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# Decarbonizing the boardroom? Aligning electric utility executive compensation with climate change incentives

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ABSTRACT

Despite the drastic reversal of decarbonization effort by the Trump administration, the majority of U.S. states continue policies aimed at reducing greenhouse gas (GHG) emissions and increasing renewable energy technology (RET) deployment. Although electrical power utilities are required and/or encouraged to comply with these policies, their executives lack direct incentives to do so. In this study, a novel incentive mechanism is evaluated for aligning utility executive compensation with such policies. First, an overview is provided on chief executive officer (CEO) pay and the GHG emissions of utilities. The relationship between GHG emissions, renewable energy diversification, and CEO pay is examined using the case study of three of the largest electric utilities in Michigan. The results show that the regulated utility market is not consistently rewarding CEOs with higher compensation for decreasing GHG emissions and that both an approach incentivizing RETs adoption and an approach encouraging GHG emissions have deficiencies. A combined approach is then analyzed that results in a compensation equation allowing for utility executives to receive incentive pay for reducing overall emissions and increasing renewable generation. The results indicate that by careful calibration of the proposed incentive equations the harmful effects of emissions can be prevented through CEO incentive pay.

## 1. Introduction

The infancy of the current U.S. Presidential administration has been marked by stark reversal of several federal decarbonization initiatives [1,2]. However, as energy policy expert Kathryn Hamilton observed, the Trump administration's actions "can't change the facts of climate change. It is happening whether or not they say it's happening." [3]. Both greenhouse gas (GHG) emissions [4–6] and carbon dioxide ($CO_2$) levels are increasing rapidly on a global scale [7–9]. This has led to climate change with significant, well established negative effects on natural and socio-economic systems [10,11]. These negative effects[1] are due to human activity, primarily through the combustion of fossil fuels, which have been increasing global temperatures from 1951 through 2010, and have been proven with a confidence of 95% [12].

The United States Environmental Protection Agency (EPA) has determined that electric utilities are the main source of GHG and $CO_2$ emissions in the United States [13,14]. In the U.S., electricity generation accounts for 31% of GHG emissions; globally, it accounts for 25% of emissions [14]. Numerous studies indicate that these GHG emissions may be a source of economic liability for electric utilities, which has the potential to significantly impact their financial viability and returns for shareholders [15–17]. Addressing this issue through reductions of emissions and increases in renewable energy technologies (RET) will help reduce the issue of climate change directly [18] and limit the potential liability for utilities [17].

The radical departure of the current presidential administration from past environmentally-centric federal energy policies is unlikely to reverse the global trend of decarbonization in the electrical power sector and therefore absolve GHG emitters of the aforementioned liability. Due to significant gains in efficiency and cost competitiveness, RETs are gaining grid parity (achieving similar or lower prices than conventional generation) throughout the United States [19,20]. For example, 2016 saw solar photovoltaic (PV) system costs drop by 20%, which contributed to solar technology becoming the leading source of new electric power generating capacity in the United States [21,3]. Another reason for the irreversible momentum is state policies aimed at combating climate change. Renewable Portfolio Standards (RPS) that require utilities to supply a set percentage of electricity from renewable

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[1] These effects include: higher temperatures with heat waves resulting in death by hyperthermia [93–95], crop failure and global hunger [96–100], power outages [101,102], sea level rise [103,104], erosion [103,104], higher risk of flooding and saltwater intrusion [105,106,104], strong, damaging storms [107–110], drought [111], and fire [112,107,113].

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sources have been an important policy tool of the decarbonization effort by individual states. Currently 29 states, Washington, D.C., and three territories have adopted an RPS [115]. The reversal of the federal decarbonization policies is yet to have a significant effect on states' renewable energy policies, including RPSs. Moreover, several states are in the process or have raised their RPS goals since November 8, 2016. Among these states is Michigan that elevated its RPS goals from 10% in 2015–15% by 2021 [22,23]. In addition, the implementing legislation, titled the "Clean, Renewable and Efficient Energy Act" (Act 342) set an ambitious albeit non-binding goal of not less than 35% of the "state's electric needs to be met through a combination of energy waste reduction and renewable energy by 2025".

In Michigan, Act 342 creates a path for electric utilities towards renewable low-carbon energy sources and away from fossil fuels. Whether Michigan electric utilities will succeed at adopting this path will in large part depend on the efforts of their top executives–directors and officers–including chief executive officers (CEOs). Traditionally, CEO compensation has included a fair number of performance incentives. Yet rarely have these incentives emanated from public environmental goals [24]. Generally, companies that are subject to government rate setting, such as electric utilities, have lower CEO pay [25]. Restricting the scope of a CEO incentives package can have unintended negative consequences [26]. Because CEOs are driven largely by personal financial gain, they are likely to focus on maximizing sales [27–29]. Therefore, in a U.S. state where utility profits are not meaningfully decoupled from volumetric sales of energy, a utility CEO is likely prioritize increasing such volumetric sales of energy the vast majority of which comes from fossil fuel-powered generation sources [30]. In the case of Michigan, this effectively creates a conflict between the binding and non-binding goals set by the state for electric utilities and the personal goals pursued by their CEOs.

Appropriate executive incentives designed to encourage transitioning to a lower carbon energy mix are likely to play a significant role in diverting electric utilities from the current fossil-fuel path. In this study, we propose a novel mechanism that aligns electric utility executive compensation with the state regulatory decarbonization requirements akin to those of Act 342, as well as global climate change mitigation goals. First, we provide a rationale for the proposed mechanism. In particular, we outline the environmental and socio-economic benefits of incorporating renewable energy into an electric utility's generation mix and employ the agency conflict and path dependence theories to lay out our theoretical foundation. Second, we provide an overview of our case study and then outline and analyze the aforementioned mechanism using RET and GHG emissions goals for determining CEO pay in order to see if current compensation is in line with RPS requirements and global climate change mitigation goals. We conclude with observations on the potential effectiveness of these novel compensation systems.

## 2. Background and conceptual framework

### 2.1. Comprehensive benefits of renewable energy technologies

Historically, environmental benefits, including climate change mitigation, have served as primary reasons for RETs adoption [31–34,18]. RETs environmental benefits extend well beyond climate change mitigation and include improving public health [35–38] and overall environmental sustainability [39–43]. Accordingly, Davis et al. [44] estimates that 30 TW of renewable generation will be needed by 2050 to curtail all GHG emissions in the electric power sector. Thus, the generation from these technologies is predicted to increase heavily in the near and long-term future [44–46].[2]

Until recently, the economic case for RETs had been built on less direct grounds, such as mitigation of substantial long-term costs on society [10,47]. Yet the drop in the cost of RET generation in the last decade has moved the technologies into competitive economic range of fossil fuels in many regions [48–51]. As noted above, solar PV as one of the most technologically promising technologies [52], has also demonstrated great economic promise due to rapid cost decline along with rapid expansion [21,3,53]. Other commercialized RETs have shown similar promise [48,49,51]. The U.S. Energy Information Administration (EIA), lists pre-tax credit levelized cost of electricity (LCOE) for new geothermal generation entering service in 2022 at 46.5 $/MWh [19,20]. In comparison, the EIA [19,20] lists the costs of natural gas-fired conventional combined cycle at 57.3 $/MWh, natural gas-fired advanced combined cycle at 56.5 $/MWh, and advanced nuclear at 99.1 $/MWh. Remarkably, EIA's [19,20] outlook does not contain any data on coal-fired power plants without carbon capture and sequestration (CSS), indicating that the agency does not see any of them entering service by 2022. The LCOE numbers on coal-fired generation with CSS are not promising either as they are roughly triple those of geothermal [19,20].

The environmental and societal case, including higher than fossil fuel jobs per-unit of energy ratio [36,54–56], has been strengthened by the business case for RETs. RETs are becoming less expensive whereas fossil fuels are moving in the opposite direction [57].[3] As noted above, the majority of the U.S. states require utilities to have a certain percentage of renewable power in their generation portfolios. Therefore, in these states, reorienting a utility away from fossil fuels and towards RETs has become a matter of both sustaining a company's economic performance and legal compliance.

### 2.2. Utility executives, agency conflict theory, and path dependence

Utilities that continue on the fossil fuel-heavy path risk engulfing themselves in the phenomenon known as path dependence. Also known as inertia, stickiness, and lock-in, path dependence in the simplest terms means that the 'past determines the future' ([117], p. 507). Puffert (2003) defines path dependence as follows:

Path dependence is the dependence of economic outcomes on the path of previous outcomes, rather than simply on current conditions. In a path dependent process, "history matters" – it has an enduring influence. Choices made on the basis of transitory conditions can persist long after those conditions change. Thus, explanations of the outcomes of path-dependent processes require looking at history, rather than simply at current conditions of technology, preferences, and other factors that determine outcomes.

Perhaps the most recognizable form of path dependence in the energy sector (the most "uninteresting' to Puffert) is known as sunk costs. This form is based on the longevity of capital-intensive infrastructure and equipment. Thus, according to Puffert [116], '[o]bsolete, inferior equipment may remain in use because its fixed cost is already "sunk" or paid for, while its variable costs are lower than the total costs of replacing it with a new generation of equipment.' The energy sector is prone to a sunk cost and path dependence problem as exemplified by nuclear power plants with massive cost overruns [58] or oil and gas projects that take nearly a quarter of a century to develop [59]. The

[2] RETs adoption is not the only way to decrease GHGs in the electricity sector. Energy efficiency, for example, represents a potent and cost-competitive tool to lower electricity

(*footnote continued*)
sector's carbon footprint [114]. However, in this study we focus only on one technological solution to decarbonization – RETs.

[3] This is not say that RETs integration into the electric grid is only a matter of the increasingly favorable LCOE. Presently, if not coupled with storage, most commercially scalable RETs are considered non-dispatchable technologies [19,20]. Because the existing electric grid was designed to accommodate dispatchable, centralized, and largely fossil fuel and nuclear generation, RETs proliferation in the existing grid is hampered by several technological and economic barriers. However, because of the largely distributed RETs application, these technologies show favorable levelized avoided costs of electricity (LACE), a measure that shows a generation technology's value to the grid [19,20].