost, as applied to electric plant, means the cost of such property to the person first devoting it to public service." FERC 18 C.F.R. pt. 101, Definition 23 (2002). Firms may capitalize (include as part of the original cost of the asset) any expenses the firm incurs to make the asset ready for its intended use, including interest on debt service, labor, and other costs incurred during the construction or installation process. PRICEWATERHOUSECOOPERS, UTILITIES AND POWER COMPANIES, 12-2 – 12-13 (March 31, 2016) [hereinafter, PwC].
[88] A firm estimates the service life based on actuarial studies and past experience with like assets, taking into consideration the effects of wear and tear, operational changes, regulatory requirements and anticipated future use of the assets. *See* EEI, *supra* note 80, at 3-4.
[89] *Id.* Equipment and other assets used in a trade or business often continue to have value after they are removed from service by their original owner. When third parties acquire these assets, the price at which the asset is sold is its "salvage value." For example, a firm may purchase an asset from salvage and either refurbish the asset to use for its original purpose, dismantle the asset and sell it for parts, or sell the asset for scrap. The residual value at that point, the price at which the asset is likely to sell at the end of its service life, is its salvage value. FERC defines salvage value as "the amount received for property retired, less any expenses incurred in connection with the sale or in preparing the property for sale; or, if retained, the amount at which the material recoverable is chargeable to materials and supplies, or other appropriate account." FERC 18 C.F.R. pt. 101, Definition 35 (2002). FERC defines "net salvage

allocate the cost of the asset in a rational manner over the asset's service life.[90] While several types of methods for calculating depreciation exist, including deferred and accelerated methods based on the age and life of an asset, utilities use the straight-line method nearly universally.[91] Under straight-line depreciation, the net salvage value is subtracted from the total cost of the asset placed in service, and then that number is divided by the asset's service life.[92]

2. *Financial Accounting*

Financial accounting rules are used to calculate firm income and to comply with financial reporting requirements. A firm's value is measured by the regularity at which revenues exceed expenses, yielding net income, or profit. The financial accounting rules provide that in calculating annual net income, a firm may deduct a portion of the total cost of the asset each year the asset is in use, reflecting that decline in value.[93] While the financial accounting rules refer to this amount as a "depreciation allowance," this article refers to the deduction as "financial depreciation" to distinguish the amount from regulatory depreciation, described above, and tax depreciation, described below. To calculate financial depreciation using the straight-line method, a firm subtracts the salvage value of the asset from the original cost of the asset and divides that difference

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value" as "the salvage value of property retired less the cost of removal." FERC 18 C.F.R. pt. 101, Definition 19 (2002). Cost of removal is defined as "the cost of demolishing, dismantling, tearing down or otherwise removing electric plant, including the cost of transportation and handling incidental thereto. It does not include the cost of removal activities associated with asset retirement obligations that are capitalized as part of the tangible long-lived assets that give rise to the obligation." FERC 18 C.F.R. pt. 101, Definition 10 (2002).

[90] *See* EEI, *supra* note 80, at 3.

[91] *Id.* at 4. Utilities may also use certain accelerated depreciation methods, such as "sum-of-the-years-digits," declining-balance methods, and units-of-production methods. *See also* PWC, supra note 87, 12-13. Utilities may also use "group methods" or "composite methods" for multiple assets or asset groups. *Id.* at 12.3.1. Firms apply the group method to homogeneous assets with service lives of approximately the same length, such as utility poles and other largely identical units of a transmission or distribution system. *Id.* Under the group method, firms depreciate the carrying amount over the average life of the assets in the group. *Id.* Firms generally use the composite method for assets that are components of a larger asset, such as a power plant. *Id.* The composite method depreciates heterogeneous assets with different useful lives based on a weighted average depreciation rate. *Id.* When assets are retired, regardless of whether an asset has reached the average service life of the assets in the group, a firm will sell the asset and take the gain or loss on that sale into account as accumulated depreciation. *Id.* Earnings are not affected. *Id. See also* EEI, *supra* note 80, at 35-48.

[92] *Id.* at 4.

[93] More specifically, the Financial Accounting Standards Board defines depreciation as follows: "The cost of a productive facility is one of the costs of services it renders during its useful economic life. Generally accepted accounting principles (GAAP) require that this cost be spread over the expected useful life of the facility in such a way as to allocate it as quotably as possible to the periods during which services are obtained from the use of the facility. This procedure is known as depreciation accounting, a system of accounting which aims to distribute the cost of other basic value of tangible capital assets, less salvage (if any), over the estimated useful life of the unit (which may be a group of assets) in a systematic and rational manner. It is a process of allocation, not of valuation." EEI, *supra* note 80, at 2 (quoting FASB Accounting Standards Codification, ASC 360-10-35-4, Property, Plant and Equipment — Overall Subsequent Measurement Depreciation). *See also* PwC, *supra* note 91, at 12.3.1.

by the asset's service life.[94] The regulatory rules modify the financial accounting rules for regulated utilities, to account for capitalization, and calculate depreciation for fixed assets.[95]

As the firm claims financial depreciation allowances each year, it deducts those depreciation allowances from the remaining undepreciated cost of the firm's fixed assets.[96] Under this system, the "net plant" or "carrying amount" continues to reflect the firm's unrecovered investment in the asset.[97] Utilities' financial statements report their aggregate investments in fixed assets as "Property, Plant and Equipment" or "Plant in Service"[98] and include a line item for aggregate "Depreciation" for those assets.[99] The balance is identified as "Plant in Service Net of Depreciation" or "Net Plant."[100]

3. Tax Accounting in the U.S.

In the United States, accounting for recovery of capitalized investments under the tax rules has diverged significantly from financial accounting practices and regulatory depreciation rules. Since the 1950s, Congress has reduced by half the time frames for a firm to recover its investments in capitalized assets, standardized recovery periods for asset groups, and introduced depreciation methods that allow most of the capitalized costs to be recovered in the first few years after an asset is placed in service.[101] Congress has also, through "bonus depreciation" rules, allowed firms to deduct a significant portion of the purchase price of an asset in the first year an asset is placed in service.[102] After applying bonus depreciation, firms recover the remaining investment at accelerated rates under the Modified Accelerated Cost Recovery System.[103] In 2010 and 2011, Congress allowed firms, including public utilities, to expense their capital costs in full under the bonus depreciation rules.[104]

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[94] *See* EEI, *supra* note 80, at 2. Financial depreciation is usually calculated on a monthly basis and applied to reduce the monthly balance of the asset's depreciable cost. *Id.* at 133. Assets placed in service earlier in the year receive more depreciation in the first year than those placed in service later. *Id.* Public service commissions may modify the financial depreciation rates for utilities during a general rate case proceeding. *Id.*
[95] *Id.* at 9.
[96] *Id.* at 15-16, 148-49.
[97] *Id.*
[98] *Id.* at 14.
[99] *Id.* at 15 ("The terms 'Accumulated Provision for Depreciation,' 'Accumulated Depreciation,' 'Accumulated Depreciation Reserve,' 'Depreciation Reserve,' or simply the word 'reserve' are all used interchangeably to denote the accounts designated in the FERC Uniform Systems of Accounts for electric and gas utilities as the 'Accumulated Provision for Depreciation of Plant in Service.").
[100] *Id.* at 16. The cost of the plant less the accumulated depreciation, or "net plant," is the main component in setting utility rates. *Id.*
[101] All of these reforms have added to the complexity of the tax system and increased the costs of compliance.
[102] *See* I.R.C. § 168(k).
[103] *See* I.R.C. § 168(k).
[104] *See* I.R.C. §§ 168(k), 179.

a. Section 167: Useful Life and Salvage Value

As with financial depreciation, the U.S. income tax system has historically allowed businesses to deduct only a portion of the cost of capitalized business assets each year.[105] When the tax system was first designed, depreciation deductions, or "allowances" for property used in a trade or business, generally tracked the gradual decline in the value of the property from wear and tear that occurred as those assets were used to generate income.[106] Initially, the tax rules matched the rules for financial depreciation, permitting a firm to recover its investment in property, plant and equipment less any salvage value[107] the property was likely to have on sale at the end of the service life or "useful life,"[108] a difference known as the "depreciable basis." After the business began to use the property or the asset was "placed in service," the firm could begin taking depreciation deductions until the business retired the asset.[109] Under the "straight-line method" of depreciation, the business could deduct an equal portion of the depreciable basis each year.[110] While at first taxpayers had broad discretion in selecting the useful life of the asset, in 1962 Congress and the Department of Treasury standardized the recovery periods for groups of assets.[111] In general, Congress designed the tax rules to match depreciation deductions with the income generated from using that asset.

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[105] *See* INTERNAL REVENUE SERVICE, HOW TO DEPRECIATE PROPERTY, PUB. 946 (2018), https://www.irs.gov/pub/irs-pdf/p946.pdf [https://perma.cc/S8DG-LANH] ("Depreciation is an annual income tax deduction that allows you to recover the cost or other basis of certain property over the time you use the property.").

[106] Section 167(a) provides that "There shall be allowed as a depreciation deduction a reasonable allowance for the exhaustion, wear and tear (including a reasonable allowance for obsolescence)— (1) of property used in the trade or business, or (2) of property held for the production of income." I.R.C. § 167(a) Neither financial depreciation nor tax depreciation match economic depreciation perfectly, however.

[107] *See* Treas. Reg. § 1.167(b)-0 (2019).

[108] *See* Treas. Reg. § 1.167(b)-0 (2019).

[109] *See* Treas. Reg. § 1.167(a)-10(b) (2019).

[110] *See* I.R.C. § 167; Treas. Reg. § 1.167(b)-1. Other methods, such as the declining balance method were also available. *See* Treas. Reg. § 1.167(b)-2. Today, property not otherwise covered under the modified accelerated depreciation system under § 168 or under the amortization provisions of § 197 continues to be governed by the depreciation rules under § 167.

[111] In 1934, the Department of Treasury began requiring taxpayers to demonstrate that their depreciation allowances were based on useful life periods appropriate for the assets being depreciated. The 1962 Revenue Act authorized the Department of Treasury to develop Special Guidelines for examining depreciation deductions to reduce taxpayer–IRS disagreements over recovery periods. The depreciation rate table was based on classes of assets in industry. *See* STAFF OF JOINT COMM. ON TAX'N, JCX-54-01, *supra* note 56, at 18. The 1971 Revenue Act authorized the Department of Treasury to develop the class life asset depreciation range system (ADR) for machinery and equipment. Class lives were based on broad classes of assets with a range of applicable periods for depreciation. Treasury later expanded ADR to include buildings and improvements to land. *Id.* ADR shortened class lives by 20%. KIEFER, *supra* note 36, at 13.

b. Section 168: Accelerated Cost Recovery

The federal income tax rules now provide for accelerated recovery of capital investments.[112] The Modified Accelerated Cost Recovery System ("MACRS"), established under the Tax Reform Act of 1986, modified the rules for depreciation allowances significantly. First, it eliminated the requirement that taxpayers deduct salvage value in determining the depreciable basis of property; this allowed the entire purchase price or cost of construction of the property placed in service to be recovered in full.[113]

Second, the system established recovery periods that were significantly shorter than the useful life of the property prescribed under Section 167.[114] MACRS generally cut by 50% the periods for recovering the costs of utility plants, including transmission and distribution facilities. For example, under the financial accounting rules, the typical life span for a nuclear power plant is 40-60 years;[115] the recovery period under MACRS is 15 years.[116] The actual service life of a coal-fired steam generation power plant is 55 years and the service life of a natural gas plant is 35 years.[117] Transmission equipment has an estimated service life of approximately 40 years[118] and distribution poles[119] have a service life of 50 years. Under MACRS, the recovery periods for these plants, as well as electric utility transmission and distribution and gas utility distribution facilities, is 20 years.[120] While natural gas pipelines have a service life of 50 years, [121] firms may recover their

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[112] In 1954 Congress first authorized accelerated depreciation methods, including the 200% declining balance method and the sum of the years-digits. Accelerated depreciation was expanded in 1981, with the Economic Recovery Tax Act, which introduced the Accelerated Cost Recovery System ("ACRS"). This system standardized recovery periods for assets, allowing taxpayers to recover investments in tangible business assets over a shorter period— three, five, ten, or 15 years on an accelerated basis. *Id.* The recovery period for real property was shortened to 15 years. Under ACRS, "public utility property" had a depreciation period of ten or 15 years. *Id.* at 19. Depreciation deductions continued to be calculated primarily using the straight-line basis with a half-year convention. When this accelerated rate of depreciation was proved too expensive, Congress modified the system in 1986 to lengthen the recovery period for certain assets, creating the system known as Modified Accelerated Cost Recovery, or MACRS. *Id.*

[113] I.R.C. § 168(b)(4). A robust market for fully depreciated assets exists because the recovery periods are significantly shorter than the useful lives for the asset classes. Any gains on sale of zero basis property are included in income. To the extent the gains are associated with accelerated depreciation previously taken, those gains are taxed at ordinary income rates. *See* I.R.C. §§ 1245, 1250 (2019).

[114] *See* I.R.C. § 168. The periods are longer, however, than those in place under the Accelerated Cost Recovery System in place from 1981 to 1986. *See* Economic Recovery Tax Act of 1981, Pub. L. 97-34, 95 Stat. 172, §201; I.R.C. § 168(c)(2)(C) and (E) (1981) (providing a 10 year recovery period for public utility property with a class life between 18 and 25 years and a 15 year recovery period for public utility property with a class life greater than 25 years). For most types of public utility property, the Tax Reform Act of 1986 lengthened the recovery periods prescribed by the Economic Recovery Tax Act of 1981, but the depreciation methods for public utility property remained the same. KIEFER, *supra* note 36, at 15.

[115] Mark Pomykacz & Chris Olmsted, *The Appraisal of Power Plants*, APPRAISAL J. 216, 217, tbl. 1 (Summer 2014).

[116] Rev. Proc. 87-56, 1987-2 C.B. 674.

[117] Pomykacz, *supra* note 115, at 217, tbl. 1.

[118] *See* EDISON ELECTRIC INSTITUTE, TRANSMISSION PROJECTS: AT A GLANCE ix (Dec. 2016); Advisian, Worley Parsons Group, Review of Standard and Remaining Lives of Assets, Networks NSW 36-38 (Jan. 12, 2015).

[119] HARRIS WILLIAMS & CO., TRANSMISSION AND DISTRIBUTION INFRASTRUCTURE, 5 (Summer 2014), https://www.harriswilliams.com/sites/default/files/industry_reports/final%20TD.pdf [https://perma.cc/QHY4-FWVG].

[120] Rev. Proc. 87-56, *supra* note 116.

[121] Garance Burke and Jason Dearen, *Aging Gas Pipe at Risk of Explosion Nationwide*, ASSOCIATED PRESS (Sep. 14, 2010).

capital costs in only 15 years.[122] The following chart compares the "service life" or "useful life" of utility assets for financial accounting and FERC rules to the "recovery period" in which a firm may deduct the costs of its investments in these assets under the tax rules.

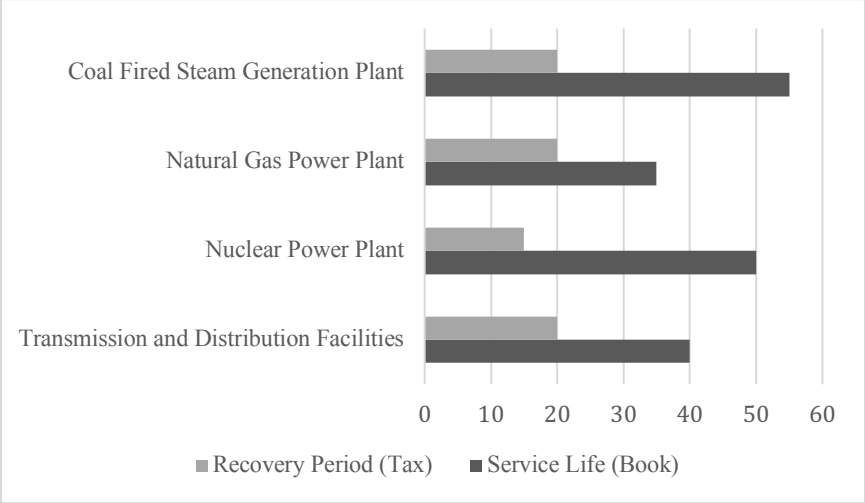

Figure 1. Comparison of recovery periods under modified accelerated (tax) depreciation (pursuant to I.R.C. Section 168) and depreciation for coal fired steam generation plants, natural gas facilities and nuclear power plants under financial accounting (book) and FERC rules.

Third, MACRS provides for property, such as equipment, to be depreciated using not only the straight-line method, but also the 200% declining balance method or the 150% declining balance method, which provides higher deductions for depreciation in the early years the asset is in service.[123] These accelerated cost recovery methods allow taxpayers to recover the bulk of their investment in the first few years of use.[124] Consequently, capital-intensive industries, including utilities, may recover their investments in durable assets more quickly for tax purposes by "front-loading" the depreciation, deducting a higher percentage of the value of the asset in the early years of its service. Electric utility steam production plants, combustion turbine production plants, and transmission and distribution plants may apply the 150% declining balance depreciation method.[125]

c. Section 168(k): Bonus Depreciation

Recently Congress has enacted tax provisions that allow taxpayers to recover their investments even more quickly than with MACRS. Section 168(k) provides for "bonus

[122] Rev. Proc. 87-56, *supra* note 116.
[123] *See* I.R.C. § 168(b). These methods switch to straight-line when that method would produce greater depreciation deductions.
[124] *See id.* While the straight-line depreciation divides the total amount of the expenditure by the recovery period to give an aliquot portion of depreciation per year, the double declining balance method allows taxpayers to deduct two times the depreciation allowed under the straight-line method in the first few years of the recovery period. The 150% declining balance provides a deduction equal to one and a half times the deduction allowed under the straight-line method. *See id.*
[125] *See* STAFF OF JOINT COMM. ON TAX'N, JCX-54-01, *supra* note 56, at 20-21.

depreciation."[126] Congress's original intention was to spur growth by allowing businesses to deduct immediately, or "expense," a portion of the cost of assets in the year they are placed in service.[127] Theoretically, a business that recovers its business investments more quickly may replace them sooner, leading to the acquisition of more business assets. By stimulating manufacturing and retail job growth, Congress sought to improve productivity and enhance economic performance.[128]

Congress initially employed bonus depreciation to spur the economy following the September 11, 2001 terrorist attacks. The Job Creation and Worker Assistance Act of 2002[129] authorized taxpayers to deduct 30% of their cost basis in qualified depreciable property with a recovery period of 20 years or less, if they acquired the property and placed it in service between September 10, 2001, and May 5, 2003. After deducting this sum, the taxpayer could also take normal depreciation deductions on their remaining basis in the property under MACRS for the year the property was placed in service and subsequent years. Congress has since extended bonus depreciation,[130] allowed it to lapse,[131] restored it,[132] and increased the bonus to cover as much as 100% of the cost of the asset, with phase-downs of the percentage in later years.[133]

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[126] I.R.C. § 168(k).

[127] Another provision dating from 1958, Section 179, permits smaller businesses to "expense," deduct in full, the cost of equipment placed in service in a given year. I.R.C. § 179. Congress has used the provision to stimulate the economy and simplify tax accounting for small businesses, though recent dramatic changes in the provision's parameters have made the deduction available for larger businesses. *See* JANE G. GRAVELLE, CONG. RESEARCH SERV., BONUS DEPRECIATION: ECONOMIC AND BUDGETARY ISSUES 3, n. 6 (2014), https://fas.org/sgp/crs/misc/R43432.pdf [https://perma.cc/2ZDQ-93VF].

In the short term, expensing provisions reduce the cost of capital for businesses to acquire qualified assets and increase the cash flow of firms investing in those businesses. *Id.*; *see also* GARY GUENTHER, CONG. RESEARCH SERV., SECTION 179 AND BONUS DEPRECIATION EXPENSING ALLOWANCES: CURRENT LAW AND ISSUES FOR THE 114TH CONGRESS 10 (2015). Currently, businesses acquiring new or used property that is depreciable under the MACRS system may take an immediate deduction of up to $1,000,000 with an investment maximum of $2,500,000, above which the deduction is reduced dollar-for-dollar. I.R.C. § 179(b) and (d). *See* An Act to Provide for Reconciliation Pursuant to Titles II and V of the Concurrent Resolution on the Budget for Fiscal Year 2018, Pub. L. 115–97, 131 Stat. 2054 (2017) (colloquially known as the Tax Cuts and Jobs Act of 2017) [hereinafter, the TCJA of 2017]. When combined with other depreciation provisions under Section 168, Section 179 is applied to the first $1,000,000 of basis, and then Section 168(k) bonus depreciation is applied, and then MACRS is applied, all of which happen during the first year the property is placed in service. Subsequent MACRS allowances are calculated from the tax basis remaining after the first year.

[128] While the original goal of bonus depreciation and expensing provisions was to spur a flagging economy, empirical studies have shown that they are not effective as stimuli. *See* GUENTHER, *supra* note 127, at 10-14.

[129] *See* Job Creation and Worker Assistance Act of 2002, Pub. L. No. 107-147, 116 Stat. 21.

[130] The Jobs Growth Tax Relief and Reconciliation Act of 2003 expanded the bonus depreciation regime. *See generally* Jobs and Growth Tax Relief Reconciliation Act of 2003, Pub. L. No. 108-27, 117 Stat. 752. Property acquired after May 5, 2003 and placed in service by December 31, 2004 was eligible for bonus depreciation of 50%. The provision expired at the end of 2004.

[131] *Id.* The provision expired at the end of 2004.

[132] In 2008, responding again to an economic recession, Congress enacted The Economic Stimulus Act, restoring the temporary 50% first-year bonus depreciation break from January 1, 2008 through September 8, 2010. Pub. L. 110-185, 122 Stat. 613 (2008). The Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010, increased the bonus depreciation allowance to 100% and extended the allowance through 2011 for property acquired after September 8, 2010 and placed in service by December 31, 2011. Pub. L. 111–312, 124 Stat. 3296 (2010). For 2012, bonus depreciation was reduced again to 50% for qualified property placed in service during this period. *Id.*

[133] The American Taxpayer Relief Act of 2012 extended the 50% bonus depreciation through January 1, 2014. Pub. L. 112–240, 126 Stat. 2313, (2013). The provision expired in 2014, but was reinstated at the end of 2015. *See* Economic Stimulus Act of 2008, Pub. L. No. 110-185, 122 Stat. 613; American Recovery and Reinvestment Act of

The following table identifies the percentage of an asset that may be deducted immediately (expensed) the first year that the asset is placed in service under the Section 168(k) bonus depreciation provisions for any portion of the year from 2001 to 2027. The table contrasts the availability of bonus depreciation for qualifying property generally and for qualifying property held by regulated utilities.

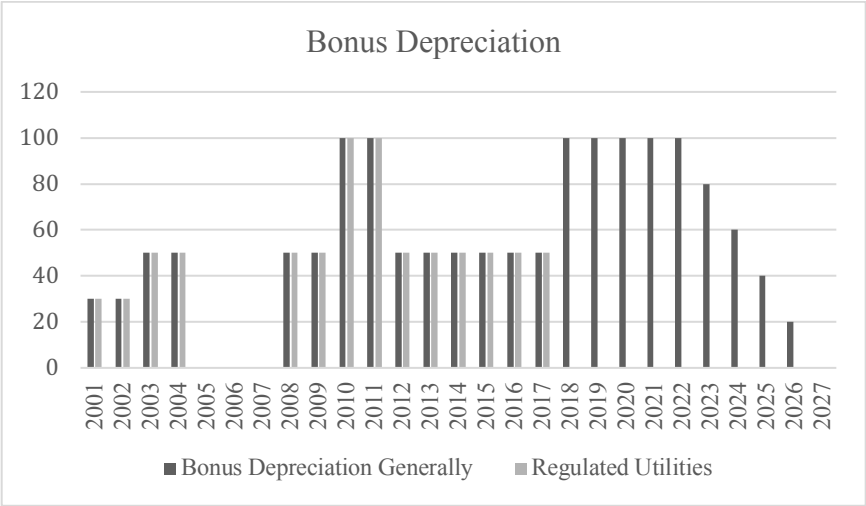

Figure 2. Comparison for the years from 2001 through 2027 of the percentage of asset value that may be expensed the year the asset is placed in service pursuant to Section 168(k) "bonus depreciation" available for qualifying property.[134]

Under the Tax Cuts and Jobs Act of 2017, Congress limited the ability of regulated utilities to take bonus depreciation under Section 168(k).[135] From 2018 to 2027, utilities may not take bonus depreciation in new assets, but they may deduct the interest they pay in full.[136] In contrast, non-utility firms may take bonus depreciation, but if they do, their ability to deduct interest is limited.[137] The rationale for this choice is economic. Historically, interest paid in connection with business loans has been deductible in full.[138] When debt is used to finance the acquisition of depreciable business assets, a significant portion of the cost of those assets may be deducted immediately. By

2009, Pub. L. No. 111-5, 123 Stat. 115; Small Business Jobs Act of 2010, Pub. L. No. 111-240, 124 Stat. 2504; Tax Relief, Unemployment Compensation Reauthorization, and Job Creation Act of 2010, Pub. L. 111-312, 124 Stat. 3296; American Taxpayer Relief Act of 2012, Pub. L. 112-240, 126 Stat. 2313. At that point, Congress extended bonus depreciation to apply to property placed in service from 2015 through 2020. Consolidated Appropriations Act, 2016, Pub. L. No. 114-113, § 143, 129 Stat. 2242, 3056-65 (2015). The act also applies retroactively to permit taxpayers to take bonus depreciation on qualified property placed in service in 2015. The Protecting Americans from Tax Hikes Act of 2015, part of the Consolidated Appropriations Act of 2016, sets bonus depreciation at 50% for 2015 through 2017. Pub. L. No. 114-113,129 Stat. 2242, 2244 (2015). The most recent change to the bonus depreciation rules occurred in December 2017.

[134] Note that when Congress passed the bonus depreciation provisions, they were available for assets placed in service as of a particular date that did not always correspond to the beginning of the calendar year. This graph indicates where bonus depreciation was available for the majority of a particular calendar year.

[135] *See* TCJA of 2017. *See* Part III.B. *infra*.

[136] I.R.C. § 163(j).

[137] *Id.*

[138] I.R.C. § 163(a), (h).

combining debt financing with bonus depreciation, a taxpayer may enjoy a subsidy in excess of the value of the asset, resulting in a negative income tax rate.[139] That is, Congress would effectively be paying firms to buy assets.

The goals of the regulatory, financial, and tax accounting systems differ. The purpose of rate regulation is to function as a substitute for competition in a monopoly setting. Regulatory accounting permits the costs of operations, including a portion of the cost of the utility facilities, to be passed through to consumers over time, while allowing investors to earn a return on their investment proportionate to their remaining unrecovered investment in those facilities. Financial accounting helps a firm determine its net income and provides investors with an accurate assessment of the firm's financial status and profitability. The central function of the tax system is to generate revenue for the federal government. While the system initially followed financial accounting rules in measuring net income, in recent years, the income tax has been employed as an economic tool. Tax accounting for fixed assets has been modified to accelerate cost recovery and spur economic growth.

Despite these differences in goals and processes, the three accounting systems use much of the same language with different meanings. The following table summarizes the parameters and clarifies the differences in the systems.

What is depreciated?	Regulatory	Service Value: The total cost of the asset plus any additional costs in acquiring, constructing the assets, and placing it in service. Salvage Value (the price at which the asset will likely sell at the end of the service life of the asset) is subtracted to determine the amount that may be depreciated.
	Financial	Net Plant or Carrying Amount: The total cost of the asset plus any additional costs in acquiring, constructing the assets, and placing it in service less Salvage Value (the price at which the asset will likely sell at the end of the service life of the asset).
	Tax	Depreciable Basis: The total cost of the asset plus any additional costs in acquiring, constructing the asset, and placing it in service. No Salvage Value is deducted.
Does the system account for salvage?	Regulatory	Yes
	Financial	Yes
	Tax	No
What is the period over which the asset is depreciated?	Regulatory	Service Life: The period for which the asset is likely to be in use.
	Financial	Useful Life: The period for which the asset is likely to be in use.
	Tax	Recovery Period: The accounting period during which the tax system will allow the taxpayer to recover their investment in the asset, usually 50% or less of the period for which the asset is likely to be in use.
What is the annual measure of depreciation and how is it used?	Regulatory	Depreciation: This is the portion of the Service Value of the asset the utility may pass through to customers as part of the operating cost (O) of the utility. The aggregate of each year's depreciation (D) is subtracted from the Service Value to determine the Rate Base. The utility also earns a return on the Rate Base.
	Financial	Depreciation Allowance: Each year the firm will deduct a portion of the total cost of an asset from the firm's income to determine net income, the amount of profit. This sum is also subtracted from the remaining Carrying Amount to track the remaining unrecovered investment in the asset.
	Tax	Cost Recovery Allowance: Each year the firm will deduct the cost recovery allowance from gross income to assess the amount of taxable income. This sum is also subtracted from the remaining Depreciable Basis to track the remaining unrecovered investment in the asset for tax purposes.

Table 1. Definition of terms and comparison of the parameters in calculating depreciation under the regulatory, financial, and tax accounting rules.

[139] *See* GRAVELLE, *supra* note 127, at 9-10 ("Under the average 26% effective tax rate for equipment under current [2014] law without bonus depreciation, the effective tax rate on debt financed investment is [negative nineteen percent] -19%. With bonus depreciation, it is [negative thirty-seven percent] - 37%.").

C. Reconciling Tax/Book/Regulatory Disparities: The Normalization Rules and Their Effects

Capitalized investments feature in the ratemaking process in three places. First, regulatory depreciation is included as part of the Operating Expense (O) that is passed forward to customers. Second, the utility and its investors are entitled to earn a return on the capital investments in the utility's facilities to the extent that customers have not yet paid for them (V-D). Third, a normalized "tax expense" is also included as part of Operating Expense.

Utilities are not permitted to pass the immediate tax savings from accelerated depreciation through to consumers or to use tax depreciation to calculate the tax expense charged to consumers as part of the ratemaking process.[140] Instead, both the FERC and the Internal Revenue Service ("IRS") require regulated utilities to follow "normalization rules" when computing tax expense and establishing cost of service during the ratemaking process.[141] The normalization rules reconcile the differences between tax accounting and accounting for ratemaking and financial reporting purposes.[142] To enforce the normalization rules, Congress provided that public utilities failing to normalize will be denied permission to use accelerated depreciation for assets currently in service and for property, plant, and equipment acquired in the future.[143] Penalties for failure to normalize accelerated deductions include the loss of those deductions and the recapture of tax credits.[144]

Normalization affects the rate-setting formula in two ways. First, tax expense is calculated by deducting depreciation allowances based on the financial and regulatory accounting rules rather than deducting cost recovery allowances under the income tax rules.[145] The normalization rules require that the operating expense include the taxes that consumers would pay if MACRS the accelerated cost recovery system had never been enacted.[146]

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[140] *See* PwC, *supra* note 91, at 19-10. *See also* I.R.C. § 168(i)(9).

[141] I.R.C. § 168(i)(9), (10). In the Tax Reform Act of 1969, Congress discouraged public utility commissions from allowing the tax benefits from accelerated depreciation to be passed through to current consumers by imposing normalization on new investments where the utilities used accelerated depreciation. U.S. GOV'T ACCOUNTABILITY OFF., GAO/GGD–91–51, PUBLIC UTILITIES; DISPOSITION OF EXCESS DEFERRED TAXES 30 (Sept. 1991), https://www.gao.gov/assets/220/215102.pdf [https://perma.cc/29PP-5REY]. The Economic Recovery Act of 1981 required utilities to normalize the tax and book depreciation timing differences in order to take advantage of ACRS depreciation. *See* KIEFER, *supra* note 36, at 13. Before that, many utilities did not use normalization; they allowed the tax benefits of accelerated depreciation to flow-through to customers immediately. *Id.* at 11. Consequently, the customers paid lower rates (because lower tax expense was included in their electricity bills) in the early years. *Id.* Later customers paid a higher electricity or gas rate when the property had been fully depreciated and there was no more tax depreciation remained to offset income and reduce their tax expense. *See* EEI, *supra* note 80, at 135.

[142] Normalization rules apply not only to accelerated depreciation, but also to other tax/book disparities, such as treatment of the "allowance of funds during use during construction" (AFUDC), "contributions in aid of construction" (CIAC), capitalized interest, investment tax credits, and overhead. PwC, *supra* note 91, at 19-11 - 19-13. Software may either be capitalized or expensed. Investment tax credits (IDC) are handled differently as well. *See* EEI, *supra* note 80, at 134.

[143] I.R.C. § 168(f)(2).

[144] I.R.C. § 168(f)(2). Note that in 2017, however, the Internal Revenue Service issued a guidance providing a safe harbor for public utilities that have failed to follow the normalization rules and indicated that it would not pursue enforcement proceedings for past failures. *See* Rev. Proc. 2017-47; *see also* Jeffrey Davis, David Burton and Isaac Maron, *An IRS Lifeline to Public Utilities on Normalization*, LAW360 (Sept. 14, 2017), https://www.law360.com/articles/964097 [https://perma.cc/XRN4-87KX].

[145] *See* PwC, *supra* note 91, at 19-10.

[146] Normalized calculation of tax expense follows the older tax depreciation rules under I.R.C.§ 167. *See* I.R.C. § 168(i)(9)(A)(ii).

As a result of the timing differences in the tax and financial accounting rules, the utility enjoys tax savings from accelerated tax depreciation.[147] However, under the normalization rules, the utility continues to collect tax payments from consumers as though accelerated tax depreciation did not exist. Under the normalization rules the utility collects more revenue from customers than it needs to cover the actual taxes the utility pays in the early years of the asset's service life.[148] Consequently, the utility enjoys a pool of tax savings consisting of its customers' "overpayments" of tax. The utility collects less revenue than it needs from customers later in the service life of the asset.[149] The tax savings are then applied to offset actual tax liability at that time, later in the asset's service life, after tax depreciation is complete.[150]

The regulatory and financial accounting rules require utilities to track the pool of tax savings in their financial statements as "accumulated deferred income taxes" or "ADIT."[151] ADIT may be calculated by subtracting the amount of financial depreciation from the tax depreciation and then multiplying that amount by the firm's marginal tax rate. During the service life of an asset, the ADIT account for that asset will increase until financial depreciation exceeds tax depreciation, which will occur at the end of the tax recovery period for the asset. At that point, the tax savings will be passed forward to consumers to reduce the tax expense. The ADIT account increases during the period of cost recovery under the tax accounting rules and then declines at the end of the cost recovery period when there is no more tax depreciation to offset income. When the utility has recovered the full cost of the asset under the financial accounting rules at the end of the asset's service life, the ADIT account for that asset will decline to a sum equal to the salvage value multiplied by the firm's marginal tax rate. This sum is sufficient to cover the taxes on the sale of the asset for salvage, assuming that it sells for its previously estimated salvage value.[152]

To provide an illustration of how the tax savings accrue and are disbursed over time consider the following two examples. The first describes the accrual of tax savings as ADIT based on tax depreciation under MACRS. The second is based on 100% bonus depreciation.

In the first example, assume that a regulated public utility invests $1.2 million in a coal-fired power plant with a 55-year service life. The equipment has a $100,000 salvage value at the end of the service life. To determine the amount of regulatory depreciation, the salvage value is subtracted from the total cost. ($1,200,000 total cost - $100,000 salvage value = $1,100,000). Second, that sum is then divided by the service life of the asset ($1,100,000 / 55 years = $20,000 per year). The utility would pass through $20,000 per year of the asset's cost to the consumers under the rate of return rules.

Likewise, under normalization, the tax expense would be calculated based on the financial depreciation and regulatory depreciation rules. To determine the amount of financial depreciation, the salvage value is subtracted from the total cost ($1,200,000 total cost - $100,000 salvage value = $1,100,000). Second, that sum is then divided by the service life of the asset ($1,100,000 / 55 years = $20,000 per year).

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[147] *See* ALT, *supra* note 32, at 39.
[148] *Id.*
[149] *Id.*
[150] *Id.*
[151] ADIT is included in the firm's financial statements as a liability account, since utility firms must gradually pass the tax savings forward to consumers over the full service life of the asset.
[152] *See* EEI, *supra* note 80, at 134; PwC, *supra* note 91, at 4-19. Note that the sale for salvage at the end of the service life of the equipment will generate income. Since MACRS does not account for salvage value, there may be a modest amount of tax savings to apply toward the tax on that income from salvage.

Next, assuming a marginal tax rate of 35%, to determine the dollar value of the tax expense associated with that asset, one multiplies the amount of the depreciation deduction under the financial accounting rules by the tax rate. A depreciation allowance of $20,000 x 35% corporate tax rate = $7,000. Under the normalization rules, depreciation of this asset would offset $7,000 of income taxes per year over the asset's entire service life.

Under the MACRS rules, however, the utility is allowed to recover the entire cost of the property placed in service over a recovery period of only 20 years. In addition, MACRS does not deduct salvage value. Therefore, the tax deduction the utility may take for depreciation associated with this asset is much larger. Under MACRS, the calculation would be as follows: $1,200,000 depreciable basis / 20 years of cost recovery = $60,000 tax depreciation per year.

Again, assuming a marginal tax rate of 35%, to determine the dollar value of the tax depreciation associated with that asset, one multiplies the amount of the cost recovery allowance under the tax accounting rules by the tax rate ($60,000 x 35% corporate tax rate = $21,000 per year). Under the tax accounting rules, depreciation of this asset would offset $21,000 of income taxes per year over the asset's 20-year cost recovery period (the first 20 years after the asset is placed in service). After that, the utility would have no cost recovery deductions for the remaining 35 years of the 55-year service life.

The tax savings that the utility accrues each year are equal to the tax savings from applying MACRS minus the tax savings that the normalization rules require the utility to use in calculating tax expense. $14,000 tax savings = $21,000 tax savings under MACRS - $7,000 tax savings used to calculate tax expense. Another way to calculate these tax savings is to subtract depreciation deductions under the financial accounting rules from the actual tax depreciation the utility enjoys under MACRS, and then multiply that sum by the marginal tax rate: $60,000 MACRS depreciation - $20,000 depreciation permitted to calculate tax expense under the normalization rules = $40,000. $40,000 excess depreciation x 35% corporate tax rate = $14,000 in tax savings.

Because of the difference in the taxes the utility actually pays to the federal government and the taxes they collect from their customers under the normalization rules, a pool of tax savings would accrue. The tax savings pool (tracked as ADIT under the financial accounting rules) would increase each year by $14,000 per year for each of the first 20 years.

At the end of the 20-year period, the ADIT account will have reached $280,000. At that point the utility has no more actual tax depreciation to reduce the taxes on revenue from operating the asset. During the last 35 years the asset remains in service, the pool of tax savings would be drawn down at a rate of $7,000 per year to apply to the tax expense that is passed through to consumers. At the end of the 55-year service life of the property, the asset has been fully depreciated and the remaining $35,000 in ADIT may be applied to the taxes on the income from sale of the equipment for salvage ($100,000). The calculations on which Figure 3 is based are included in Appendix A.

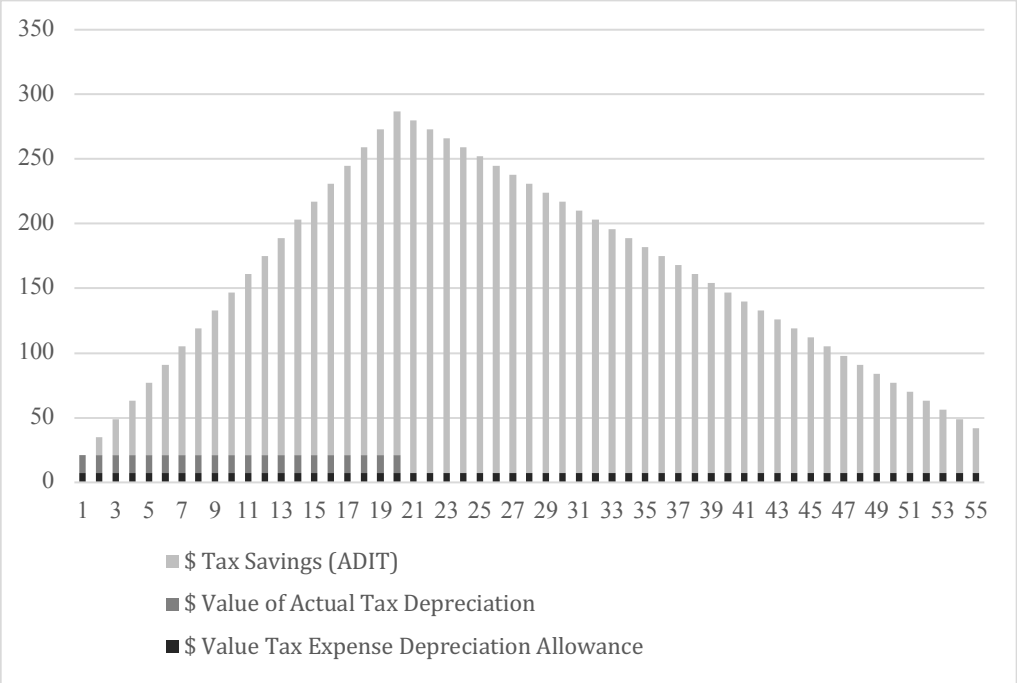

Figure 3. This chart the tax savings (ADIT) that accrue under the normalization rules because of the timing differences under MACRS. The chart shows the tax savings that accrue and are disbursed for a $1,200,000 asset, with a 55-year service life, and a 20-year cost recovery period. The vertical figures are in the $1000s.

In the second example, we assume the same parameters, except that the utility is taking advantage of 100% bonus depreciation. Bonus depreciation allows an immediate deduction of a certain percentage of an asset's value before applying the usual MACRS rules. Bonus depreciation has ranged from 20% to 100%. Bonus depreciation vastly increases the pool of tax savings in the early years of the asset's service life.

A utility will achieve the highest level of tax savings if it employs expensing, or 100% bonus depreciation, which was in effect in 2010 and 2011 for public utilities. Under 100% bonus depreciation, all of the tax savings are accrued the first year the asset is placed in service. The figure below depicts the accrual and draw down of the tax savings for a $1,200,000 coal-fired power plant with a 55-year service life with 100% bonus depreciation.

As above, under the rate of return rules, the utility would pass through to consumers $20,000 of regulatory depreciation each year for 55 years. Under the normalization rules, the tax depreciation of the asset would offset $7,000 of income taxes per year over the asset's entire service life.

Under 100% bonus depreciation, however, the utility is allowed to recover the entire cost of the property in the first year the asset is placed in service. The tax deduction for depreciation that the utility would take would be as follows: $1,200,000 depreciable basis x 100% = $1,200,000 cost recovery in the first year. The dollar value of that cost recovery deduction would be $420,000; $1,200,000 tax depreciation x 35% corporate tax rate = $420,000. After the first tax year, the utility will have no additional cost recovery allowances.

Applying the tax accounting rules to this asset, the utility will enjoy $420,000 in tax savings the year the asset is placed in service. However, only $7,000 of those savings will be applied to calculate tax expense for consumers. Therefore, customer rates will result in tax savings of

$413,000. These tax savings are tracked as ADIT under the financial accounting rules. During the remaining 54 years the asset remains in service, that pool of tax savings, the ADIT account, will be drawn down to offset the utility's actual tax liabilities, and applied to reduce the tax expense passed through to consumers.

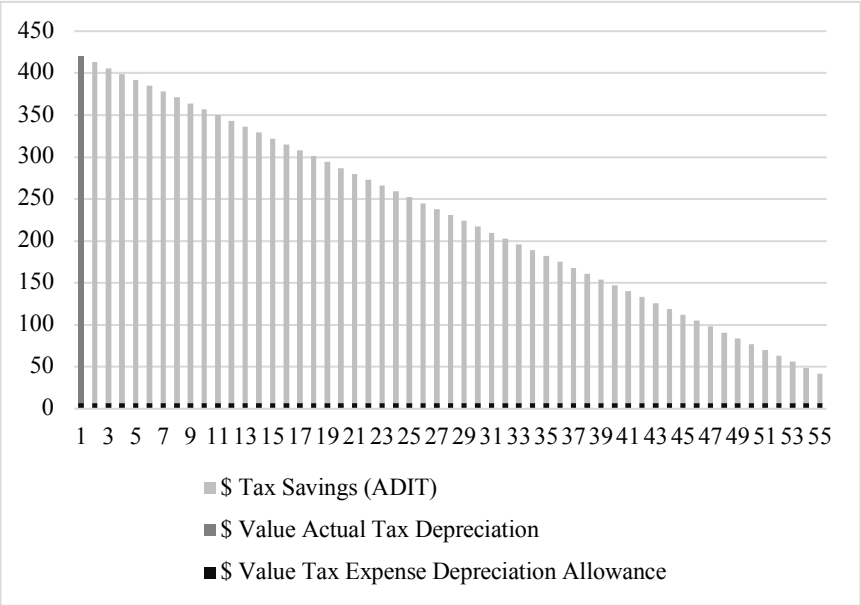

Figure 4. This chart depicts the tax savings (ADIT) that accrue under the normalization rules because of timing differences from the application of 100% bonus depreciation (expensing) under § 168(k). The chart shows the tax savings that accrue and are disbursed for a $1,200,000 asset, with a 55-year service life and a 1-year cost recovery period, applying a 35% corporate tax rate. The vertical figures are in the $1000s.

At the end of the 55-year service life, the asset has been fully depreciated. Again, the last $35,000 in ADIT would be used to offset income tax liability on the $100,000 salvage value estimated when the asset was first placed in service. The calculations on which Figure 4 is based are included in Appendix B.

The normalization rules require the utilities to refrain from passing the immediate tax benefits of accelerated tax depreciation through to consumers. There are several justifications for this decision. First, an immediate pass-through of accelerated tax depreciation would generate less taxable income for utilities and less revenue for the government.[153] If public service commissions had authorized utilities to use accelerated tax depreciation to calculate tax expense in the rate-setting process,[154] the utilities would pass through to consumers the actual taxes they paid. Under MACRS, over the asset's service life, the tax expense charged to consumers would be much lower in the early years of the asset's service life, when accelerated tax deprecation provided larger tax deductions, and much higher in later years, when no tax depreciation was available to offset income.[155]

In recent years, many public utilities have paid no federal income taxes, because accelerated depreciation and, particularly bonus depreciation, have offset the utility's income in

[153] *See* EEI, *supra* note 80, at 134.
[154] *Id.*
[155] *See* GAO, *supra* note 141, at 4.

its entirety.[156] Calculation of tax expense using the actual taxes paid by the utility would result in the consumers paying zero tax expense during those years, and enjoying lower utility rates.

If the benefits of accelerated tax depreciation were passed through to customers during the early years, the tax expense passed through to consumers in later years (when tax depreciation was complete) would be higher and the utility would charge higher rates for the same level of service.[157] Lower income households might not be able to afford to cover these increased costs and the distributional impacts might include loss of service. By employing the normalization rules, Congress was able to maintain the rate base and operating expense at even levels over the life of the asset.[158] The normalization rules stabilize the rates consumers pay for energy and the revenues the utilities earn as they provide electric service.

Under the normalization rules, the utility over-collects revenue from consumers to cover tax expense.[159] The tax savings that accrue from this process are treated as zero-cost capital because the customers have contributed these sums through their overpayment of tax expense. The sums in the ADIT account substitute for capital from investors and lenders, reducing the need to pay dividends or interest.[160] To the extent the funds in the ADIT account have been provided by the customers, the investors should not earn a return on these funds.[161]

Utilities may use either of two different approaches to ensure that the returns to the tax savings in the ADIT account accrue to consumers rather than to investors.[162] The first provides that, in calculating the rate base, both the ADIT and all accrued depreciation (D) are deducted from the gross value of the utility's fixed assets.[163] The rate formula used to calculate a utility's revenue requirement is modified as follows to take into account the deduction of ADIT:

$$R = O + r\,(V - D - ADIT).$$ [164]

Subtracting ADIT from the rate base ensures that the investors are not permitted to earn a return on customer-funded capital.[165] Conceptually, this arrangement allows consumers to enjoy

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[156] *See* SARAH ANDERSON, *ET AL.*, UTILITIES PAY UP, HOW ENDING TAX DODGING BY AMERICA'S UTILITIES CAN HELP FUND A JOB CREATING, CLEAN ENERGY TRANSITION, INSTITUTE FOR POLICY STUDIES (July 2016), https://ips-dc.org/utilities-pay-up/ [https://perma.cc/CBL3-2LFG].
[157] *See* GAO, *supra* note 141, at 6.
[158] *Id.*
[159] *Id.* at 4.
[160] *Id.* at 8; *See* KIEFER, *supra* note 36, at 23.
[161] *See* GAO, *supra* note 141, at 4. Another conceptualization of the financial effects of normalization treats the tax savings as an interest-free loan from the U.S. Treasury to the utility company. *See* KIEFER, *supra* note 36, at 23. The utility keeps the principal of the loan and, until repayment, earns interest itself, which it passes forward to consumers. *Id.* The interest rate is equal to the utility's allowed rate of return and the consumers enjoy that interest as lower utility rates. *Id.*
[162] *See* ALT, *supra* note 32, at 39.
[163] *Id.*
[164] Again, R refers to the utility's total revenue requirement. O refers to the utility's operating expenses, including depreciation charges and tax expense. V is the gross value of the utility's tangible and intangible property placed in service. D refers to the utility's accrued financial depreciation. ADIT is the tax savings in the accumulated deferred income tax liability account. The rate base is reduced by the ADIT as well as the depreciation that has been passed through to consumers (V). The rate base (V- D - ADIT) is multiplied by r, the rate of return that regulators allow investors to earn on the rate base (the investors' remaining capital investment).
[165] *See* ALT, *supra* note 32, at 39.

free energy from the assets they are assumed to have acquired with their excess tax expense payments under the normalization rules.

The second option is to treat ADIT as a zero-cost source of capital in calculating the cost of capital.[166] The rate of return (r) that is applied to the rate base is essentially the weighted average cost of capital ("WACC") for the utility.[167] WACC is calculated by averaging the cost of each source of capital and then weighting each source based on the percentage that source contributes to the total.[168] The percentage of capital that is funded by debt is multiplied by the interest rate paid to lenders and bondholders, the percentage of capital funded by preferred stocks is multiplied by the return that must be paid to preferred shareholders, and the percentage of capital funded by common stocks is multiplied by the return that must be paid to common stock shareholders. Then those sums are added together to determine the total cost of capital. The following chart depicts the process for calculating the WACC.

Source of Capital (No ADIT)	**Percentage**	**Cost**	**Weighted Cost**
Debt	50%	5%	2.50%
Preferred Stock	5%	7%	0.35%
Common Stock	45%	10%	4.5%
Total	**100%**		**7.35%**

Table 2. Calculation of the Weighted Cost of Capital (with no ADIT to be treated as zero-cost capital).

Under the second option, ADIT is not subtracted from the rate base. ADIT is instead treated as consumer-funded capital with the percentage of capital funded by consumers equal to ADIT/Value.[169] The return that must be paid on this source of capital is zero. The following chart depicts the calculation of WACC where the pool of tax savings tracked as ADIT provides 15% of the capital needed for the utility's facilities.

Source of Capital (ADIT treated as Zero Cost Capital)	**Percentage**	**Cost**	**Weighted Cost**
Debt	40%	5%	2.00%
Preferred Stock	5%	7%	0.35%
Common Stock	40%	10%	4.00%
ADIT	15%	0%	0%
Total	**100%**		**6.35%**

Table 3. Calculation of the Weighted Cost of Capital (with ADIT to be treated as zero-cost capital).

In the formula above, "r" stands for the rate the regulatory authorities will allow a utility to charge on the rate base as a return on its capital investment. R, the revenue requirement, is the

[166] *Id.*
[167] *Id.* at 41; *See* DAVIES, *supra* note 3, at 302. This is essentially the same as the rate of return— (r) applied to the rate base to calculate the Revenue Requirement in the rate-setting process. *See* ALT, *supra* note 32, at 39.
[168] *See* ALT, *supra* note 32, at 39.
[169] *Id.*

total return permitted to investors. A public service commission will set consumer utility rates at the level that will allow the utility to generate the total return needed to cover operating expenses and to provide the necessary return to investors to cover the costs of capital. If "r," the rate of return on the rate base, is lower, the utility rates will be lower.

Note that the normalization rules require that the amount of ADIT excluded from the rate base (or treated as cost-free capital) cannot exceed the amount that the customers have paid in tax expense for a particular period during the rate-making process.[170] Congress wanted to ensure that the consumers gain the benefit of zero-cost capital (or have ADIT excluded from the rate base) only to the extent they contributed that zero-cost capital through their payment of tax expense.[171] Otherwise, they would be receiving an additional subsidy.[172]

When accelerated cost recovery was introduced and depreciation periods were cut to 50% or less of the service life of the assets, the accrual of tax savings was gradual. Ratepayers would pay tax expense that was somewhat in excess of what was paid by the utility for that year. In such situations, the overpayment of tax would likely cover most, if not all, of the tax savings enjoyed by the utility under the tax depreciation rules. The normalization rules would have then required the full amount of tax savings tracked in the ADIT account to be deducted from the rate base.

Bonus depreciation, however, creates enormous tax savings. In the years in which bonus depreciation, and in particular 100% expensing, has been available, the ratepayers are unlikely to have fully funded the tax savings in the ADIT account. Some of those tax savings would more properly be characterized as an interest-free loan from the federal government.[173] Since 2001, many utilities have incurred net operating losses when their deductions from bonus depreciation exceeded their income,[174] raising questions about normalization and the extent to which those losses should be deducted from the rate base.[175] If the tax savings from deferral exceed the amount the ratepayers have paid in tax expense, the excess is not deducted from the rate base or treated as zero cost capital. Instead, those tax savings are treated as investor-contributed capital and investors are allowed to earn a return on those tax savings. In sum, the investors have earned a subsidized

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[170] The Treasury Regulations explain that a taxpayer has failed to comply with the normalization requirements if the amount of ADIT excluded from the rate base (or treated as cost-free capital) exceeds the amount that the customers have paid for in their tax expense for the period during the rate-making process. Treas. Reg. § 1.167(l)-1(h)(6)(i). The regulations include a formula which provides that a utility may deduct from the rate base (or treat as zero-cost capital) only the amount of ADIT that has accrued historically (that the ratepayers have previously paid for with their tax expense), plus a pro rata amount reflecting the portion that the ratepayers will pay as tax expense in the future during that period. Treas. Reg. § 1.167(l)-1(h)(6)(ii).

[171] P.L.R. 2015-41-010 (Oct. 9, 2015). Accelerated cost recovery system—normalization method of accounting—accumulated deferred income tax.

[172] Rev. Proc. 2017-47, 2017 38 I.R.B. 233 (Sept. 7, 2017) ("Congress enacted the ITC and accelerated depreciation to stimulate investment. These incentives were not intended to subsidize the consumption of any products or services, including utility products or services. Recognizing that public utility rates are set based on the utility's costs incurred to provide the utility service, including federal income tax expense, Congress enacted a set of rules to assure that some or all of the value of the incentives it provided for utility capital investment would not be diverted from investment by utilities to lower prices for consumption by customers of utilities.")

[173] *See* GAO, *supra*, note 141, at 3.

[174] For example, in 2015, 23 of the 40 profitable U.S. publicly held utility companies paid no federal income taxes and 16 paid no state taxes, largely as a result of bonus depreciation. *See* ANDERSON, *supra* note 157, at 4.

[175] *See* DETERMINING WHETHER A UTILITY'S RATEMAKING TREATMENT OF AN NOL CARRYFORWARD COMPLIES WITH THE NORMALIZATION REQUIREMENTS, DELOITTE (2014), https://www2.deloitte.com/content/dam/Deloitte/us/Documents/Tax/us-tax-utility-nol-102314.pdf [https://perma.cc/U9DD-9ZCX].

return from bonus depreciation. Therefore, these excess returns to investors from bonus depreciation should be accounted for in assessing the scope of stranded assets.

D. Environmental Impacts of Passing Tax Subsidies Through to Consumers

In general, when corporate entities receive a subsidy through the tax system, the incidence of that subsidy is not clear; the economic benefit of that subsidy may accrue to consumers, to labor, to the owners of capital, or to other material inputs of the corporation's operations.[176] However, the current normalization rules specifically direct the economic benefits of the tax subsidies from accelerated tax depreciation to consumers to the extent of their excess tax expense paid to the utility.[177] To clarify how the rate-setting rules pass tax subsidies forward to consumers, consider the following example, based on data pulled from the 2017 financial statements of Consolidated Edison of New York for the 2016 fiscal year.[178]

The first example calculates the Revenue Requirement without taking the tax savings from accelerated depreciation into account in determining the rate base.

1. Without ADIT**:** $R = O + r (V – D)$

$$O = \$9{,}604{,}000$$
$$V = \$40{,}411{,}000$$
$$D = \$8{,}541{,}000$$
$$r = 7.34\%$$

Source of Capital	**Amount**	**Percentage**	**Cost**	**Weighted Cost**
Debt	14,735,000	50.75%	5.09	2.58%
Common Stock	14,298,000	49.25%	9.66%	4.76%
Total	**29,033,000**	**100%**		**7.34%**

$$R = \$9{,}604{,}000 + .0734\ (\$40{,}411{,}000 - \$8{,}541{,}000)$$
$$R = \$11{,}943{,}000$$

The second example considers the Revenue Requirement after deducting ADIT from the rate base. This assumes that ratepayers have paid sufficient tax expense that the pool of tax savings from their payments is equal to the tax savings that result from accelerated depreciation.[179]

2. With ADIT: $R = O + r (V – D – ADIT)$

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[176] *See* Arnold C. Harberger, *The Incidence of the Corporate Income Tax*, 70 J. OF POL. ECON. 215 (June, 1962); STAFF OF JOINT COMM. ON TAX'N, JCX-14-13, MODELING THE DISTRIBUTION OF TAXES ON BUSINESS INCOME, (2013); JIM NUNNS, URBAN INSTITUTE AND URBAN-BROOKINGS TAX POLICY CENTER, HOW TPC DISTRIBUTES THE CORPORATE INCOME TAX (2012), https://www.taxpolicycenter.org/sites/default/files/alfresco/publication-pdfs/412651-How-TPC-Distributes-the-Corporate-Income-Tax.PDF [https://perma.cc/U2ZW-G2CH].
[177] *See* GAO, *supra* note 141, at 5.
[178] *See* Appendix C, infra.
[179] *See supra* notes 173-176, and accompanying text.

R = $9604,000 + .0734 ($40,411,000 - $8,541,000 - $9,450,000)
R = $11,250,000

Third, the electricity rate discount that results from tax subsidies may be determined. The difference between the two Revenue Requirement calculations divided by the original Revenue Requirement (ignoring ADIT) will provide the percentage discount.

3. Percentage Difference in Revenue Requirement

($11,943,000 - $111,250,000) / $11,943,000 = 5.81% Discount

While consumers may enjoy the discount in their utility rates, adverse consequences result from artificially depressing the prices for electricity and natural gas. First, there is a relationship between price and the quantity demanded for most goods in the economy.[180] The law of demand provides that, all else being equal, when the price of a good rises, demand is lower; when the price of a good falls, demand is higher.[181] Assuming a robust market, the law of supply and demand clarifies that the price of a good will adjust to bring the quantity supplied and the quantity demanded into equilibrium.[182] The equilibrium price, or market-clearing price, is the price at which buyers (who are willing and able to purchase) demand and sellers (who are willing and able to sell) supply.[183] Consequently, when a government introduces subsidies that artificially reduce prices for consumers, consumer demand for gas and electricity will be higher.[184] Lower prices may also encourage wasteful use of these resources. Fossil fuels also have numerous negative externalities associated with their extraction, production, and use, including the health and environmental harms associated with air and water pollution and the growing threats associated with climate change.[185] Subsidizing use of fossil fuels only exacerbates these problems.

Furthermore, these tax subsidies may generate deadweight loss at the macroeconomic level. The loss in revenue to the federal government from the tax preference is likely to be substantial. The Joint Committee on Taxation reports that the revenue losses associated with the shorter depreciation periods for electric transmission lines alone are between $40 and $100 million per year.[186] Revenue losses from accelerated depreciation of natural gas lines are between $80 and $200 million per year.[187] The tax expenditure budget does not track the revenue losses specifically associated with accelerated cost recovery for other energy plant, property and equipment.

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[180] *See* N. GREGORY MANKIW, PRINCIPLES OF ECONOMICS, 67(5th ed. 2008).
[181] *Id.*
[182] *Id.* at 77.
[183] *Id.*
[184] *Id.* at 43-44. Note, however, that consumers generally have an inelastic response to energy price changes. Raising prices may not immediately result in a reduction in use.
[185] *See supra* note 1.
[186] *See* STAFF OF JOINT COMM. ON TAX'N JCX-81-18, ESTIMATES OF FEDERAL TAX EXPENDITURES FOR FISCAL YEARS 2018-2022 22 (2018); STAFF OF COMM. ON TAX'N, 115TH CONG., ESTIMATES OF FEDERAL TAX EXPENDITURES FOR FISCAL YEARS 2016-2020, JCX-3-17, 30 (2017).
[187] *Id.* Compare one year (as opposed to five year) expenditures for 15-year MACRS for certain electric transmission property in STAFF OF JOINT COMM. ON TAX'N JCX-81-18, ESTIMATES OF FEDERAL TAX EXPENDITURES FOR FISCAL YEARS 2018-2022 22 (2018) with STAFF OF COMM. ON TAX'N, 115TH CONG., ESTIMATES OF FEDERAL TAX EXPENDITURES FOR FISCAL YEARS 2016-2020, JCX-3-17, 30 (2017).

Nevertheless, when combined with the social costs of harm to health and the environment, the total costs to the society may exceed the economic benefits of cheaper electricity.

While there appear to be no studies specifically modeling the social cost of fossil fuel energy subsidies,[188] researchers have modeled the benefits of carbon pricing schemes which increase electricity rates and drive a reduction in electricity use. In 2019 Resources for the Future simulated the effects of a carbon dioxide prices on New York power plants.[189] Imposing a cost of $51 (in 2013 dollars) per ton of carbon dioxide emissions by 2025, the research team estimated that the cost of the carbon pricing scheme would raise electricity prices to consumers between 0.1% and 1.1%.[190] They estimated that the increase in rates would reduce emissions between 6% and 25% and would provide a net benefit of between $108 million to $651 million per year.[191] Assuming that the model is non-stochastic and price increases procure emissions reductions at a linear rate, eliminating the pass through of tax subsidies to consumers could potentially multiply these social benefits by several-fold.

By deflating the price of energy produced from fossil fuels, these subsidies encourage the continued acquisition, development, and use of carbon-based energy. The subsidies also undercut the market for renewable energy. Terminating this passthrough would help to relieve lock-in and accelerate the shift to renewable energy resources.

III. STRANDED ASSETS

The risk of stranded assets also contributes to carbon lock-in. Greenhouse gas regulation would increase the costs of operating coal-fired and natural gas-fired power plants, rendering these fossil-fuel based assets less profitable and potentially forcing their premature retirement. This part describes the historical treatment of stranded assets claims before the courts and by regulators. It clarifies the economic incentives that encourage consumers of fossil-fuel based energy systems to vote to keep those systems in place. It then estimates the extent of the risk of stranded costs faced by the fifteen largest public utilities based on data extracted from their financial statements. It also quantifies the tax savings to these public utilities that arise from the timing differences in tax, financial, and regulatory accounting rules based on the ADIT reported in their financial statements. Finally, it argues that these tax savings may serve as a partial recovery pool for stranded costs.

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[188] In 2010, a federal Interagency Working Group created an estimate for the social cost of carbon based on global impacts. In 2015, they estimated that the social cost of carbon was $36 per metric ton of CO2 at a three percent discount rate. The group did not estimate the additional costs contributed solely by the U.S. subsidies to the fossil fuel industry. *See* INTERAGENCY WORKING GROUP ON SOCIAL COST OF GREENHOUSE GASES, TECHNICAL SUPPORT DOCUMENT: TECHNICAL UPDATE OF THE SOCIAL COST OF CARBON FOR REGULATORY IMPACT ANALYSIS UNDER EXECUTIVE ORDER 12866 (Aug. 2016). *See also The Cost of Carbon Pollution*, INST. POL. INTEGRITY (last visited Dec. 31, 2019), https://costofcarbon.org/faq/what-is-the-scc [https://perma.cc/GP8L-BZWC]. Use of estimates of the social cost of carbon to evaluate taxes and subsidies is not universally supported, however. *See* Noah Kaufman, *The Social Cost of Carbon in Taxes and Subsidies*, COLUMBIA SIPA CTR. ON GLOBAL ENERGY POL. (Mar. 2018), https://energypolicy.columbia.edu/sites/default/files/pictures/CGEPSocialCostofCarbonEstimatesinTaxesSubsidies0318_0.pdf [https://perma.cc/DA24-LFR9].

[189] *See* DANIEL SHAWHAN, PAUL PICCIANO, & KAREN PALMER, RESOURCES FOR THE FUTURE, BENEFITS AND COSTS OF POWER PLANT CARBON EMISSIONS PRICING IN NEW YORK: OVERVIEW AND SUMMARY (2019), https://www.rff.org/documents/2136/NY_C_adders_intro__summary_19-08_2.pdf [https://perma.cc/WNH3-MY4H].

[190] *Id.*

[191] *Id.*

A. Historical Treatment of Stranded Assets

Traditional utility regulation dominates the electricity industry.[192] However, in the last four decades, the industry and the regulatory models have begun to change.[193] Today, while a number of regulated industries continue to function as natural monopolies, some divisions of these industries are now governed by competitive markets. In the 1980s, the federal government began to disaggregate the various functions involved in a variety of regulated industries to permit some of the non-monopoly functions to operate through market competition.[194] The nuclear, natural gas, and electric power industries all underwent significant transitions.[195] This led management and investors in these industries either to seek compensation or to shift the costs of stranded assets to other market participants, such as consumers.[196]

Litigants and scholars have argued that deregulation[197] and changes in regulation[198] violate the regulatory compact and give rise to takings claims under the Fifth and Fourteenth Amendments of the Constitution. The general argument proceeds as follows. When firms enter into implied regulatory contracts with the government, they are entitled to be compensated for costs they incur in reliance on that contract. Investors in regulated utilities incur enormous costs in constructing power generation and distribution facilities. The regulatory compact protects an investor owned utility from competition by granting the utility a monopoly. By shielding the utility from competition, the utility and its investors have assurance that it may recover their investment in those facilities. In exchange, regulators control the utility's prices and monitor its services to consumers. The utility is permitted to recover its reasonable and prudentially incurred costs, plus an agreed upon return on investment. When the government exposes the utility to competition, it breaches the regulatory compact. Therefore, litigants and scholars argue that the investors are entitled to compensation for breach of that compact. Furthermore, they argue the regulatory modification works a taking of private property requiring the payment of just compensation.

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[192] *See* DAVIES, *supra* note 3, at 260.
[193] *Id.* at 259.
[194] *See* TOMAIN, *supra* note 40, at 33-37.
[195] *Id.*
[196] *See* Reed W. Cearley and Daniel H. Cole, *Stranded Benefits Versus Stranded Costs in Utility Regulation,* THE END OF A NATURAL MONOPOLY: DEREGULATION AND COMPETITION IN THE ELECTRIC POWER INDUSTRY, 169 (Peter Z. Grossman & Daniel H. Cole, eds. 2003).
[197] *See* J. Gregory Sidek & Danliel F. Spulber, *Deregulatory Takings and Breach of the Regulatory Contract*, 71 N.Y.U. L. REV. 851(1996).
[198] *See, e.g.*, *West Virginia et al. vs. EPA, et al.* (No. 15-1363). In this case, following the publication of the proposed regulations for regulating carbon emissions under Section 112 of the Clean Air Act, known as the Clean Power Plan, West Virginia filed a petition for review. West Virginia was joined by 21 other states (Alabama, Arkansas, Colorado, Florida, Georgia, Indiana, Kansas, Kentucky, Louisiana, Michigan, Missouri, Montana, Nebraska, New Jersey, Ohio, South Carolina, South Dakota, Texas, Utah, Wisconsin, and Wyoming) and numerous other private litigants and trade associations, challenging the Clean Power Plan on several fronts, including a claim that the regulations would work as regulatory taking in violation of the Fifth Amendment, by rendering coal-fired power plants unprofitable and by upsetting "settled investment expectations."

Other scholars have dismantled these arguments.[199] First, while the government has held that a firm is entitled to compensation when the government violates an express provision in a formal contract, courts have not found the government owes compensation for regulatory changes when there is no formal contract in place.[200] Furthermore, such contracts are construed against the grantee and in accordance with the narrowest rational reading.[201]

Second, courts elucidating the terms of the regulatory compact have concluded that a regulatory agency may decline to permit utilities to recover investments in assets that were imprudently incurred or assets that are no longer "used and useful."[202] While, as a theoretical matter, utilities may operate at least cost, a more realistic assumption is that utilities may have incurred unwarranted or excessive costs and that their managers may have made investment mistakes.[203] Unless the excess costs or the faulty investments were previously challenged in a rate case, the regulators are unlikely to catch those mistakes during the regulatory process.[204]

Third, regulators may be subject to capture, leading them to exercise lax regulatory control and allow the utility to overinvest in plant, property and equipment, resulting in excess costs.[205] Consequently, refusing to reimburse stranded assets may be consistent with existing terms of the implied regulatory contract. Requiring that utilities act reasonably and prudently when they make investments functions as a deterrent to waste and improvident spending.[206]

Fourth, if market factors other than a governmental change to the regulatory environment are causing the assets to become obsolete, then there is no responsibility on the part of government to authorize compensation.[207] The retirement of coal-fired power plants has not been caused exclusively by a change in the regulatory environment. During the past six years, hundreds of fossil fuel-based power generation plants have been retired or converted to natural gas plants.[208] In 2015, plants with a total capacity of 19 gigawatts were closed or converted;[209] in 2016, the number

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[199] *See* Oliver E. Williamson, *Deregulatory Takings and the Breach of the Regulatory Contract: Some Precautions*, 71 N.Y.U L. REV. 1007 (1996); Stephen F. Williams, *Deregulatory Takings and Breach of the Regulatory Contract: A Comment*, 71 N.Y.U L. REV. 1000 (1996); Jim Rossi, *The Irony of Deregulatory Takings*, 77 TEX. L. REV. 297 (1998); Herbert Hovencamp, *The Takings Clause and Improvident Regulatory Bargains*, 108 YALE L. J. 801 (1999).
[200] Hovencamp, *supra* note 199, at 807-818. *See United States v. Winstar*, 518 U.S. 839 (1996); *Munn v. Illinois*, 94 U.S. 113 (1876); *Proprietors of Charles River Bridge v. Proprietors of Warren Bridge,* 36 U.S. 420 (1837).
[201] Hovencamp, *supra* note 199, at 807, 817.
[202] When utilities file a case for a rate increase to include additional costs in the operating expense or capital expenditures in the rate base, regulators review those costs to determine whether they were prudent expenditures at the time they were incurred. *See* ALT, *supra* note 32, at 29. Costs that are not judged prudent are disallowed and must be paid for by the utility's shareholders. *Id.*
[203] *Id.*
[204] *See* Williamson, *supra* note 199, at 1003; Hovencamp, *supra* note 199, at 823-825.
[205] *See* Williamson, *supra* note 199, at 1013-14.
[206] *Id.* at 1016-18 (clarifying that making compensation contingent on the requirement of prudent investment in the regulatory compact deters excess investments *ex ante* and that guaranteeing full reimbursement would have the opposite effect, which is likely the reason that there is no express guarantee in the compact).
[207] Hovencamp, *supra* note 199, at 828-830.
[208] *See* Benjamin Storrow, *Big, young power plants are closing. Is it a new trend?* E&E NEWS, (Apr. 27, 2017, 1:14 pm), https://www.eenews.net/stories/1060053677 [https://perma.cc/4HN3-ACZB].
[209] *See Factbox: U.S. coal-fired power plants scheduled to shut*, REUTERS (October 29, 2019, 1:15 pm), https://www.reuters.com/article/us-usa-coal-retirement-factbox/factbox-u-s-coal-fired-power-plants-scheduled-to-shut-idUSKBN1X8298 [https://perma.cc/M2KK-9ZCQ].

was 13 gigawatts.[210] In 2017, generators announced the early closure or conversion of 27 coal-fired plants with 22 gigawatts of productive capacity.[211] While regulatory changes relating to mercury[212] and carbon emissions[213] have been cited as the cause for the plant closures, those regulations were reversed in 2017. Despite the official 180 degree pivot in U.S. policy away from clean energy and in support of coal,[214] coal-fired power plant closures have continued throughout 2018 and 2019.[215] In 2018, generators closed or converted coal-fired plants with the total capacity of over 13,300

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[210] *See Factbox: U.S. coal-fired power plants scheduled to shut*, REUTERS (May 16, 2017), https://www.reuters.com/article/us-usa-coal-retirement-factbox/factbox-u-s-coal-fired-power-plants-scheduled-to-shut-idUSKCN18C2C5 [https://perma.cc/KM3M-ML6H].

[211] *See* Silvio Marcacci, *Utilities Closed Dozens of Coal Plants In 2017. Here Are The 6 Most Important*. FORBES (Dec. 18, 2017) https://www.forbes.com/sites/energyinnovation/2017/12/18/utilities-closed-dozens-of-coal-plants-in-2017-here-are-the-6-most-important/ [perma.cc/UPW6-LZAH].

[212] During the Obama Administration, the Environmental Protection Agency issued new rules under the Mercury and Air Toxic Standards (MATS). These requirements would have been more expensive for older plants to meet. *See* National Emission Standards for Hazardous Air Pollutants from Coal- and Oil-Fired Electric Utility Steam Generating Units and Standards of Performance for Fossil-Fuel-Fired Electric Utility, Industrial-Commercial Institutional, and Small Industrial-Commercial-Institutional Steam Generating Units, 77 Fed. Reg. 9304 (Feb. 16, 2012) (codified at 40 C.F.R. pts. 60 and 63). However, the Trump Administration rolled back these rules in 2018. *See* Michael Biesecker and Matthew Brown, *Trump EPA moves to roll back more clean air and water rules,* WASH. POST (Mar. 1, 2018), https://www.washingtonpost.com/business/trump-epa-moves-to-roll-back-more-clean-air-and-water-rules/2018/03/01/6ac314d8-1dbf-11e8-98f5-ceecfa8741b6_story.html [https://perma.cc/J85L-ZEFG].

[213] On March 28, 2017 President Trump issued an executive order rescinding Obama-era Presidential and regulatory actions that address carbon emissions and instructing the Environmental Protection Agency to withdraw the Clean Power Plan regulations under the Clean Air Act. *See* Exec. Order No. 13783, 82 Fed. Reg. 16093 (Mar. 28, 2017). The EPA proposed to repeal the Clean Power Plan on October 10, 2017. *See* 82 Fed. Reg. 48035 (Oct. 16, 2017). On August 21, 2018, the EPA issued an alternative proposal, the Affordable Clean Energy rule, to establish emission guidelines for states to regulate greenhouse gas emissions from existing coal-fired power plants. *See* 83 Fed. Reg. 45588 (Sept., 10, 2018). The change would relax the rules on greenhouse gas emissions. *See* Juliet Eilperin, *Trump administration proposes rule to relax carbon limits on power plants*, WASH. POST (Aug. 21, 2018), https://www.washingtonpost.com/national/health-science/trump-administration-proposes-rule-to-relax-carbon-limits-on-power-plants/2018/08/21/b46b0a8a-a543-11e8-a656-943eefab5daf_story.html [perma.cc/ABN8-RRLD]. That rule was finalized on July 8, 2019. *See* Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions From Existing Electric Utility Generating Units; Revisions to Emission Guidelines Implementing Regulations, 84 Fed. Reg. 32520 (July 8, 2019) (to be codified at 40 C.F.R. pt. 60).

[214] The Trump Administration has also proposed modifications to numerous environmental statutes in support of coal-fired energy production. *See* Brad Plumer, *Trump Orders a Lifeline for Struggling Coal and Nuclear Plants* N.Y TIMES (June 1, 2018), https://www.nytimes.com/2018/06/01/climate/trump-coal-nuclear-power.html [perma.cc/J2XR-2U6N]. These efforts have been viewed as part of a broader roll-back of environmental regulations affecting many industries and communities throughout the U.S. *See* Nadia Popovich, *et al, 78 Environmental Rules on the Way Out Under Trump* N.Y. TIMES (Oct 5, 2017, updated Dec. 28, 2018), https://www.nytimes.com/interactive/2017/10/05/climate/trump-environment-rules-reversed.html [perma.cc/SCS6-Y3BR]; Eric Lipton, *et al*, *This Is Our Reality Now*, N.Y. TIMES (Dec. 27, 2018) https://www.nytimes.com/interactive/2018/12/26/us/politics/donald-trump-environmental-regulation.html [perma.cc/WY4Z-J9BU].

[215] *See* Slade Johnson & Kien Chau, Energy Information Administration, Today in Energy, *More U.S. coal-fired power plants are decommissioning as retirements continue* (July 26, 2019) ("Between 2010 and the first quarter of 2019, U.S. power companies announced the retirement of more than 546 coal-fired power units, totaling about 102 gigawatts (GW) of generating capacity. Plant owners intend to retire another 17 GW of coal-fired capacity by 2025, according to the U.S. Energy Information Administration's (EIA) Preliminary Monthly Electric Generator Inventory."), https://www.eia.gov/todayinenergy/detail.php?id=40212 [https://perma.cc/nv84-2z8h]; *US coal plant retirements to continue*, ECONOMIST (Sept 7th 2018), http://www.eiu.com/industry/article/1277120111/us-coal-plant-retirements-to-continue/2018-09-07 [https://perma.cc/4fxa-rxxl].

megawatts and in 2019 that number was expected to reach 13,800 megawatts.[216] The age of the existing facilities,[217] new technologies that directly compete with coal as an energy resource,[218] and enhanced access to previously unrecoverable resources[219] have all rendered these plants less competitive in delivering power to consumers. This continued trend toward closure and conversion clarifies that the downturn in the market for coal is not tied strictly to a regulatory change.

Finally, to the extent that regulatory changes have caused any decline in the value of fossil-fuel based assets, that regulatory change should not come as a surprise. Recent research verifies that fossil fuel companies were among the first to ascertain that climbing CO2 emissions would cause global warming.[220] The energy industry has been aware of the negative climate externalities associated with fossil-fuel combustion for decades.[221] Consequently, the risk of climate change regulation is likely to have been built into both firm and individual investment strategies. This knowledge should also be considered part of any review of expenditures under the prudential standard.

While the courts have resisted government reimbursement of utilities' stranded assets under Takings Clause claims, regulators have been receptive when energy policy has shifted sharply.[222] In the 1960s and 70s, the federal government encouraged significant investments in

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[216] *See* REUTERS, *supra* note 208; *Factbox: U.S. coal-fired power plants scheduled to shut*, REUTERS (Oct. 29, 2019), https://www.reuters.com/article/us-usa-coal-retirement-factbox/factbox-u-s-coal-fired-power-plants-scheduled-to-shut-idUSKBN1X8298

[217] *See Most coal plants in the United States were built before 1990*, U.S. ENERGY INFORMATION ADMINISTRATION (Apr. 17, 2017), https://www.eia.gov/todayinenergy/detail.php?id=30812 [https://perma.cc/87FB-9ZGP] ("Coal-fired electricity generators accounted for 25% of operating electricity generating capacity in the United States and generated about 30% of U.S. electricity in 2016. Most coal-fired capacity (88%) was built between 1950 and 1990, and the capacity-weighted average age of operating coal facilities is 39 years.")

[218] Renewable energy has grown as a source of power and the prices are reduced. However, to date, energy from renewables is available on an episodic basis. It cannot ramp up during peak demand. While combined-cycle natural gas plants can ramp up and down relatively cheaply to meet demand as a complement to renewable energy, coal plants have high fixed operating costs and lack that flexibility. *See* Benjamin Storrow, *Big, Young Power Plants Are Closing. Is It a New Trend?* E&E NEWS (Apr. 27, 2017), https://www.eenews.net/stories/1060053677 [https://perma.cc/MLD6-VEPP].

[219] Competition from record shale gas production reduced revenues to coal plants. *See Shale gas, not EPA rules, has pushed decline in coal-generated electricity, study confirms*, SCIENCEDAILY (October 7, 2016), https://www.sciencedaily.com/releases/2016/10/161007105548.htm [https://perma.cc/D5LX-7UB4]; Marin Katusa, *Shale Gas Takes On Coal To Power America's Electrical Plants,* FORBES (May 30, 2012, 01:43pm), https://www.forbes.com/sites/energysource/2012/05/30/shale-gas-takes-on-coal-to-power-americas-electrical-plants/#51e2b4f18b01 [https://perma.cc/WUR8-FERD].

[220] *See* Shannon Hall, *Exxon Knew about Climate Change almost 40 years ago*, SCIENTIFIC AMERICAN (Oct. 26, 2015), https://www.scientificamerican.com/article/exxon-knew-about-climate-change-almost-40-years-ago/ [https://perma.cc/S5WS-6JEB] ("Exxon was aware of climate change, as early as 1977, 11 years before it became a public issue, according to a recent investigation ... This knowledge did not prevent the company (now ExxonMobil and the world's largest oil and gas company) from spending decades refusing to publicly acknowledge climate change and even promoting climate misinformation …"); Élan Young, *Coal Knew, Too*, HUFFPOST (Nov. 22, 2019, updated Dec. 16, 2019), https://www.huffpost.com/entry/coal-industry-climate-change_n_5dd6bbebe4b0e29d7280984f [https://perma.cc/6ESA-XWND]; *Cherry Discovers Early Evidence Coal Knew*, University of Tennessee, Knoxville (Dec. 2, 2019), https://cee.utk.edu/cherry-discovers-early-evidence-coal-knew/ [https://perma.cc/6FKN-EEFK].

[221] See *id.*

[222] *See* Richard J Pierce, Jr., *The Regulatory Treatment of Mistakes in Retrospect: Canceled Plants and Excess Capacity*, 132 U. PA. L. REV. 497 (1984) (coal and nuclear); John Brett MacArthur, *Cost Responsibility or Regulatory Indulgence for Electricity Stranded Costs*, 47 AMER. U. L. REV. 775, 779-80 (1998); Donald F. Santa, Jr. & Clifford

nuclear energy.[223] In the context of rising oil prices and geopolitical changes in the Middle East, nuclear power allowed the United States to reduce reliance on foreign oil.[224] However, in 1979, the Three Mile Island nuclear disaster raised questions regarding the safety of nuclear energy facilities; at the same time, the stabilized oil and natural gas prices of the 1980s provided an alternative, cheaper source of power.[225] With the sudden change in relative fuel costs, the federal government canceled over 120 contracts for nuclear plants, many of which were still under construction.[226] The nuclear power plant owners were allowed to recover part or all of their construction and development costs for these plants: while appeals to the courts were unavailing,[227] state utility commissions allowed firms to recover at least a portion of their costs, including costs associated with excess capacity, canceled plants, and construction works-in-progress[228] by passing these costs through to consumers in the rate setting process.[229]

Similarly, in the 1980s, Congress restructured the natural gas industry by disaggregating gas sales from distribution and by providing open access to pipelines, allowing producers to ship gas to the market.[230] Previously pipeline owner-suppliers had entered into long-term "take-or-pay contracts" with buyers to ensure their recovery of the costs associated with pipeline construction.[231] The contracts required purchasers to either take the product from the supplier or to pay the supplier a penalty.[232] While take-or-pay contracts reduced risk to the suppliers, they also created a significant barrier to entry for new suppliers.[233] In the 1990s, when the pipelines were converted to open access resources, investors sought compensation for the loss in value from increased competition in the open market. Initially, the FERC refused to grant relief to investors for the take-or-pay contracts, but after a protracted legal battle,[234] FERC relented and allowed utilities to split the costs between consumers and investors.[235] Later, FERC allowed pipelines to pass the remaining costs through to customers in their utility rates.[236]

Likewise, in the 1990s the federal government restructured the electric power industry from a regulated natural monopoly to a competitive wholesale market.[237] While courts again spurned

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S Sikora, *Open Access and Transition Costs: Will the Electric Industry Transition Track the Natural Gas Industry Restructuring?*, 25 ENERGY L. J. 113, 139-43 (2004).

[223] *See* Emily Hammond & Jim Rossi, *Stranded Costs and Grid Decarbonization*, 82 BROOK. L. REV. 645, 653 (Winter 2017).

[224] *Id.* at 652-53.

[225] *Id.* at 653.

[226] *Id.* at 654-55.

[227] *Duquesne Light Co. v. Barasch*, 480 U.S. 299 (1989).

[228] *See* Hammond, *supra* note 221, at 653.

[229] *Id.*

[230] *Id.* at 655.

[231] *Id.*

[232] *Id.*

[233] *Id.*

[234] *Associated Gas Distribs. v. Fed. Energy Regulatory Comm'n*, 824 F.2d 981, 993 (D.C. Cir. 1987).

[235] Regulation of Natural Gas Pipelines After Partial Wellhead Decontrol (Order 500), 52 Fed. Reg. 30,334 (Aug. 7, 1987) (codified at 18 C.F.R. pts. 2 and 284).

[236] Pipeline Service Obligations and Revisions to Regulations Governing Self Implementing Transportation Under Part 284 and Regulation of Natural Gas Pipelines After Partial Wellhead Control (Order 636), 57 Fed. Reg. 13,267 (Apr. 8, 1992) (codified at 18 C.F.R. pt. 284).

[237] *See* Hammond, *supra* note 221, at 658. Some states have also moved to competitive retail markets, creating stranded asset issues at the state level as well as the federal level, managed by state public utility commissions rather than FERC.

investors' constitutional Takings Clause claims for compensation for lost revenue,[238] FERC ultimately allowed utility shareholders to recover all of the stranded costs resulting from the transition.[239]

Historically, several states have authorized utilities to securitize their stranded costs.[240] Under securitization, utilities issue bonds, the revenues of which will be used to repay investors for their remaining unrecovered capital expenditures in plant, property, and equipment ("PPE").[241] The bonds will be repaid by consumers over time through higher utility rates.[242] Recently, a number of states have introduced legislation to permit investor-owned utilities and regulators to pursue this option to cover the costs associated with closed and converted coal plants.[243] State regulators have also allowed utilities to pass the costs of PPE through to consumers more quickly than previously permitted by changing the financial and regulatory depreciation rules.[244] In both cases, consumer utility rates must rise to cover the costs of both working and non-working assets. Because consumers desire to maintain their low utility rates, their short term interests are generally in opposition to legislation that will accelerate this process, including climate change regulation. Consumer concerns about stranded assets therefore form one more impediment to effective carbon controls and a shift to renewable energy systems, contributing to carbon lock-in.

B. How Extensive Are the Risks of Stranded Assets for Public Utilities in the United States?

This part examines the extent to which investors in public utilities bear the risk of stranded costs based on information set forth in their financial reports. The financial statements and balance sheets of investor-owned public utilities clarify the extent of their unrecovered capital.

For example, consider the Consolidated Balance Sheets of Consolidated Edison of New York for 2016, the operating revenues of which were primarily derived from regulated utilities.[245]

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[238] *See Fed. Power Comm'n v. Hope Nat. Gas Company*, 320 US 591 (1944) (takings challenge for computing cost recovery).

[239] Order 888, 61 Fed. Reg. 21,540 (Apr. 24, 1996) (codified at 18 C.F.R. pts. 35 and 385). Some states allowed full recovery of these stranded costs; others did not. *See* Hammond, *supra* note 221, at 659.

[240] *See* J. Paul Forrester, *Unstranding Stranded Costs*, 14 J. STRUCTURED FIN. 33 (2008).

[241] *Id*.

[242] *Id*.

[243] *See* Herman K. Trabish, *Securitization fever: Renewables advocates seize Wall Street's innovative way to end coal*, UTILITYDIVE (May 28, 2019), https://www.utilitydive.com/news/securitization-fever-renewables-advocates-seize-wall-streets-innovative-w/555089/ [https://perma.cc/F9Y4-K8WT].

[244] *Id*. For an in-depth discussion of changes made to financial depreciation and accelerate cost recovery for potentially stranded assets, see Christopher Serkin and Michael P. Vandenbergh, *Prospective Grandfathering: Anticipating the Energy Transition Problem*, 102 MINN. L. REV. 1019 (2018). For examples of states and nations in which accelerated financial depreciation has been applied, see ANNIE BENN, ET AL., MANAGING THE COAL CAPITAL TRANSITION, ROCKY MOUNTAIN INSTITUTE (2018), https://rmi.org/wp-content/uploads/2018/09/RMI_Managing_the_Coal_Capital_Transition_2018.pdf [https://perma.cc/4J26-5LRR].

[245] See Appendix C.

Consolidated Edison of New York
Property Plant and Equipment (in millions)

$40,411	Placed in Service
- 8,541	Depreciation Taken (recovered from ratepayers as part of Operating Expense)
31,870	Plant in Service Net of Depreciation
-10,205	Accumulated deferred income taxes
$21,665	Remaining unrecovered capital exposed to regulatory risk

Based on these calculations, Consolidated Edison of New York has recovered from its customers approximately 21% of the $40,411,000 of fixed assets the company has placed in service.[246] As explained above, these costs were passed through to consumers as part of the utilities' operating expense under the financial accounting and regulatory rules. The ADIT account reflects the tax savings the company currently enjoys as a result of accelerated depreciation. The utility will pass these tax savings through to consumers over the remaining service life of the assets.

If, however, climate change regulation forced the utility to retire those assets, the ADIT account could serve as a recovery pool for investors. Upon approval by regulators, those funds would offset an additional 23% of the PPE placed in service, significantly reducing investors' exposure to regulatory risk.[247] The unrecovered capital remaining at risk would be 55.5% of the company's total assets placed in service.[248]

Historic information relating to PPE placed in service, financial depreciation taken, and the growth of the ADIT account may provide a longer-term perspective. Figure 5 tracks Consolidated Edison's (1) total investment in depreciable PPE, (2) portions of those investments that have been recovered via the book depreciation rules permitted in the ratemaking process, and (3) the advance recovery of these investments in the form of tax savings (ADIT). The data has been taken from the company's financial statements from 2009 to 2018, listed in Appendix C.

[246] $8,451 million of depreciation recovered from ratepayers divided by $40,411 million PPE placed in service = 20.9% of capital invested that has already been recovered by investors from ratepayers.
[247] ADIT of $9,450 million divided by $40,411 million PPE placed in service equals 23.4% of total capital that could be recovered through a distribution of ADIT to investors.
[248] $40,411 PPE placed in service - $8,541 depreciation (recovered from ratepayers as part of Operating Expense) less $9,450 million accumulated deferred income taxes equals $22,420 million in remaining unrecovered capital exposed to regulatory risk; $22,420 million in remaining unrecovered capital divided by $40,411 million PPE placed in service equals 55.5% remaining unrecovered capital at risk for becoming stranded.

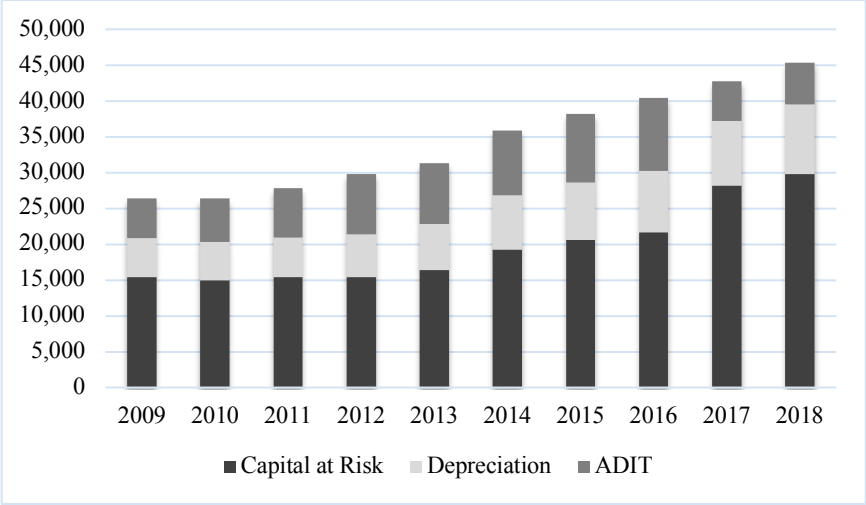

Figure 5. Consolidated Edison of New York, Unrecovered Capital at Risk after deducting Depreciation and ADIT, based on data from Consolidated Edison Financial Statements 2009 – 2018. Vertical axis shows sums in the millions.

To examine the broader risk of stranded assets among the 15 largest publicly regulated utilities in the United States, the following chart identifies the total capital cost of the PPE in service, the aggregate depreciation under the financial accounting rules (the portion of the capital investments that have been recovered from consumers), and the remaining unrecovered capital. The figures, from 2016, are taken from the utilities' financial statements set forth in their 2017 annual reports listed in Appendix C. Each of the utilities appears to have been observing the normalization rules. The firm financial statements also include information about the tax savings from accelerated tax depreciation, tracked as ADIT and published in each firm's annual report.

	Company	**PPE in Service**	**Deprec -iation**	**Unrecov'd Capital (UC)**	**% UC**	**ADIT**	**Capital at Risk**	**% at Risk**
1	**Ameren**							
	Ameren Missouri	18959	7880	11079	58.4	3013	8066	42.5
	Ameren Illinois	10208	2850	7358	72.1	1631	5727	56.1
2	**American Electric Power**							
	Appalachian Power Company	13073	3637	9436	72.2	2673	6763	51.7
	Ohio Power Company	7220	2116	5104	70.1	1346	3758	52
	Public Service Company of Oklahoma	4948	1273	3675	74.3	1059	2616	52.9
	Southwestern Power Company	8883	2567	6316	71.1	1607	4709	53
3	**CMS Energy**							
	Consumers Energy Company	20838	5944	14844	71.2	3042	11802	56.6
4	**Consolidated Edison**							
	Consolidated Edison of New York	40411	8541	31870	78.8	9450	22420	55.5
5	**Dominion Resources**							
	Virginia Power and Electric Company	40030	12436	27594	68.9	5103	22491	56.2

	Company	PPE in Service	Deprec -iation	Unrecov'd Capital (UC)	% UC	ADIT	Capital at Risk	% at Risk
6	**DTE Energy**							
	DTE Electric Company	22094	7721	14373	65.1	3793	10580	47.9
7	**Duke Energy**							
	Duke Energy Carolinas	41127	14365	26762	65.1	6544	20218	49.2
	Duke Energy Progress	28419	10561	17858	62.8	3323	14535	51.1
	Duke Energy Florida	16434	4644	11790	71.7	2694	9096	56.6
	Duke Energy Indiana	14241	4317	9924	69.7	1900	8024	56.3
	Duke Energy Ohio	8126	2579	5547	68.3	1443	4104	50.5
8	**Edison International**							
	Southern California Edison Company	42890	9000	33890	79.0	9798	24092	56.6
9	**First Energy**	43767	15731	28036	64.1	3765	24271	55.5
10	**NextEra Energy**							
	Florida Power and Light	44966	12304	32622	72.5	8541	24121	53.6
11	**PG&E**							
	Pacific Gas and Electric Company	69409	22012	47397	68.3	10510	36887	53.1
12	**PPL Corp**							
	PPL Electric Utilities Corporation	9654	2714	6940	71.9	1899	5041	52.2
	Louisville Gas & Electric and KU Energy LLC	12746	1465	11281	88.5	1735	9546	74.9
13	**SEMPRA**							
	San Diego Gas & Electric	17844	4594	13250	74.3	2829	10421	58.4
	Southern California Gas	15344	5092	10252	66.8	1709	8543	55.7
14	**Southern Company**	98416	29852	68564	60.7	14092	54472	55.3
15	**XCEL Energy**	45427	14381	31046	68.3	6784	24262	53.4
	TOTALS	**695,474**	**208,576**	**486,898**		**110,283**	**376,615**	
	Average				67.5			52.1

Table 4. This chart clarifies the extent of unrecovered capital (in millions) for the largest 15 investor-owned utilities after deducting accrued depreciation (in millions) under the financial and regulatory accounting rules based on the companies' 2016 financial statements. If the tax savings from accelerated tax depreciation (ADIT) are used as a pool for capital recovery, the utilities' capital at risk is reduced on average by 16%.

As of 2016, in the aggregate these publicly regulated utilities had recovered, on average, about 33% of their investments in PPE placed in service from their customers. As a result, approximately 67% of their capital expenditures, or $486,898,000,000 of the $695,474,000,000 remained outstanding and at risk. However, these utilities also held an aggregate of $110,283,000,000 in tax savings, per the ADIT line in their financial records. If applied to offset existing unrecovered capital, the remaining capital at risk would be reduced by 15% to $376,615,000,000, leaving an average of approximately 52% of the utilities' PPE placed in service at risk of being stranded.

C. Modifying the Tax and Regulatory Rules to Apply ADIT and its Returns to Offset Stranded Assets

The policy of passing the returns of tax deferral forward to consumers is inefficient. The tax and energy regulations should be revised to eliminate this transfer. Consider the following charts, which suggest an alternative use for the returns to ADIT. The charts depict the recovery of capital for a $1.2 million asset with a service life equal to that of a coal-fired power plant. For any year in the recovery period for that asset, one can identify the extent of the asset that remains at risk for stranding. The chart reflects a tax and regulatory policy change, however, that provides that the returns to ADIT are not passed forward to consumers, but accrued and available to offset unrecovered capital at a compounded rate of interest.

The following charts depict the return of capital for an asset purchased for $1,200,000 with a 55-year service life. The graph indicates the amount of unrecovered capital after subtracting (1) depreciation allowed under the rate-setting rules — the aggregate capital costs that have been passed through to ratepayers each year, (2) the tax savings from accelerated tax depreciation (treating ADIT as though it were available to offset stranded assets in any year), and (3) the returns to those tax savings that have accrued up to that year based on 5% interest compounded annually. The first chart depicts capital recovery under a 20-year MACRS recovery period. The second chart depicts the same parameters applying 100% bonus depreciation.

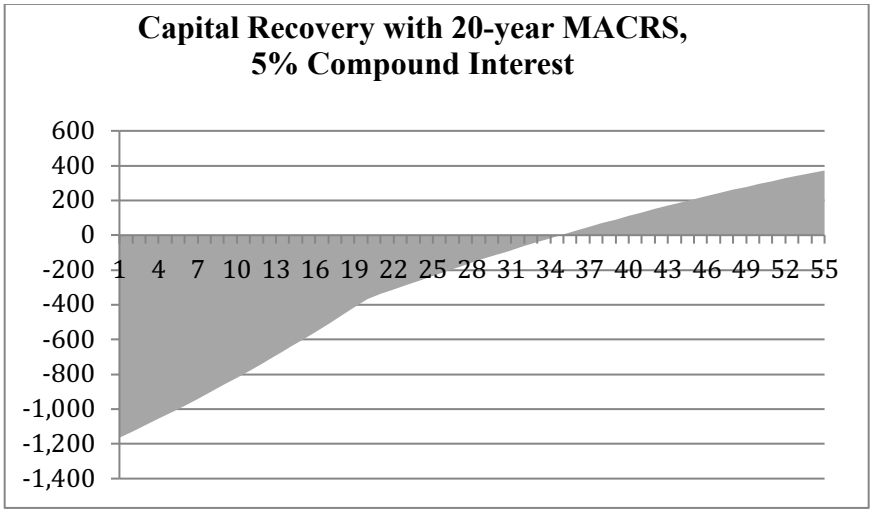

Figure 6. Negative figures depict the unrecovered capital investment in the asset that would be stranded if the asset ceases operations that year, assuming a $1,200,000 asset with a 55-year service life, taking into consideration annual recovery of costs from consumers as operating expense, tax savings (ADIT) from MACRS, and returns to ADIT invested at 5% interest compounded annually. The horizontal axis identifies the number of years in service and the vertical axis depicts recovery of capital investment in the asset (in the 1,000s). Positive figures depict returns in excess of original investment.

For an asset acquired or constructed and placed in service at a cost of $1,200,000, the firm will have achieved full cost recovery in year 35, not year 55. All returns to ADIT and the deferred tax credits generate additional profit for the final 20 years of the asset's service life equal to $372,000, all of which could be used to cover the costs of other stranded assets. The calculations on which Figure 6 is based are included in Appendix A.

In 2010 and 2011, utilities, as well as other businesses, enjoyed 100% bonus depreciation for tangible assets placed in service during these years. A $1,200,000 facility costing $1.2 million to construct and place in service during those years, with a useful life of 55 years (for book depreciation purposes), would receive an immediate deduction for the full $1.2 million investment. At a 35% corporate tax rate, the actual tax depreciation would offset $420,000 in taxes, but only $7,000 would be passed through to consumers to offset tax expense for that year. As a result, the first year the disparity between the firm's financial accounting and tax accounting rules for depreciation would yield $413,000 in ADIT. If, instead of passing through the return to ADIT to the utility's ratepayers, the firm invested ADIT funds to earn a modest five percent rate of return, the ADIT funds would accrue $20,650 in interest in Year 1. The balance of ADIT would gradually decline each year as the ADIT was applied to offset the tax expense, but that declining sum would continue to earn compound interest.

The amount of unrecovered capital may be calculated by subtracting the aggregate of book depreciation, ADIT, and the returns to ADIT from the original investment in the asset. This accelerates the date by which the firm (and the investors) will have recovered the full value of the asset.

The following chart depicts cost recovery for an asset purchased for $1,200,000 with a 55-year service life, subject to 100% bonus depreciation in Year 1. If the tax savings are invested at a modest five percent interest, compounded annually, the firm will have recovered the entire value of the asset as of Year 27.

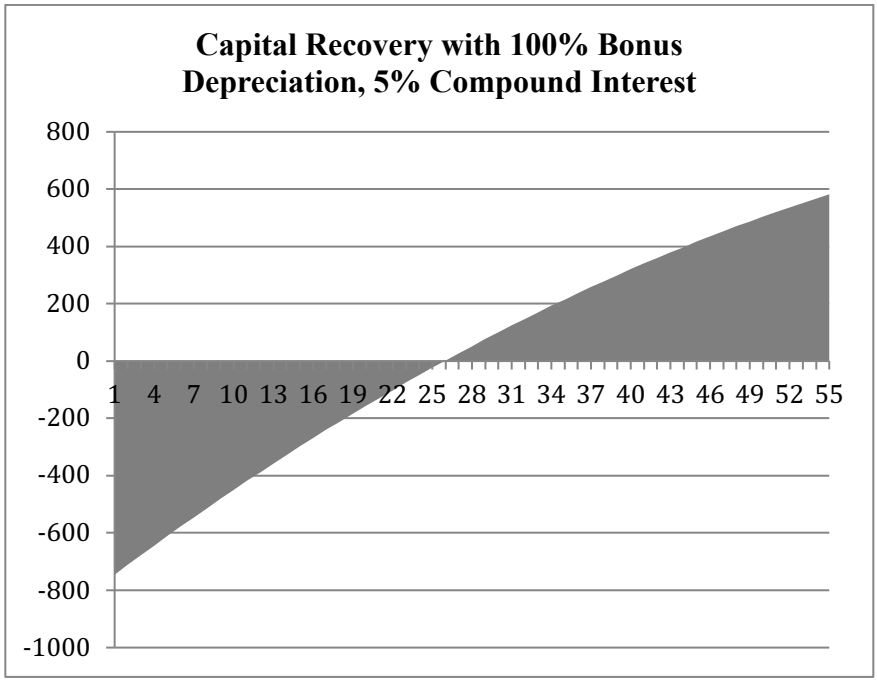

Figure 7. Negative figures depict the unrecovered capital investment in the asset that would be stranded if the asset ceases operations that year, assuming a $1,200,000 asset with a 55-year service life, taking into consideration annual recovery of costs from consumers as operating expense, tax savings (ADIT) from 100% bonus depreciation, and returns to ADIT invested at 5% interest compounded annually. The horizontal axis identifies the number of years in service and the vertical axis depicts recovery of capital investment in the asset. Positive figures depict returns in excess of original investment.

With 100% bonus depreciation, an asset costing $1.2 million to construct and place in service, with a 55-year service life, will achieve complete cost recovery (taking into consideration book depreciation, ADIT and returns to ADIT invested at 5% interest, compounded annually) at approximately the mid-point of the asset's useful life, 26 years. Earnings resulting from ADIT from that point forward exceed the purchase price of the asset. If the asset is employed for its full-service life, the compounded returns to ADIT at this interest rate will produce an additional $582,000 in earnings *after* full cost recovery. The calculations on which Figure 7 is based are included in Appendix B.

For example, if the returns to the ADIT account are maintained in a retirement reserve, the utility will earn interest on the ADIT over time. The ADIT and the earnings on ADIT from compound interest allows a full recovery of stranded assets well before the end of the service life of the asset. After that point, the compound interest earned on ADIT will exceed the remaining unrecovered cost of the asset. In such cases, those additional earnings may be used to offset other stranded costs at the time of the regulatory change.

Note that a change in regulatory and tax policy (without other modifications) could have adverse consequences. For example, changing the tax and regulatory rules to ignore ADIT in the ratemaking process would likely result in utilities and their investors enjoying the returns to those tax savings as either lower rates or higher returns, respectively. The tax benefits from deferral would likely be capitalized into the value of the stock, drawing additional investors to fund fossil fuel-based utilities. In other words, if these tax savings provide higher returns to investors, the price of the utility stock may rise. Without regulatory limits, utilities could disburse the returns to tax savings as dividends, attracting increased investment in fossil-fuel based energy. Furthermore, tax subsidies distort investment decision-making process and are likely to result in the utilities allocating capital inefficiently. Without regulatory limits, utilities could also use the returns to tax savings to purchase additional fossil fuel infrastructure; this would ensure that the utility, its investors, and its ratepayers would be carbon-dependent well into the future.

Therefore, changes to the regulatory and tax rules should take into account these potentially adverse incentives. First, if the tax and regulatory rules require ADIT to be included in the rate base, consumers would no longer receive the discount from accelerated depreciation. To prevent those tax benefits from being passed forward to investors, the regulatory rules could impute a return to ADIT and account for it in a retirement reserve. The release of those funds for use by the utility or disbursement to investors should be conditioned upon the passage and implementation of climate change legislation and the decommissioning of fossil-fuel assets. In addition, to undercut any incentive to invest to reap the benefits of stranded assets relief, the retirement reserve could be directed to past investors based on capital ownership during the periods the assets were constructed and placed in service. The sums in the ADIT account, and an assumed return to those funds, would be charged against stranded assets based on ownership of stocks over the periods those assets were acquired and placed into service.[249]

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[249] Utilities must maintain records relating to depreciated property based on the vintage of the asset, tax class, tax method, and recovery period; record-keeping may entail the maintenance of as many as four sets of books. *See* EEI, *supra* note 80, at 133. FERC also keeps track of a utility's book records by account, subaccount, location, and vintage based on the utility and the jurisdiction. *Id*. By matching the records for stranded assets with the stock ownership records, the specific parties who provided capital for their construction could be reimbursed.

D. Handling Excess ADIT from Corporate Tax Rate Changes

When Congress reduces corporate tax rates, accrued ADIT may exceed the actual tax liabilities that will be due from the utilities in the future.[250] The accrued tax savings that exceed the tax liabilities that will accrue in the future under the lower tax rates are referred to "excess deferrals"[251] or "excess ADIT." In 1986, when corporate tax rates were dropped from 46% to 34%, Congress had the option of passing through the excess ADIT to ratepayers immediately or at an accelerated rate.[252] Congress elected to do neither and instead elected to require the excess ADIT to be passed to consumers on the same schedule as before the rate change occurred.[253]

Likewise, the Tax Cuts and Jobs Act of 2017 reduced the top marginal corporate tax rate from 35% to a flat rate of 21%.[254] Regulators are faced with a similar quandary with the excess ADIT that results from that recent change. Sixteen states have since called upon FERC to modify the tax and regulatory rules to permit a reduction in utility rates.[255] They have requested that FERC and state public service commissions authorize the disbursement of the excess ADIT to consumers at an accelerated rate to reduce their tax expense, and consequently, their utility rates. FERC has declined to do so and has required that excess ADIT be amortized over the same period as applied before the change in the corporate tax rates.[256] FERC's rationale was that amortization would be consistent with their past practice.[257]

There are also other justifications for maintaining the current policy. First, current and future rate payers are not necessarily the same parties that have overpaid the tax expense which has created the excess ADIT. The assets that give rise to ADIT have service lives of over 55 years and the tax/book disparities that have given rise to the ADIT have been in place for over 35 years.

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[250] *See* KIEFER, *supra* note 36, at 23.

[251] *See* GAO, *supra* note 142, at 18-20.

[252] *See* GAO, *supra* note 142, at 18. For a comparison of tax savings flow-through treatment with the normalization treatment, see Max Swiren, *Accelerated Depreciation Tax Benefits in Utility Rate Making*, 28 CHICAGO L. REV. 629 (1961).

[253] *See* Tax Reform Act of 1986, Pub. L. 99-514, § 203(e), 100 Stat. 2085, 2146.

[254] Most of the investor-owned utilities have recharacterized the funds that were previously included in ADIT attributing to the change in tax rates, but they have not been consistent in their recharacterization, with some reclassifying the Excess ADIT as regulatory liabilities and others in other ways. For this reason, reviewing the financial statements before the end of 2016 provides a clearer picture of the tax savings that will continue to be available over the life of the assets for use as an insurance pool for stranded assets.

[255] *See* Paige Jones, *States Call for Lower Utility Rates in Light of Lower Corporate Tax Rate*, TAX NOTES (Jan. 15, 2018). https://www.taxnotes.com/tax-notes-today-state/utility-tax/states-call-lower-utility-rates-light-lower-corporate-tax-rate/2018/01/12/26sbv [https://perma.cc/MP5M-QBFG]. The sixteen states include California, Connecticut, Florida, Illinois, Kentucky, Maine, Maryland, Massachusetts, Nevada, New Hampshire, New York, North Carolina, Rhode Island, Texas, Vermont, and Virginia.

[256] *See* 83 Fed. Reg. 59,295 (Nov. 23, 2018) (codified at 18 CFR pts. 35, 101, 154, 201, 35, and 352). With respect to ratemaking, FERC provided that the excess or deficient ADIT would be refunded to ratepayers based on the schedule that was initially established and not at an accelerated rate. They also held that for both accounting purposes and ratemaking purposes, public utilities and natural gas companies would be required to record the excess ADIT in Account 254 (Other Regulatory Liabilities) and deduct offsetting entries to Account 410.1 (Provision for Deferred Income Taxes, Utility Operating Income) under the Uniform System of Accounts. The Commission also concluded that amortizing the excess and/or deficient ADIT recorded in Account 254 to Account 410.1 was appropriate since it was supported by their existing regulations, it was consistent with the manner the sums were reflected in rates, and those accounts provided more transparency than recording the amounts in Account 407.3 because the specific source of the regulatory asset or regulatory liability would be known.

[257] *Id*.

Reducing tax expense to current taxpayers would not grant relief to the parties who overpaid tax expense in the past.

Second, given the mounting budget deficits[258] and the dramatic increase in the federal debt,[259] Congress may soon increase the corporate tax rate again. In that case, if the current ratepayers enjoy the immediate reduction in their rates from the application of excess ADIT against their tax and other liabilities, future ratepayers will face rate increases when Congress raises corporate tax rates. When climate change legislation is passed, future ratepayers will not only have to cover the full costs of stranded assets at that time, but also face rate hikes to cover the additional cost of a carbon price. Instead, by retaining excess ADIT to apply to stranded assets, the ratepayers who enjoyed the benefits of overpaying tax expense (in the form of discounted electricity) are also the parties who remain burdened by the assets that produced the discounted electricity. The ratepayers shouldering the burdens are more likely to be the same persons who reaped the benefits of those tax savings.

Third, allowing excess ADIT to be allocated to current ratepayers has adverse environmental consequences. Current ratepayers will enjoy artificially induced low utility rates, which encourages overuse and waste, deters actions such as weatherization that will reduce energy use, and increases emissions. These adverse incentive effects may be avoided by paying out the excess ADIT in one lump sum. However, this would provide current rate payers with a huge benefit that is not proportionate to their years of ratepaying.

Fourth, passing excess ADIT through to ratepayers at the same rate as planned leaves more tax savings to serve as a pool for recovery of stranded assets.[260] FERC noted that when assets are sold or retired, the balance of the ADIT account is applied to the taxes due on that sale or retirement and extinguished.[261] However, FERC held that the excess ADIT associated with the sold or retired asset would continue to be amortized over the full period originally planned.[262] This position currently leaves those sums available for stranded asset retirement. Public Service Commissions have recently approved the application of excess ADIT to similar costs.[263] In 2018, the Florida Public Service Commission approved the application of excess ADIT toward restoration costs incurred by Duke Energy Florida LLC following Hurricane Michael and toward replenishing a

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[258] *See* Damian Paletta & Erica Werner, *The government set a record with a $234 billion deficit in February*, WASH. POST. (March 22, 2019), https://wapo.st/2HNywLF?tid=ss_mail&utm_term=.ba647173ae73 [https://perma.cc/43NK-JLNM]; Niv Elis, *Federal deficit jumps to $747B, likely to exceed $1T by September*, THE HILL (July 11, 2019) https://thehill.com/policy/finance/452675-treasury-federal-deficit-jumps-to-747b-likely-to-exceed-1t-by-september [https://perma.cc/Q2AP-JDUT].

[259] *See* Bill Chappell, *U.S. National Debt Hits Record $22 Trillion*, NPR (Feb. 13, 2019), https://www.npr.org/2019/02/13/694199256/u-s-national-debt-hits-22-trillion-a-new-record-thats-predicted-to-fall [https://perma.cc/VL67-7LRW].

[260] *See* 83 Fed. Reg. 59295 (FERC Nov. 23, 2018) (codified at 18 CFR pts. 35, 101, 154, 201, 35, and 352). The Commission, consistent with their prior rulings, also determined that because the sale or retirement of an asset with an ADIT balance is usually deemed a taxable event under IRS rules, the ADIT balance would be extinguished as the deferred taxes and would then become payable to the appropriate government authorities. As a result, there would no longer be an ADIT balance to return to customers. For a public utility or a natural gas pipeline that continued to have an income tax allowance, the Commission held that any excess ADIT associated with the asset must continue to be amortized in rates even after the sale or retirement of that asset.

[261] *Id.*

[262] *Id.*

[263] *See* MATHENY, *supra* note 65, at § 4.23.

storm reserve that was depleted following Hurricanes Irma and Nate.[264] The application of excess ADIT toward stranded costs resulting from climate change regulation would be consistent with these practices.

E. Potential Application Abroad

While federal courts and energy regulators in the United States have been dealing with claims for stranded assets since the deregulatory efforts of the 1980s, the more recent discourse has come from Europe. Nongovernmental organizations there have sought to force the fossil fuel industry to recognize in their financial statements that their assets may be overvalued considering the threat of climate change and the potential difficulty of recovering stranded costs. Their push for disclosure is designed to encourage divestment by institutional investors and other firms seeking long-term value. These cautions may be the most effective approach to managing the risks of stranded assets in countries in which tax accounting tracks financial accounting, as is the case with most members of the European Union.

When the tax and regulatory regimes of a nation mirror those in the United States, with significant disparities in tax and financial accounting for fixed assets, the tax and regulatory rule modification proposed above may have a broader audience. The following table identifies the countries in which depreciation for tax and financial accounting purposes deviate.

Countries Where Tax Follows Financial Accounting Depreciation	**Countries Where Tax does NOT Follow Financial Accounting Depreciation**
Argentina (for moveable property)	Australia
Brazil	Canada
France	China
Germany	India
Italy	Japan
Korea	Kuwait
Netherlands (In principle, with adjustments)	Malaysia
Portugal	Mexico
Spain (but subject to limits under corporate income tax rules)	Nigeria
Sweden	Russia
Turkey	Saudi Arabia
	Singapore
	South Africa
	United Kingdom (for tangible assets only)
	United States

Table 5. Comparison of countries in which tax depreciation follows book / statutory accounting depreciation to countries in which tax and financial depreciation diverge.[265]

Further research is needed to determine the extent to which tax and regulatory accounting practices differ, to quantify any tax savings that may result, and to clarify whether returns to those

[264] *Id.* (citing *In re: Application for limited proceeding to approve 2017 revised and restated agreement, including certain rate adjustments by Duke Energy Florida, LLC*, Order No. PSC – 2017 – 0451-AS-EU, issued Nov. 20, 2017, in Docket No. 20170183-E1 and 20170272-E2.)

[265] *See* ERNST & YOUNG, WORLDWIDE CAPITAL AND FIXED ASSETS GUIDE 2018 (2018), https://www.ey.com/Publication/vwLUAssets/ey-2018-worldwide-capital-and-fixed-assets-guide/$FILE/ey-2018-worldwide-capital-and-fixed-assets-guide.pdf [https://perma.cc/J9U2-VAGE].

tax savings have been passed forward to consumers or back to investors. Nevertheless, this may present a promising avenue in addressing stranded assets abroad.

V. CONCLUSION

Despite key economic gains and health and environmental advantages, the diffusion of alternative energy and other carbon-saving technologies has been remarkably slow. Legal and financial institutions have evolved to serve existing fossil-fuel-based technologies for energy development and distribution. Together, these systems enjoy returns to scale that create a significant barrier to entry for other energy systems. Consequently, industrial economies have been, by institutional co-evolution and path-dependent economies of scale, "locked into" fossil fuel-based energy systems. Carbon lock-in stalls the adoption of new energy technology and slows the transition to a carbon-neutral economy. By making a relatively small modification to the tax and regulatory rules for public utilities, policy-makers may begin to dismantle one of the key structures supporting carbon lock-in.

For coal, natural gas, and other energy facilities, accelerated tax depreciation generates a pool of tax savings for public utilities. These tax savings accrue primarily to fossil-fuel based energy systems, resulting in discounts on electricity and gas service rates. This policy is inefficient and wasteful. First, consumers that receive these discounts are encouraged to use more energy than they would without the subsidies. Second, these subsidies, by reducing prices for fossil fuels, undercut sales of electricity from renewable energy resources, and deter the deployment of these systems. Third, higher energy use increases emissions, accelerating and exacerbating the effects of climate change. If, instead, tax and FERC policies are modified to bar utilities from passing the returns to these tax subsidies forward to consumers, these wasteful discounts would cease, enhancing efficiency.

Discussions about stranded assets have generally focused on whether the owners of fossil fuel-based infrastructure and assets should be entitled to recovery. Certainly, any claims for full reimbursement of stranded costs should be discounted to the extent they arise not from regulatory action, but from the normal market responses to technological changes or from the vicissitudes of consumer demand. Stranded benefits should also be included in the analysis. Existing discussions about stranded assets have failed, however, to take into consideration the significant economic value that the federal income tax delivers through accelerated cost recovery. The tax savings from accelerated cost recovery are tracked and reported on a firm's consolidated balance sheets as ADIT. Financial statements for the 15 largest regulated public utilities firms show that these firms have aggregated a pool of tax savings in excess of $110 billion. Those tax savings should be converted into an insurance pool from which investors in regulated utilities would recover an additional tranche of their stranded costs in the event of a sharp regulatory change. As of 2016, on average, the 15 largest regulated public utilities had recovered approximately 338% of their investments in PPE through regulatory depreciation, leaving approximately 672% in unrecovered capital. If the tax savings from accelerated depreciation were applied against stranded assets, the amount of their assets subject to regulatory risk would decline to approximately 52% of total capital in service.

To the extent the economic returns to ADIT have not been passed forward to consumers, they have accrued to investors. If the tax savings accrued to date exceed customers' overpayments from normalized tax expense, the excess has not been deducted from the rate base or treated as zero-cost capital in determining the consumers' utility rates. Instead, the returns to those tax savings in the ADIT account have subsidized investor returns. Consequently, these subsidized

returns to investors should also be treated as an offset in calculating stranded costs. Given that many utilities have accrued net operating losses in recent years, it is likely that investors, rather than consumers, have enjoyed most of the economic benefit from bonus depreciation allowances.

Finally, both the tax savings currently in the ADIT account and the returns to the ADIT account could serve as a stranded asset recovery pool. The funds could be released to past investors after climate change legislation or regulations are passed and fossil fuel assets are decommissioned. To affect this change, the normalization rules would need to be revised to require that utilities (1) keep track of ADIT, allowing it to accrue as a retirement reserve, (2) account for (and assume) a return to those savings at a market rate of interest, (3) charge both the ADIT and the returns to ADIT against any stranded assets, and (4) trigger the release of funds at the implementation of effective climate change regulation and the termination of operations and decommissioning of the fossil fuel assets and systems.

Changing the tax and regulatory rules has a number of attractive features. First, the change in policy could be explicitly characterized as a payoff to investors in utilities to reimburse stranded asset claims. Second, the policy is flexible. The completion of cost recovery could be designed to track the phase-out and termination of fossil fuel-based technology operations. If the phase-in of regulation or the phase-out of old technologies were delayed, any additional returns to ADIT during that prolonged period could be charged against other stranded assets with longer remaining service lives. Third, this change in the rules reallocates existing subsidies to address transition costs; it does not create new subsidies, the costs of which increase budgetary deficits and, in the current tax environment, the federal debt.[266]

Finally, this policy enhances equity. Customers have been receiving a discount in their energy rates based on a tax subsidy. Terminating that subsidy will increase prices, but reduce pollution and improve health outcomes. Consumer utility rates will be no higher from this policy change than if accelerated tax depreciation had not been enacted. In addition, U.S. taxpayers rather than consumers will have paid for any tax benefits accruing to investors. If the tax savings remaining in the ADIT account are transferred to investors, the consumers' share of the burden of stranded costs will be lessened, since the broader taxpaying public will have shouldered some of those costs. Spreading that economic burden may soften the blow and reduce resistance to climate change policy in some of the most fossil fuel-dependent areas of the country.

In the United States and abroad, comprehensive climate change policies should include a significant tax component. By changing these tax and regulatory accounting rules, policymakers may eliminate waste, manage stranded costs, and smooth the transition to a carbon-neutral economy at lower consumer cost.

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[266] Prior to the enactment of the Tax Cuts and Jobs Act of 2017, the change would have had no additional budgetary cost. This policy change would have appealed not only to economists, but also to deficit hawks and politicians concerned about rising budget deficits, since it would only have shifted the incidence of the tax subsidies currently available. The amount of tax subsidies would not increase or otherwise affect the federal budget.

APPENDIX A: STRANDED ASSET RECOVERY UNDER MACRS WITH ADIT AND COMPOUND INTEREST ACCRUING TO A RETIREMENT RESERVE

Total Cost to be Recovered = 1,200,000
V = 1,200,000 -100,000 = 1,100,000
Service Life: 55 years
Regulatory Depreciation (for calculating Operating Expense) = 1,100,000 / 55 years = 20,000 / Year
Dollar value of Regulatory Depreciation (for calculating Tax Expense passthrough) = $20,000 X .35 corporate tax rate = $7,000

Cost Recovery Period 20 Years
Cost Recovery under Tax Accounting Rules = 1,200,000 / 20 years = $60,000
Dollar value of Cost Recovery Allowance under MACRS for Years 1 – 20 = $60,000 X .35 = $21,000
Dollar value of Cost Recovery Allowance under MACRS for Years 20 – 55 = $0
ADIT = Dollar value of Cost Recovery Allowance under MACRS – Regulatory Depreciation (for Tax Expense) = $21,000 - $7,000 = $14,000 increase each year for Years 1 – 20, <$7,000> for Years 21 - 55

Assume that the returns to ADIT are NOT passed through to ratepayers, but instead that ADIT Accrues five percent interest per year, compounded annually and that at the end of the year the sum is treated as a Retirement Reserve for Stranded Costs.

Unrecovered Investment = Total Asset Cost – Aggregate Regulatory Depreciation
Retirement Reserve = ADIT – Interest on ADIT – Interest on Interest

Remaining Capital at Risk for Stranding = Unrecovered Investment – Retirement Reserve

Year	Total Asset Cost	Aggregate Regulatory Depreciation (passed as part of Operating Expense)	Unrecovered Investment	$ Aggregate Reg. Depreciation (passed as part of Tax Expense)	$ Aggregate Cost Recovery MACRS	ADIT	Interest Rate	Interest on ADIT	Interest to be Compounded	Interest on Interest	Retirement Reserve	Remaining Capital at Risk for Stranding
1	1,200	20	1,180	21	7	14	0.05	0.7	0	0.00	14.70	1,165
2	1,200	40	1,160	42	14	28	0.05	1.4	0.7	0.04	30.14	1,130
3	1,200	60	1,140	63	21	42	0.05	2.1	2.1	0.11	46.31	1,094
4	1,200	80	1,120	84	28	56	0.05	2.8	4.2	0.21	63.21	1,057
5	1,200	100	1,100	105	35	70	0.05	3.5	7	0.35	80.85	1,019
6	1,200	120	1,080	126	42	84	0.05	4.2	10.5	0.53	99.23	981
7	1,200	140	1,060	147	49	98	0.05	4.9	14.7	0.74	118.34	942
8	1,200	160	1,040	168	56	112	0.05	5.6	19.6	0.98	138.18	902
9	1,200	180	1,020	189	63	126	0.05	6.3	25.2	1.26	158.76	861

Year	Total Asset Cost	Aggregate Regulatory Depreciation (passed as part of Operating Expense)	Unrecovered Investment	$ Aggregate Reg. Depreciation (passed as part of Tax Expense)	$ Aggregate Cost Recovery MACRS	ADIT	Interest Rate	Interest on ADIT	Interest to be Compounded	Interest on Interest	Retirement Reserve	Remaining Capital at Risk for Stranding
10	1,200	200	1,000	210	70	140	0.05	7	31.5	1.58	180.08	820
11	1,200	220	980	231	77	154	0.05	7.7	38.5	1.93	202.13	778
12	1,200	240	960	252	84	168	0.05	8.4	46.2	2.31	224.91	735
13	1,200	260	940	273	91	182	0.05	9.1	54.6	2.73	248.43	692
14	1,200	280	920	294	98	196	0.05	9.8	63.7	3.19	272.69	647
15	1,200	300	900	315	105	210	0.05	10.5	73.5	3.68	297.68	602
16	1,200	320	880	336	112	224	0.05	11.2	84	4.20	323.40	557
17	1,200	340	860	357	119	238	0.05	11.9	95.2	4.76	349.86	510
18	1,200	360	840	378	126	252	0.05	12.6	107.1	5.36	377.06	463
19	1,200	380	820	399	133	266	0.05	13.3	119.7	5.99	404.99	415
20	1,200	400	800	420	140	280	0.05	14	133	6.65	433.65	366
21	1,200	420	780	0	147	273	0.05	13.65	147	7.35	441.00	339
22	1,200	440	760	0	154	266	0.05	13.3	160.65	8.03	447.98	312
23	1,200	460	740	0	161	259	0.05	12.95	173.95	8.70	454.60	285
24	1,200	480	720	0	168	252	0.05	12.6	186.9	9.35	460.85	259
25	1,200	500	700	0	175	245	0.05	12.25	199.5	9.98	466.73	233
26	1,200	520	680	0	182	238	0.05	11.9	211.75	10.59	472.24	208
27	1,200	540	660	0	259	231	0.05	11.55	223.65	11.18	477.38	183
28	1,200	560	640	0	196	224	0.05	11.2	235.2	11.76	482.16	158
29	1,200	580	620	0	203	217	0.05	10.85	246.4	12.32	486.57	133
30	1,200	600	600	0	210	210	0.05	10.5	257.25	12.86	490.61	109
31	1,200	620	580	0	217	203	0.05	10.15	267.75	13.39	494.29	86
32	1,200	640	560	0	224	196	0.05	9.8	277.9	13.90	497.60	62

Year	Total Asset Cost	Aggregate Regulatory Depreciation (passed as part of Operating Expense)	Unrecovered Investment	$ Aggregate Reg. Depreciation (passed as part of Tax Expense)	$ Aggregate Cost Recovery MACRS	ADIT	Interest Rate	Interest on ADIT	Interest to be Compounded	Interest on Interest	Retirement Reserve	Remaining Capital at Risk for Stranding
33	1,200	660	540	0	231	189	0.05	9.45	287.7	14.39	500.54	39
34	1,200	680	520	0	238	182	0.05	9.1	297.15	14.86	503.11	17
35	1,200	700	500	0	245	175	0.05	8.75	306.25	15.31	505.31	-5
36	1,200	720	480	0	252	168	0.05	8.4	315	15.75	507.15	-27
37	1,200	740	460	0	259	161	0.05	8.05	323.4	16.17	508.62	-49
38	1,200	760	440	0	266	154	0.05	7.7	331.45	16.57	509.72	-70
39	1,200	780	420	0	273	147	0.05	7.35	339.15	16.96	510.46	-90
40	1,200	800	400	0	280	140	0.05	7	346.5	17.33	510.83	-111
41	1,200	820	380	0	287	133	0.05	6.65	353.5	17.68	510.83	-131
42	1,200	840	360	0	294	126	0.05	6.3	360.15	18.01	510.46	-150
43	1,200	860	340	0	301	119	0.05	5.95	366.45	18.32	509.72	-170
44	1,200	880	320	0	308	112	0.05	5.6	372.4	18.62	508.62	-189
45	1,200	900	300	0	315	105	0.05	5.25	378	18.90	507.15	-207
46	1,200	920	280	0	322	98	0.05	4.9	383.25	19.16	505.31	-225
47	1,200	940	260	0	329	91	0.05	4.55	388.15	19.41	503.11	-243
48	1,200	960	240	0	336	84	0.05	4.2	392.7	19.64	500.54	-261
49	1,200	980	220	0	343	77	0.05	3.85	396.9	19.85	497.60	-278
50	1,200	1000	200	0	350	70	0.05	3.5	400.75	20.04	494.29	-294
51	1,200	1020	180	0	357	63	0.05	3.15	404.25	20.21	490.61	-311
52	1,200	1040	160	0	364	56	0.05	2.8	407.4	20.37	486.57	-327
53	1,200	1060	140	0	371	49	0.05	2.45	410.2	20.51	482.16	-342
54	1,200	1080	120	0	378	42	0.05	2.1	412.65	20.63	477.38	-357
55	1,200	1100	100	0	385	35	0.05	1.75	414.75	20.74	472.24	-372

APPENDIX B: STRANDED ASSET RECOVERY UNDER 100% BONUS DEPRECIATION WITH ADIT AND COMPOUND INTEREST ACCRUING TO A RETIREMENT RESERVE

Total Cost to be Recovered = 1,200,000

V = 1,200,000 -100,000 = 1,100,000
Service Life: 55 years
Regulatory Depreciation (for calculating Operating Expense) = 1,100,000 / 55 years = 20,000 / Year
Dollar value of Regulatory Depreciation (for calculating Tax Expense) = $20,000 X .35 corporate tax rate = $7,000

Cost Recovery Period: 1 Year
Cost Recovery under Tax Accounting Rules (100% Bonus Depreciation): $1,200,000 x 100% = $1,200,000 for year 1
Dollar value of Cost Recovery Allowance under Bonus Depreciation = $1,200,000 x 0.35 = $420,000 Year 1
Dollar value of Cost Recovery Allowance under Bonus Depreciation for Years 2 – 55 = $0

ADIT = Dollar value of Cost Recovery Allowance under Bonus Depreciation – Regulatory Depreciation (for Tax Expense passthrough) = $420,000 - $7,000 = $413,000 for Year 1
Assume that the returns to ADIT are not passed through to ratepayers, but instead that ADIT Accrues five percent interest per year, compounded annually and that at the end of the year the sum is treated as a Retirement Reserve for Stranded Costs.

Unrecovered Investment = Total Asset Cost – Aggregate Regulatory Depreciation
Retirement Reserve = ADIT – Interest on ADIT – Interest on Interest

Remaining Capital at Risk for Stranding = Unrecovered Investment – Retirement Reserve

Year	Total Asset Cost	Aggregate Regulatory Depreciation (passed as part of Operating Expense)	Unrecovered Investment	$ Aggregate Reg. Depreciation (passed as part of Tax Expense)	$ Cost Recovery 100% Bonus Depreciation (each year)	ADIT	Interest Rate	Interest on ADIT	Interest to be Compounded	Interest on Interest	Retirement Reserve	Remaining Capital at Risk for Stranding
1	1,200	20	1,180	7	420	413	0.05	20.65	0	0	434	746
2	1,200	40	1,160	14	0	406	0.05	20.3	20.65	2	449	711
3	1,200	60	1,140	21	0	399	0.05	19.95	40.95	3	463	677
4	1,200	80	1,120	28	0	392	0.05	19.6	60.9	4	477	643
5	1,200	100	1,100	35	0	385	0.05	19.25	80.5	5	490	610
6	1,200	120	1,080	42	0	378	0.05	18.9	99.75	6	503	577
7	1,200	140	1,060	49	0	371	0.05	18.55	118.65	7	515	545
8	1,200	160	1,040	56	0	364	0.05	18.2	137.2	8	527	513
9	1,200	180	1,020	63	0	357	0.05	17.85	155.4	9	539	481

Year	Total Asset Cost	Aggregate Regulatory Depreciation (passed as part of Operating Expense)	Unrecovered Investment	$ Aggregate Reg. Depreciation (passed as part of Tax Expense)	$ Cost Recovery 100% Bonus Depreciation (each year)	ADIT	Interest Rate	Interest on ADIT	Interest to be Compounded	Interest on Interest	Retirement Reserve	Remaining Capital at Risk for Stranding
10	1,200	200	1,000	70	0	350	0.05	17.5	173.25	10	550	450
11	1,200	220	980	77	0	343	0.05	17.15	190.75	10	561	419
12	1,200	240	960	84	0	336	0.05	16.8	207.9	11	572	388
13	1,200	260	940	91	0	329	0.05	16.45	224.7	12	582	358
14	1,200	280	920	98	0	322	0.05	16.1	241.15	13	592	328
15	1,200	300	900	105	0	315	0.05	15.75	257.25	14	602	298
16	1,200	320	880	112	0	308	0.05	15.4	273	14	611	269
17	1,200	340	860	119	0	301	0.05	15.05	288.4	15	620	240
18	1,200	360	840	126	0	294	0.05	14.7	303.45	16	628	212
19	1,200	380	820	133	0	287	0.05	14.35	318.15	17	636	184
20	1,200	400	800	140	0	280	0.05	14	332.5	17	644	156
21	1,200	420	780	147	0	273	0.05	13.65	346.5	18	651	129
22	1,200	440	760	154	0	266	0.05	13.3	360.15	19	658	102
23	1,200	460	740	161	0	259	0.05	12.95	373.45	19	665	75
24	1,200	480	720	168	0	252	0.05	12.6	386.4	20	671	49
25	1,200	500	700	177	0	245	0.05	12.25	399	21	677	23
26	1,200	520	680	182	0	238	0.05	11.9	411.25	21	682	-2
27	1,200	540	660	189	0	231	0.05	11.55	423.15	22	687	-27
28	1,200	560	640	196	0	224	0.05	11.2	434.7	22	692	-52
29	1,200	580	620	203	0	217	0.05	10.85	445.9	23	697	-77
30	1,200	600	600	210	0	210	0.05	10.5	456.75	23	701	-101
31	1,200	620	580	217	0	203	0.05	10.15	467.25	24	704	-124
32	1,200	640	560	224	0	196	0.05	9.8	477.4	24	708	-148

Year	Total Asset Cost	Aggregate Regulatory Depreciation (passed as part of Operating Expense)	Unrecovered Investment	$ Aggregate Reg. Depreciation (passed as part of Tax Expense)	$ Cost Recovery 100% Bonus Depreciation (each year)	ADIT	Interest Rate	Interest on ADIT	Interest to be Compounded	Interest on Interest	Retirement Reserve	Remaining Capital at Risk for Stranding
33	1,200	660	540	231	0	189	0.05	9.45	487.2	25	710	-170
34	1,200	680	520	238	0	182	0.05	9.1	496.65	25	713	-193
35	1,200	700	500	245	0	175	0.05	8.75	505.75	26	715	-215
36	1,200	720	480	252	0	168	0.05	8.4	514.5	26	717	-237
37	1,200	740	460	259	0	161	0.05	8.05	522.9	27	718	-258
38	1,200	760	440	266	0	154	0.05	7.7	530.95	27	720	-280
39	1,200	780	420	273	0	147	0.05	7.35	538.65	27	720	-300
40	1,200	800	400	280	0	140	0.05	7	546	28	721	-321
41	1,200	820	380	287	0	133	0.05	6.65	553	28	721	-341
42	1,200	840	360	294	0	126	0.05	6.3	559.65	28	720	-360
43	1,200	860	340	301	0	119	0.05	5.95	565.95	29	719	-379
44	1,200	880	320	308	0	112	0.05	5.6	571.9	29	718	-398
45	1,200	900	300	315	0	105	0.05	5.25	577.5	29	717	-417
46	1,200	920	280	322	0	98	0.05	4.9	582.75	29	715	-435
47	1,200	940	260	329	0	91	0.05	4.55	587.65	30	713	-453
48	1,200	960	240	336	0	84	0.05	4.2	592.2	30	710	-470
49	1,200	980	220	343	0	77	0.05	3.85	596.4	30	707	-487
50	1,200	1000	200	350	0	70	0.05	3.5	600.25	30	704	-504
51	1,200	1020	180	357	0	63	0.05	3.15	603.75	30	700	-520
52	1,200	1040	160	364	0	56	0.05	2.8	606.9	30	696	-536
53	1,200	1060	140	371	0	49	0.05	2.45	609.7	31	692	-552
54	1,200	1080	120	378	0	42	0.05	2.1	612.15	31	687	-567
55	1,200	1100	100	385	0	35	0.05	1.75	614.25	31	682	-582

APPENDIX C: ANNUAL REPORTS FOR FIRMS WITH INVESTOR OWNED PUBLICLY REGULATED UTILITIES

Ameren, 2017 Annual Report (Form 10-K), at 104 (Feb. 28, 2018).
American Electric Power, 2017 Annual Report (Form 10-K), at 113-114, 141-142, 155-156, 169-170 (Feb. 23, 2018).
CMS Energy, 2017 Annual Report (Form 10-K), at 100-101 (Feb. 14, 2018).
Consolidated Edison, 2010 Annual Report (Form 10-K), at 82-83 (Feb. 22, 2011).
Consolidated Edison, 2011 Annual Report (Form 10-K), at 71-72 (Feb. 21, 2012).
Consolidated Edison, 2012 Annual Report (Form 10-K), at 72-73 (Feb. 21, 2013).
Consolidated Edison, 2013 Annual Report (Form 10-K), at 72-73 (Feb. 21, 2014).
Consolidated Edison, 2014 Annual Report (Form 10-K), at 84-85 (Feb. 19, 2015).
Consolidated Edison, 2015 Annual Report (Form 10-K), at 78-79 (Feb. 18, 2016).
Consolidated Edison, 2016 Annual Report (Form 10-K), at 82-83 (Feb. 16, 2017).
Consolidated Edison, 2017 Annual Report (Form 10-K), at 89-90, 114-115 (Feb. 15, 2018).
Consolidated Edison, 2018 Annual Report (Form 10-K), at 93-94 (Feb. 21, 2019).
Dominion Resources, 2017 Annual Report (Form 10-K), at 78-79 (Feb. 27, 2018).
DTE Energy, Annual Report (Form 10-K), at 69-70 (Feb. 16, 2018).
Duke Energy, 2017 Annual Report (Form 10-K, Amend No. 1), at 77-78, 89-90, 94, 99, 104 (Feb. 23, 2018).
Edison International, 2017 Annual Report (Form 10-K), at 64, 76 (Feb. 22, 2018).
First Energy, 2017 Annual Report (Form 10-K), at 72 (Feb. 20, 2018).
NextEra Energy, 2017 Annual Report (Form 10-K), at 66-67 (Feb. 16, 2018).
PG&E, 2017 Annual Report (Form 10-K), at 95-96 (Feb. 9, 2018).
PPL Corp, 2017 Annual Report (Form 10-K), at 115-116, 121-122 (Feb. 22, 2018).
SEMPRA, 2017 Annual Report (Form 10-K), at F-14-F15, F-20-F21 (Feb. 27, 2018).
Southern Company, 2017 Annual Report (Form 10-K), at 92-93 (Feb.21, 2018).
XCEL Energy, 2017 Annual Report (Form 10-K), at 82 (Feb. 23, 2018).