Climate Change
And
The Clean Water Act

Vermont's Energy Terroir and the Questions that Aren't Being Asked

William F. Scully

CLIMATE CHANGE AND THE CLEAN WATER ACT

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Prologue

On December 26th, 2008, I had an epiphany: *I live in a town with several dams, so why am I not driving an electric car powered by my backyard?* Since that time, I have been working to answer that question by immersing myself in the process of hydroelectric redevelopment, governance, and environmental stewardship. I was so profoundly moved by this question that I have since spent tens of thousands of hours trying to understand the matter. I have developed and benefited from relationships with developers, environmentalists, Vermont agencies, the Vermont Legislature and many others without whom I may never have been successful in creating a tangible answer to my question or in reaching an understanding of the issues.

The following research represents the culmination of nearly ten years of study, while only recently was I able to comprehend the depth of the question I was asking. Working with Bennington College's Center for the Advancement of Public Action afforded me helpful insight and language as well as generating some beneficial questions. I now can fully articulate the intricacies and issues that, despite everyone's best efforts and intentions, have led to unintended consequences in water management. This document is meant to be the first comprehensive summary of the administration of the Clean Water Act as it relates to twenty-first-century administration of riverine water resources.

Overview

As currently legislated and applied, the 1972 Clean Water Act (CWA) causes degradation to our waters through a complex web of unintended consequences. The CWA was born out of 73 years of water legislation. Paramount to its intent and language is that development and environmental protection should be mutually reinforcing. However, in the words of Paul Charles Milazzo, "Twenty-first-century observers are predisposed to view environmental protection and development as mutually exclusive." Due to this disconnect regarding the intent of the CWA and a series of subsequent circumstances, Vermont finds itself far afield from its original charge and its current legislative, administrative and social intents.

A tenet of all environmental policy is the need to address the "total environment." The CWA is no exception, but the current application of the CWA fails to meet this standard in many ways. In water quality management, there is insufficient attention to known stressors such as climate change, existing pollution and farming impacts. The CWA also fails to account for positive acts and does not have the language to acknowledge their benefit. Being almost exclusively an emissions-based policy with minor ambient standards, the language of the act makes it largely enforceable through prevention of degradation. It is this specificity of the policy's language that was most responsible for the early successes and the current drawbacks. There was an immediate and sustained limitation of pollutants from point sources of entering waterways. However, the CWA does not directly address preexisting concerns, so it experiences a declining rate of return as existing toxins flush from the waterways through precipitation at

ever-slower rates. The CWA does not address accessing renewable energy or cleaning up toxins from rivers, thus giving these no value in the act. Trickle down effects, coupled with jurisdictional complications, lead Vermont to undervalue hydroelectric. For example, Vermont's Public Utility Commission uses redevelopment costs from the 1980s to establish rates. It specifies hydroelectric facilities at zero cents per kilowatt-hour for Brownfield and Superfund redevelopment, whereas all other renewable resources see a 7 and 20 percent incentive. This disconnect is pervasive because it is so intrinsic to our lawmaking processes.

Due in large part to the efforts of the state's Public Utility Commission (PUC), the Legislature, and others, Vermont has reached a major milestone in renewable energy with the announcement in 2017 that Vermont energy peaks are occurring later in the day, even after sundown. This announcement necessarily triggers the next evolution in Vermont's energy planning beyond conventional photovoltaic solar. If Vermont intends to advance in-state renewable energy, the next phase must involve hydropower. No other options exist for base load on the order required. This is made clear in the Solutions Project and other assessments, and for the following reasons: Vermont's topography, population, rainfall, and being landlocked. Though hydropower is critical to Vermont's energy future—without it, Vermont cannot achieve its mandated energy goals—there is currently no plan to further progress on this front.

The CWA was drafted before climate change was a known concern, and the Vermont Legislature has yet to direct the Agency of Natural Resources (ANR) to address climate change specifically and proactively as it relates to water resources. Vermont's government, like other state governments, has addressed climate change largely through energy, whether by decreased usage through efficiency or increased renewable sourcing. In addressing climate change through renewable energy, the legislature has drafted and approved various bills and rules that have had limited effects on hydroelectric, the technology that must provide some sixty-four percent of our energy (see page 11). This fact is rooted in how an act is placed in statute and then applied by the practitioner. When passed, the language of the bill is placed under the correct title and chapter. Renewable energy legislation falls under Title 30, *Public Service*, not Title 10, *Conservation and Development*. The issue being that the State see jurisdiction over hydroelectric projects only under Title 10 so there has been no charge to the ANR to advance the only renewable energy over which it has jurisdiction. Although state jurisdiction is limited, no other Vermont agency has jurisdictional authority over hydroelectric. This vital renewable resource has unintentionally been forsaken as an energy source.

The State of Vermont has the only hydroelectric redevelopment in the country that improved water quality. As the project economics represent a quantifiable net gain, this project helped disprove the myth that all "*dams are harmful to rivers.*" The Vermont Tissue Hydroelectric Redevelopment, with valuable collaboration between the developer, the state agencies, and private stakeholders, saw many benefits. These benefits include detoxifying the river, accessing renewable energy, and turning an ephemeral reach into a permanent stretch. It is

a project that represents the best in how we can collaborate and transition our ideologies into design concerns. While parties in the state struggle with how to manage cleaning the waterways, no has even asked if this has already been done, likely because we lack the framework to acknowledge the benefit. It is in this vein that we have cultivated vast misconceptions about how to manage water as a resource. Among these misconceptions and ignoring our own history, we have yet to even acknowledge hydropower as a legally defined designated use in Vermont. Also counter to Vermont law, we are judging the legality of matters by the actor and not the act.

In examining the climate of water and energy in Vermont, I realized the parallel between this and the current dairy farming issues. Fundamentally, they are both questions of energy, particularly how we decide to utilize our *energy terroir*. Dairy is a two-step solar product, and by examining it in that manner, it is obvious that the cost to produce milk will always be more in Vermont versus locations that are closer to the equator, less mountainous and less forested. Conversations about compacts, legislation and legacy, while they are serious, simply fail to discuss the primary issue: energy terroir.

Perhaps the most deeply troubling issues surround Vermont's net metering Rule 5.100. The PUC failed to follow proper rulemaking procedures in the recent revision. This was followed by the Legislature's attempt to retroactively bolster undermining vested rights of net metering ratepayers. In 2017, under the *H.411 Appliance Efficiency* bill, the Legislature saw fit to strip net metering ratepayers of many of their most basic protections from the State under Title I.

We are faced with troubling times that require that our actions match and achieve our intentions. Vermont has the opportunity to make this a time to inspire and to encourage. We can achieve this with simple yet profound actions on the part of the Legislature. Vermont can seize the opportunity to see its goals made possible by curing the unintended consequences we experience today. We can accelerate both redevelopment and removal and see these aims met more expeditiously through collaboration. The need to address old dams and access renewable energy is a certainty. The longer we wait, the fewer choices we will have as circumstances become direr. We can begin by making climate change mitigation an environmental concern and by setting to right the unintentional disconnects in administrative processes, and by asking the right questions rather than answering with canned responses.

Climate Change
and
The Clean Water Act

Part I

Unintended Consequences

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Introduction

The Clean Water Act of 1972 (CWA) has done great service to the state of Vermont. However, through its successes and with changing conditions, the Act now experiences a declining rate of return which may, if left unchecked, lead to increased degradation. Additionally, the Act as implemented fails to consider deeply critical modern issues such as climate change. The resulting feedback loops are directly counter to the intent of the Act. Perhaps the most fundamental and pivotal divergence from what the framers of the CWA understood is that environmental action and development are not and should not be mutually exclusive. It is in this divide that we lose sight of opportunity and inspiration. We have unintentionally lost sight of the spirit and letter of the law in the CWA, which is innovative and should foster collaboration across technologies, agencies, and ideologies.

Clean Water as Policy

What causes water as a resource to become a public policy issue? The decades-long debates of Representative John Blatnick, Senator Edmund Muskie, and many others as to how best to manage water resources as a vital national interest represent a monument to effective governance. The CWA was able to repurpose and revitalize preceding laws, such as the Refuse Act of 1899, and apply them effectively to then current concerns such as the management of effluent. The conversation began to elevate after Blatnick's 1956 Federal Water Pollution Control Act framed a narrative that would bridge legal and environmental ideologies and allow for successful implementation. As detailed in this section, specific people, philosophies, and precedents converged to allow for the formation of an innovative and effective approach to management of one of our most essential resources as a nation and a species.

The People

Representative John Blatnick viewed the issue of clean water through the lens of the New Deal. This facilitated some achievable first steps toward clean water in an unsympathetic social and political environment. Blatnick was able to successfully marry industrial growth, job creation and natural resource development together. His position on the House Subcommittee on Rivers and Harbors provided him the access to significant funding to promote clean water through a series of municipal waste treatment facilities. Blatnick was able to understand and detail the vital relationship water had to cities and industry. At the time, effluent had not only reached an imbalance with many river systems' abilities to assimilate existing volumes, but projections forecast the usage of clean water to rise dramatically: from approximately 262 billion gallons per day in 1955 to 453 billion gallons by 1975.[1] All data clearly represented that the then current clean water regulation practices were unsustainable. The input of effluent was rising

[1] Paul Charles Milazzo, *Unlikely Environmentalists: Congress and Clean Water, 1945-1972*, (University Press of Kansas, 2006) page 27

against a presumed unchanging supply of water. The first efforts to achieve a national standard for clean water were public works development projects. This focus was almost exclusively on effluent's impact on the reuse of water as it passed through the nation. The remedy was primarily to build adequate waste treatment infrastructure. Contemporary alternative solutions sought to create dams for storage. The latter method facilitates surplus from high precipitation for controlled release later, thereby stabilizing low precipitation periods with stored water and decreasing the relative effluent through diffusion. Either approach sought to address the same core issue: the abundance of clean water. It was later a lack of potable water in New England, due to drought in the mid-60s, that served to facilitate the eventual Clean Water Act. The Public Health Service (PHS) actively advocated for the need to limit effluent. In addressing the Nathaniel Wollman's water supply and demand methodology intended for clean water administration, which differentiates loss versus use, PHS officer Melvin Scheidt identifies that "the problem of quantity in the last analysis, frequently breaks down to a problem of quality, since deterioration in the quality of water resulting from previous uses can ultimately render it unfit for most further use, even though it is still available in sufficient quantity for such persons."[2] Put simply, water quantity is directly affected by quality. This perspective is also predictive of future views, which include a broader scope of concerns such as inorganic toxins. Blatnick's approach to achieve a national standard through managing effluent, though limited in effect to achieving our modern standard of clean water, was successful where modern policy falls short. It married industry and ideology rather than splintering those factions.

As the progressive political entrepreneur Senator Edmund Muskie came to the stage, a convergence of interests emerged. Muskie grew up in Maine and the all-too-familiar industrialized riverine sections of New England and so, much like Blatnick, he understood the relationship of responsible environmental stewardship to economics. As governor of Maine he had directly faced off against industrial polluters and immediately saw the need for "patience, ingenuity and cooperation."[3] The senator was highly ambitious. Due perhaps to an ill-received comment to then Senate Majority Leader Lyndon Johnson, he did not find himself on committees he thought worthy of his ambition, rather on three less appealing committees, including Public Works. Even this circumstance could not hamper the ambitious and brilliant Muskie. Muskie brokered in information and was able to apply his knowledge effectively. Though he had no interest in clean water in 1958, he rose to expert on the subject and built a powerful group of stakeholders behind his efforts. His ability to understand intimately not just the nature of a problem but the language necessary to effect real, lasting change afforded him great success. He transcended being a political operative and emerged as a technical expert on the subject of clean water. In the early 1960s, as Blatnick began to find the House a more complex place in which to navigate environmental policy, Muskie moved the conversation surrounding clean water to the Senate where he was able to effectively focus resources. Muskie's

[2] Quoted in Milazzo, page 50.
[3] Quoted in Milazzo, page 65.

gravitas afforded him legislative effectiveness, which led to remarkably favorable Senate votes early in his career. Among these are environmental legislation in the 1963 Clean Air Act and the 1965 Water Quality Act. Muskie kept improving such that "the 1966 Clean Water Restoration Act and the 1967 Air Quality Act both passed without a single dissenter."[4] The avid political entrepreneur knew how to compromise, but more importantly when to compromise. He was unyielding in his pursuit of effective policy for the 1972 Clean Water Act, even under extreme pressure from the public as well as legislative and executive branches. He believed in consensus building. His insistence on proper language, as a practical matter, not an existential belief, led to achievable and effective standards that would satisfy the gambit of concerns, rather than conceding to a quick and easy bill passage. Muskie's need for proper language is most noticeable when he faces the so-called "Tunney Amendment." Senator Muskie's contributions to the 1972 Clean Water Act are nothing short of pivotal.

The third person key to the emergence of the CWA is President Richard Nixon. Though Nixon's motives and means differ substantially from that of Muskie, his actions play a pivotal role in setting the stage and drive for the CWA. In post-Vietnam America, the ambitious and savvy Nixon saw the necessity of attracting a politically aware and environmentally sensitive group of young voters. Nixon also saw Muskie as his likely rival for the next presidential election. As it relates to clean water, Nixon's interests emerge on two fronts. The first, The National Environmental Protection Act (NEPA), was a path to environmental protection that Muskie disliked, one that is federally administered and relies on "expert" opinion. Muskie consistently opposed the NEPA and it was a political win for Nixon to sign it into law in 1970. After this, Nixon then turned his attentions to the Clean Air Act and the Clean Water Act. The latter became a contentious race between Muskie and Nixon. Nixon generated significant political pressure to pass a clean water act, attempting to steal the credit from Muskie. The pressure applied by Nixon all but made the passage of some clean water act imminent. Moreover, once Muskie stewarded his own legislation out of Congress, Nixon then realized reflexive pressure for a water quality standard that overrode his veto of Muskie's bill.

It is the ecologists who bring scientific innovation to the CWA. Perhaps the most influential of the ecologists on the CWA are Gene Likens and George Woodell. With Herbert Bormann, Likens studied dynamic equilibrium in natural systems and the stresses to that equilibrium. The primary study, performed at the Hubbard Brook Experimental Forest, detailed the hydraulic stresses to a system. After establishing baseline nutrient "budgets," Liken and Bormann were able to assess the impacts of deforestation on riverine systems. Resulting increased run-off creates a net increase to mineral and nutrient depletion. The outcome is up to fifteen percent more mineral transport to rivers. The suspended material renders the water unfit for human consumption. Woodell's work dovetailed with this to establish that complex systems are more vulnerable to stress-induced entropy and the entropy is directly proportional to

[4] *cited*: Paul Charles Milazzo, *Unlikely Environmentalists, Congress and the Clean Water Act, 1945-1972, page 73*

proximity to the source. These scientists brought a new methodology, borne out of the military industrial complex, to the stewarding of the environment. This approach would replace conservation.

The Philosophy

Human thinking hit an evolution in the post–World War II climate: the emergence of systems thinking. Initially military based in nature, systems thinking became pervasive in many human constructs including government and science. Systems thinking replaces, in many cases, development focused governance for the United States. Not only did this create a language that could cross disciplines, but with it formed new branches of knowledge. One such manifestation is the emergence of ecosystem ecology, or ecology. The credibility of ecology as a science took time to be accepted, but eventually its value was paramount to clean water legislation. Having grown out of World War II and the Cold War, systems planning enabled ecologists and legislators to find commonality. Ecology seeks a balance in natural systems. For that reason, ecology and conservation are necessarily divergent. The former aims to protect the environment and the latter to preserve the environment. The latter is at odds with itself once science steps in, as the natural state of things is for entropy to increase with time.[5] Conservation and preservation are unachievable and, therefore, standards which cannot be regulated. Ecology is not without its limitations, but in this case, and as will be discussed later, the limitations are the shadow of law upon the scientific method, not a defect in the discipline.

Systems thinking also gave popularity to now common concepts such as feedback loops. The term dates back to the 1860s, predating WWII, and it grew into the field of electronics. Ecology applies the term to discuss system divergence: negative or positive feedback loops. These negative or positive values affect the natural balance and are cyclical. This term is used similarly today by climatologists who apply the idea, for example, to the transference of sea ice from 90% heat reflective to 94% heat absorbent when melted, thereby creating a feedback loop in the heat retention of the planet as the ice melts.

The Precedents

Another ecology tenet to consistently underlie the debates over water quality was the need to address the “total environment.” This standard is reiterated throughout the discussions of the CWA and is also taken up in the National Environmental Protection Act. The need to address the “total environment” had become a core value of all environmental legislation after NEPA. NEPA, which directed that all government activities should think about the environment, takes an approach of reliance on experts and findings, a method Muskie loathed. These experts and their findings would enter the project economics through an “environmental impact statement” (EIS), which would describe the total environment relative to the project. EISs are now so

[5] Carnot’s Principle, the second law of thermodynamics.

common they are taken for granted, and unfortunately not fully considered, nor are the contents in any way "total." EISs don't weigh net benefit, just impact and mitigation, thus EISs tend to ignore rather critical factors. Muskie's approach was to let the states administer federal law, whereas NEPA sought to make everyone a responsible party to a federally administered process of environmental impact consideration. Regardless of the regulatory method or the subject, ecology had shifted the goals of the environmental decade to encompass the total environment. However correct for scientific application, the legal application of total inclusion presents some shortcomings: the most significant among these being the legal boundaries, or the point at which jurisdictional authority changes, or in cases becomes plural.

Vermont becomes central to the discussion of the CWA with the emergence of the Vermont Yankee Nuclear Power Plant. The plant, located in Vernon, would become perhaps the most pivotal element on the thermal pollution conversation, as it posed significant environmental impact and no clear process of jurisdictional authority existed. The Plant proposed elevating the temperature of the Connecticut River some 15–20 degrees, a circumstance that did not sit well with Vermont, New Hampshire, Massachusetts, Connecticut, or the Department of Interior. This case brought to the forefront the inadequacy of the current water quality legislation to manage the complexities. The Vermont Yankee Plant saw the Department of Interior and state interests pitted against growing power needs with the Atomic Energy Commission (AEC) adjudicating. The AEC's position was consistent in recognizing no authority other than their own and led to several notable lawsuits in the 1960s. Muskie found himself addressing the issue with the AEC chairman, an issue which he felt previously resolved in the Water Quality Act. The AEC took a position of having unimpeachable authority, which many felt ignored, among other aspects, statutory environmental authority of the United States Fish and Wildlife. Further, the AEC felt that they, as the jurisdictional body, had no authority to compel non-AEC facilities to comply. This and subsequent correspondence led to Muskie actively pursuing regulation and holding hearings on the matter. The outcome of this was, as Muskie phrased it, "water quality compliance as a precondition to all federal activities."[6] Muskie was able to codify this as a federal standard in the 1970 Water Quality Improvement Act. Though his goal to provide for robust, universal standards for all projects, including federal projects, was successful for some time, concerns began to emerge.

Authority to enforce a clean water act came from a seemingly arcane law, administered by those viewed as the enemy by environmentalists. Modern interpretation of this law became the most relevant and favorable of all the tools used to achieve the CWA. The Refuse Act of 1899 afforded the Federal Government the jurisdiction necessary to move beyond Blatnick's and Muskie's early models for clean water administration. The post–Civil War Rivers and Harbors Act contains Section 10, commonly known to those who work with waterways, which makes illegal dredging, filling, erecting structures in or modifying waterways without a permit from the

[6] *see* "Exploratory Statement by Senator Muskie" in *Thermal Pollution*, 1968, pt. 3 Appendix 1, page 976

United States Army Corps of Engineers (USACE). The Act's lesser known Section 13 (Refuse Act) became the silver bullet for pollution control. The Section was originally intended to prevent the impedance or navigability of shipping vessels in Commerce Waters of the United States. Section 13 states, "*It shall not be lawful to throw, discharge, or deposit, or cause, suffer, or procure to be thrown, discharged, or deposited either from or out of any ship, barge, or other floating craft of any kind, or from the shore, wharf, manufacturing establishment, or mill of any kind, any refuse matter of any kind or description whatever other than that flowing from streets and sewers and passing therefrom in a liquid state, into any navigable water of the United States, or into any tributary of any navigable water from which the same shall float or be washed into such navigable water;...*"[7] To understand what might qualify as a Commerce Water, one need only imagine a commercial application. Aside from shipping and as example, if a waterway may be used for transporting logs downstream, it is a Commerce Water of the United States, falling under federal jurisdiction. Though unintended in its inception, the Refuse Act makes any unpermitted discharge into a US waterway a crime. It is under this authority that an emission-based standard could be implemented.

The final debate as to the best legal method by which to regulate water quality came to a head in 1971. Senator John Tunney proposed an ambient standard (swimmable) which, due to its simplicity, took firm hold publicly and inside Congress. The unenforceability of this Tunney Standard was unsettling for Muskie, who, under public pressure to adopt a similarly simplistic guideline, pushed back for a definable standard. In later iterations Tunney proposed a modification to swimmable including the habitat, to which there were objections, and then an amendment adding "naturally recurring" to the aquatic life. The term "natural" further upset Muskie who insisted on defining the term. Muskie argued for a more concrete standard on which to base a clean water policy prescription. Tunney's language defined a conservationist approach. Muskie opposed the ambient standard because this method had failed him previously throughout the 1960s. He had initially preferred the ability to "enhance" ambient standards as a way to improve the expectations over time. Failure in this vein forced him to embrace a strict emission-based policy. This emissions approach afforded an easily quantifiable standard and allowed for unambiguous penalties. It is Woodell who is finally able to put a word to what everyone is trying to convey. That word is integrity. This becomes a pivotal moment for the policy and the basis that would carry the CWA to completion. The objective of the CWA should be "maintenance of the chemical, physical, and biological integrity of all waters." Woodell's language "suggested a quantifiable state of dynamic equilibrium."[8] Woodell's insight is a profound contribution to the Act. Advancing Woodell's language into legalese, ecologist and attorney Thomas Jorling described integrity as, "that character of the aquatic ecosystem as it is determined by evolutionary factors including man, but not technological man…. It is the ecosystem which is a function of evolution. It is a mature non-successional community having been established over

[7] *see* http://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title33-section407&num=0&edition=prelim
[8] *quoted:* Paul Charles Milazzo, *Unlikely Environmentalists: Congress and Clean Water, 1945-1972,* page 206

geologic time. It is 'background.' Proper pollution controls had to ensure that human activities would not alter this 'background' beyond the acceptable range of 'flux.'

The 1972 Clean Water Act

The Clean Water Act, as we appreciate it, took a series of events, insights and people over the course of 73 years to be created. It required the Rivers and Harbors Act's Section 13 Authority, the evolution of World War II system thinking into the science of ecology, the New Deal thinking of Blatnick, the progressive entrepreneurialism of Muskie, Nixon's political ambition, Vermont Yankee's thermal proposal, the Tunney Amendment, and much more to coalesce into a comprehensive and effective national policy that could facilitate abundant, high quality water to the United States. The debate over administration and jurisdiction favored Muskie's recommendation for a locally administered national policy. Ultimately, the CWA was passed as an emission-based standard with minor, vestigial ambient standards. Muskie's "no discharge," emission control method afforded a quantifiable solution at the source, with identifiable, responsible parties and was presumed to eventually meet and exceed the Tunney ambient standard. However, this was not achieved before some debate over the phasing on implementation. The policy initiated mandated "best practical technology" and shifted to "best available technology" by 1985, which remains the current standard. The administration of the CWA is primarily charged to the states in collaboration with the Environmental Protection Agency (EPA), The Department of the Interior under United States Fish and Wildlife (USFW), and the USACE under Sections 401, 402 and 404 (USACE Section 10). The term *point source* is used in reference to those locations subject to the CWA jurisdiction. Point Source is defined as: *any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural stormwater discharges and return flows from irrigated agriculture*."[9] The latter two categories remain largely and erroneously unregulated by the CWA as set-aside "nonpoint sources." This is likely due to the history of "*intense pressure to abandon federal water quality standards from the petroleum and farm interests."*[10]

Critical to point source effectiveness is identifiable culpability. The description is a binary standard, and there must be a legal entity that can be identified as responsible. Moreover, the concern must be able to be mitigated. Initially, dams did not fall under the jurisdiction of the CWA. Some storage dams may lead to gas bubble disease and generate greenhouse gases that arguably could be point sources. However, it was not as a point source that hydroelectric dams became subject to the CWA. A series of decisions, notably a rare Supreme Court decision in 1994 regarding Washington State, found that dams are subject to the CWA because they must

[9] *see* Clean Water Act, Section 502 General Definitions, No. 14
[10] *cited:* Paul Charles Milazzo, *Unlikely Environmentalists: Congress and Clean Water, 1945-1972,* page 85

not violate state water quality standards. In the case of *PUD No. 1* of *Jefferson County v. Washington Department of Ecology,*[11] the issue was flow releases for aquatic species and aesthetics, and the Court ruled that the State could place minimum flow requirements.

Paul Charles Milazzo poignantly states in perhaps the best history of the Clean Water Act, "*Twenty-first-century observers are predisposed to view environmental protection and development as mutually exclusive.*[12]" Mr. Milazzo elaborately details in *Unlikely Environmentalists* that the CWA is evidence that these two groups can and should be mutually reinforcing.

Powering Vermont

The use of dams for the generation of power predates the State of Vermont. Vermont, as well as all of New England, provides an environment that favors hydroelectric redevelopment: high annual rainfall, low population density, and mountainous terrain. The combination of these factors was instrumental in the United Stated exceeding Britain during the Industrial Revolution and emerging as the dominant world leader in industry. Villages and cities within the state are built on waterways and near changes in river elevation. The mills and factories required the river as a power source, either mechanical or electrical—at least until the New Deal's Rural Electrification Act of 1936 was fully implemented and fossil fuels became common in electrical generation. These combined events provided for cheap energy that was not reliant on water power, which led to a major reorientation of Vermont. It began with the abandonment of the hydroelectric facilities as a source of mill power, and then, eventually, the abandonment of the mills themselves followed by the abandonment of the state as an industrial leader. For this, we have no comprehensive plans to date. No broad plan for reuse of dams. No overarching plan for removal of dams. We are left with divergent ideologies in the absence of policy. This power policy vacuum was further exacerbated by the decommissioning of the Vermont Yankee Nuclear Power Plant, solidifying hydroelectric as the only non-fossil fuel option for reliable base load production.

There are three types of hydropower: impoundment, diversion and pumped storage.[13] For the purposed of this article, impoundment (or storage) and diversion (or run-of-river) are most central. Hydropower is a form of solar power as the cycle is driven by the sun.[14] The state was literally built around hydropower, which at one time provided one hundred percent of the energy. However, with changing laws, ideologies, and technologies this trend came to an end in 1987.

[11] *see* PUD No. 1 of Jefferson Cnty. v. Wash. Dep't of Ecology, 511 U.S. 700, 710–11 (1994) (explaining the challenge to fishery maintenance flow release conditions).
[12] Paul Charles Milazzo, *Unlikely Environmentalists: Congress and Clean Water, 1945-1972*, page 18
[13] *see* Department of Energy, https://www.energy.gov/eere/water/types-hydropower-plants
[14] *see* Department of Energy, https://energy.gov/eere/water/how-hydropower-works

"Vermont has lost more than 20 MW of hydroelectric generation between 1941 and 2005."[15] It was not until November of 2013 that a plant was recommissioned in Troy, Vermont.

During this hiatus, Vermonters desired in-state hydro to be the main source of renewable energy by a margin of 35% over the next highest choice. There is overwhelming support (96%) for Vermont's continuing to buy power from the independent power contracts, negotiated by the state, with woodchip and hydro projects. Further, 97% of Vermonters agree that Vermont should continue buying electricity from the Vermont-based independent power producers[16]. The obvious inference from these statistics is that a clear minority has successfully driven environmental and energy policy for some decades, but that may not be the cause. The state trend has seen a greater than six to one ratio of removal to redevelopment with twenty-six removals[17] and four redevelopments. The vast majority (if not all) dam construction in Vermont predates modern environmental standards, so there is some need to address dormant infrastructure. However, there is cause for concern, as dam removal is not comparably regulated under the CWA. There exists also the policy necessity to meet Vermont's energy goals of ninety-percent renewable energy by 2050. According to recent US Department of Energy studies, just 3% of the more than 87,000 dams in the US National Inventory are being used for hydroelectric generation. The outstanding 97% represents up to 12 GW of opportunity. The International Energy Agency (IEA) estimates that the United States has tapped only 16% of its potential hydro production.[18] The US has commissioned the vast majority of intentional dam removals.[19] There seems an obvious correlation to our also being the only country which also denies climate change. The United States has an unspoken value system and history of action that strongly favors dam removal over redevelopment and favors fossil fuels over renewable energy. The US at one time had a massive hydroelectric equipment industry until the Reagan administration's divestment from hydroelectric due to its lack of profitability.[20] Reagan's pro–fossil fuel policies took a toll on the manufacturing sector. Fortunately, solar manufacturing survived this era. However, for hydroelectric there are currently only a few US hydroelectric manufacturers, primarily start-ups with collectively fewer than ten plants commissioned.

Understanding Vermont's power needs requires a basic primer in renewable energy generation. First, different technologies serve very different purposes. Photovoltaic (PV) solar by example is very effective at reducing peak load demand on the grid. Peak loads cause the utility to source electricity reacting to demand. This need may be serviced by fossil fuels plants, as they

[15] *see* Lori Barg of Community Hydro, *The Undeveloped Hydroelectric Potential of Vermont, 2007*, page 1
[16] *see* Report on the Deliberative Poll® on "*Vermont's Energy Future*" Commissioned by the Vermont Department of Public Service, Page 2, 17 & 54
[17] http://www.vermontbiz.com/news/2017/august/09/fitzgerald-removing-%E2%80%98deadbeat%E2%80%99-dams-win-vermont
[18] *see* International Energy Agency, Renewable Energy Essentials: Hydropower 2 figure 3 (2010)
[19] Emily H. Stanley & Martin W. Doyle, *Trading Off: The Ecological Effects of Dam Removal*, 1 Frontiers Ecology 15, 21 (2003) ("[*The vast majority of intentional removals have occurred in the US*.").
[20] Western Area Power Administration, Serving the West: WAPA's First 25 years as a Power Marketing Agency, page 100

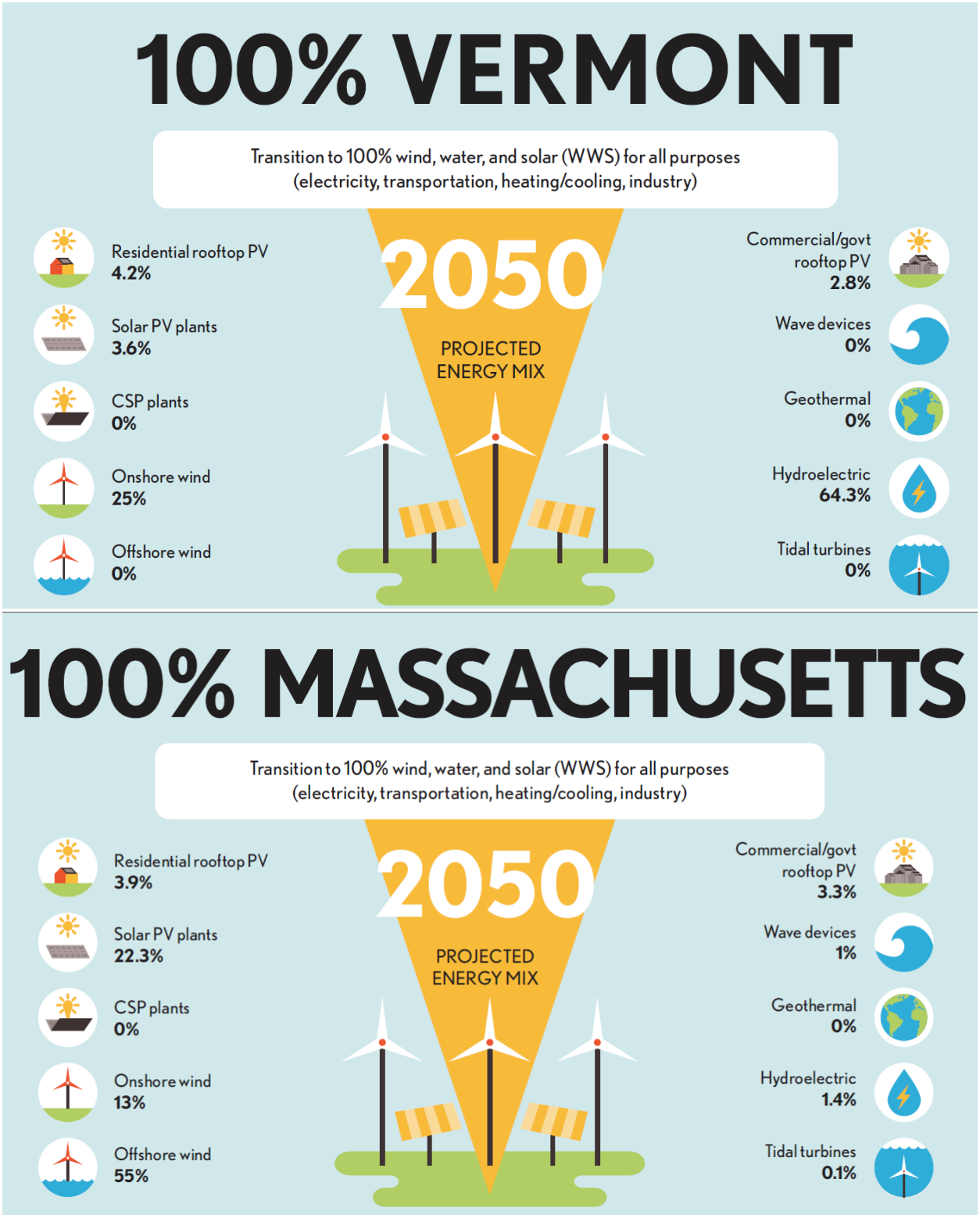
can ramp up and down in production quickly. This power may also be provided by hydroelectric plants that are storage facilities (not run-of-river) which, although sometimes not considered renewable energy by the Department of Energy, are a more environmentally friendly solution than fossil fuels. PV solar provides the most environmentally friendly alternative, though it's also more expensive. For these reasons, PV solar is a heavily subsidized technology. The result has been successful and the goals largely met. On January 20th, 2017 the Vermont Department of Public Service announced that, "Vermont utility peaks are shifting toward later in the day and even past sundown in some cases."[21] This represents a significant milestone in Vermont's energy goals as PV solar, coupled with energy efficiency measures, has nearly accomplished the goal of reducing peak load, but this is also a moment to pause.

The types of PV solar power that can be used in Vermont have a low capacity factor, one that averages around seventeen percent. Capacity factor is the actual production divided by the total possible production if the plant ran all the time at full capacity. If a 100kW solar array were to generate 420 kilowatt hours per day the generation per year would be 153,300 kWh. It has the potential to generate 876,000 kWh per year if the sun were constantly overhead. Thus, the capacity factor is 17.5%. Hydroelectric plants can vary in their capacity factor, but most hover around 50% and some exceed 80%. What this means is that equal capacity (or size) plants generate vastly differing amounts of production across, and even within, technologies. As a result, while PV solar is more effective at directly addressing peak loads, because the loads tend to occur when the sun is overhead, hydro is more economical for the base load renewable energy production and cheaper for the end user. Also, hydro is necessary. While a transition to 100% solar might be a boon for Yankee Candle, losing power at sunset would be unacceptable to most Vermonters. Further, as solar production increases beyond curtailing peak loading, there is a sharply declining value to the ratepayer, as the kilowatt hours are more costly than hydroelectric and servicing the same need. This means that there is definitely a need to use a variety of technologies together to fulfill the state's needs. After the decommissioning of Vermont Yankee and in light of the current moratorium on wind production, this leaves hydroelectric and solar, with the base load being the vast majority required and needing to come from hydroelectric generation or fossil fuels.

Knowledge of how Vermont differs greatly from its neighbors is critical to understanding how best to proceed with setting up an effective grid. First, of the six New England states and New York, Vermont is the only landlocked state. Thus, Vermont is the only state without access to offshore wind. This produces a stark contrast in the make-up of the energy grid. I find this best represented in the Solutions Project when comparing Massachusetts and Vermont.[22] To reach 100% renewable energy, the Solutions Project has identified that of the available resources

[21] *see* Report to the Vermont General Assembly on the Net-Metering Program Pursuant to Act 99, January 20, 2017, page 6
[22] *see* http://thesolutionsproject.org/why-clean-energy/

Massachusetts should target 1.4% hydroelectric, whereas Vermont would need to target 64.3% hydroelectric.



While these results will almost certainly change with research and in application, the modelling clearly represents that a marked difference exists between the needs of the states, even within a region of seemingly comparable terrain and rainfall. Further extrapolated from these analyses, the removal of dams in coastal areas can restore salt marshes, which act as carbon sinks. While important knowledge, this must be understood to not be a factor for Vermont. Negative impacts occur when governmental organizations (GOs) or non-governmental organizations (NGOs) apply regional ideologies and planning to Vermont. Vermont currently has two large-scale renewable energy options—solar and hydroelectric—and solar is reaching its current practicable climax. Regional GO and NGO standards virtually halted Vermont hydroelectric development for nearly three decades. As a result, Vermont has gone out of its way to circumvent in-state environmental pressure and is a standalone at having outsourced the energy needs to Canada. In fact, "To enable Vermont utilities to purchase power from large Quebec hydro projects, the state legislature removed the cap on renewable hydro."[23] Rather than addressing its environmental issues as design concerns to be borne out by the rates, the state has legislated its responsibility to a foreign country. Thus, rather than utilizing existing infrastructure, the choice was to auction off the industrial revenue, tax, and job base and avoid the associated environmental discussion. Though this has the appearance of a plan, it is actually the absence of a comprehensive, environmentally and economically sound plan and a misinterpretation of duties under the CWA.

Federal Power Regulation

Hydropower projects fall under federal jurisdiction. The first dams and hydropower plants were governed by riparian rights. Simply put, those with land along the water's path have a right of allocation. Use for power tended to be in the form of waterwheels that captured the gravitational energy and transferred the power, mechanically or electrically, to virtually any industrial machine of the era. The common law version applied in many cases whereby the flow must be unobstructed. Later, this was amended to allow mill dams, as the preceding rule explicitly prohibited dams as obstructors. The first hydroelectric plants emerged in the US around 1880, including Thomas Edison's group who "built a 12.5-kilowatt plant on the Fox River in 1882." [24] The regulation of dams becomes a federal concern under the Commerce Clause, which allowed the federal government the right to regulate use of US waterways. Jurisdictional authority over US waters rested entirely with the Secretary of the Army. In 1890, the Congress granted the Secretary of the Army the specific power to approve dams on navigable waters; however, a formal licensing procedure was not adopted until 1910. The jurisdiction and standards for the Army were all vested in revisions of the Rivers and Harbors Act of 1890, the same policy which gave rise to the Refuse Act (Section 13).

[23] Dan Tarlock, "Hydro Law and the Future of Hydroelectric Power Generation in the United States," *Vanderbilt Law Review* vol. 65:6 1723, 1726 (2012), page 1728
[24] Thomas V. Cech, *Principles of Water Resources: History, Development, Management, and Policy*, Page 19

In 1920 Congress passed the Federal Water Power Act (FWPA), later renamed the Federal Power Act (FPA), under Chapter 12 of Title 16, in an effort to favor regulated, private development of the nation's energy grid. The FWPA's authority was vested in the Federal Power Commission, and this group had the authority to grant licenses for use of US waterways; however, the FWPA did not strip from the Army the right to regulate the navigability granted under Sections 10 and 13 of the Rivers and Harbors Act. When the FWPA was later rebranded as the FPA, the Federal Power Commission's name changed to the Federal Energy Regulatory Commission (FERC). To this day the FERC continues to regulate the issuance of licenses in the US, though the role has changed with the times. It is through the FERC licensing of hydroelectric plants that the state's rights under the CWA are expressed in the Water Quality Certificate (WQC) and later, if the applicant is successful, become codified within the project license. The result of this web of entities and interests, many not mentioned here, has turned "the FERC licensing into one of the most complex processes in all of environmental law."[25] While the initial charge of the FERC lent itself to facilitating the expansion of energy generation, the Commission today has become more adjudicator than advocate. This is due both to changes and enhancements to the law, such as the CWA, but also to the emergence of capable state GOs and coordinated NGOs.

The Ouroboros Effect

As successful as the CWA has been, the Act itself as currently applied to Vermont is cause for concern. This is due to a variety of reasons, most of which could not have been foreseeable when the Act was drafted. Any one of the following concerns should prompt policymakers to act, but collectively they highlight a pervasive series of misconceptions and require an urgent call to action.

The Total Environment

Of great significance is the failure of the CWA to explicitly acknowledge the existence of climate change as part of the "total environment." To date, climate change has never been a substantive criterion in any Vermont CWA proceeding, yet "to the extent that hydropower obviates the need to burn oil, natural gas, or coal, dams provide an important environmental benefit to river systems, for climate change also ranks high as a threat to freshwater ecosystems."[26] Vermont recognizes this in part in stating, "stormwater runoff is different from the discharge of sanitary and industrial wastes . . . and the increased stream flows causing degradation of the quality of the receiving water at the time of discharge."[27] The CWA, as currently applied in Vermont, does not acknowledge climate change as causal and stands directly

[25] Dave Owen and Colin Apse, *Trading Dams*, 48 *U.C. Davis L. Rev.* 1043 (2015), page 1065
[26] Ashley D. Ficke et al., *Potential Impacts of Global Climate Change on Freshwater Fisheries*, 17 Rev. Fish Biology & Fisheries 581, 603-04 (2007).
[27] *see* Title 10, Chapter 47 §1264 (a), (2), (B)

at odds with Vermont's stated energy goals under Act 56.[28] Moreover, and even if Act 56 were not a statute, the CWA requires the state to address climate change. Climate change, whether one views it as manmade or natural, is happening and fuels the precipitation within a watershed to become a source of pollution. Climate change specifically leads to an increase in the amplitude and frequency of precipitation. Aside from fossil fuel pollution, Vice President Gore's "water bombs" cause, among other things, increased saturation and run-off driven pollution, mineral depletion, increased riverine mortality, loss to human life, and loss to infrastructure. Decreased rainfall leads to drought, which, among other results, increases water shortages (leading to more dam construction), increases water temperatures, decreases dissolved oxygen, causes stagnation and resulting increased carbon dioxide emission, and decreased food production. The net result of the oscillation is an overall lower average water quantity and reduced water quality, or degradation. States are specifically charged under the CWA's Antidegradation Policy (§40 CFR 131.12[29]) with preventing degradation. Failure to address climate change as causal to river degradation leads to a positive climate change feedback loop.

Given that hydroelectric must, with current technologies, be the predominant tool to reduce greenhouse gas emissions in Vermont; and, given greenhouse gases are the leading human controlled input which can mitigate climate change; and, given climate change leads to increased rainfall amplitude and frequency; and, given increased amplitude and frequency are sources of degradation to a watershed; then, the management of removal and redevelopment of dams is an environmental, national security, health, and commerce necessity. It is a primary stressor and one which the CWA was intended to and does charge and empower the state with addressing. The CWA's application in Vermont, not acknowledging climate change as a mitigating factor in river health, is a failure not just in missing the "total environment," but in overlooking the leading input in any reasonable environmental assessment. The legal precedent by which dams fall under the CWA is precisely the means by which state jurisdiction exists. Climate change itself violates Vermont water quality standards, as the watershed is now a source of degradation.

Turtles All the Way Down

The statement that the CWA in Vermont does not recognize climate change is deserving of elaboration. As someone who works closely with the state's legislature and Agency of Natural Resources (ANR), I know the people in these two groups to be not only intelligent, diligent and civic minded, but to generally agree with the fact that climate change must be addressed, renewable energy is one of the tools we must employ, and that hydropower is a part of that equation. The legislature has stated such and acted to effect legislation to make a difference. So

[28] *see* Vermont Department of Public Service, http://publicservice.vermont.gov/renewable_energy
[29] *see* https://www.epa.gov/sites/production/files/2014-10/documents/handbook-chapter4.pdf

how could I say that the CWA in Vermont does not recognize climate change? The answer is that there exists a succession of failure points stacked on one another.

To begin, the process of lawmaking creates a natural dismemberment of theme. This begins when a bill is drafted and passed; it typically opens stating the impetus and intent of the legislature in the *Findings and Purpose*, and then proceeds into a logical series of amendments or additions to existing statute. For amendments relating to hydropower, these existing statutes would likely fall almost exclusively under Title 10 (Conservation and Development) and Title 30 (Public Service). It is also important to know that the Agency of Natural Resources (ANR) and the Public Utility Commission (PUC) are primarily tied to Titles 10 and 30 respectively. Once the bill is passed, the language becomes part of the statute under the correct Title. The first divergence comes with the division of thought, as the intent fails to travel with the legalese to the tool used in implementation: the titles. A second and pivotal schism occurs with the division into the respective, individual titles. By example, if the legislature drafted a climate change bill ordering an increase to renewable energy because water quality must not be degraded, Title 10's amendments would direct the ANR to maintain water quality and Title 30 would direct the PUC to implement renewable energy schemes. At no time in this series of events is the ANR specifically directed to address climate change as it pertains to water resources. Upon review of every statute under Title 10 relating to water resource management, I can find no mention of climate change. It is possible I have missed a reference, but even if that is the case, climate change should be a dominant theme. It should be a priority to proactively protect the environment from climate change. ANR appears not to be directed by statute to address climate change as a threat to the environment other than to, by protracted inference, mitigate its effects.

This brings us to the third point, also pivotal. Why is the regulation of clean water relative to renewable energy so critical to hydropower? The answer is jurisdiction. Vermont Title 10 Chapter 43 §1081(b) states, in part, "Jurisdiction over a dam is transferred from the Department [of Environmental Conservation (within ANR)] to the Public Utility Commission whenever the Federal Energy Regulatory Commission grants a license to generate electricity at the dam or whenever the Public Utility Commission receives an application for a certificate of public good for electricity generation at that dam." While the legislature for the past decade has been drafting laws to bolster renewable energy, hydropower is all but unaffected by this, apart from the rate. Specifically, the PUC, charged with fostering renewable energy, has no jurisdiction to do so until after the project has surmounted the largest hurdle, the FERC License. The jurisdictional body regulating hydroelectric has no mandate to advance that technology. Statutory support to begin a project cannot be gained until the project is completed. And, the project cannot be completed because there is no statutory support to begin the project. It's turtles all the way down.

But no, that isn't the end of the turtles. Title 10 Chapter 43 §1081(b) is actually unenforceable. Once a hydropower project has a FERC License, the PUC has no jurisdiction and

itself found that "[the Board is] preempted from exercising its authority to require the applicant for an issuance of a certificate of public good under 10 V.S.A. Chapter 43 for hydroelectric projects over which FERC has jurisdiction."[30] When I pointed this out to the Senate Natural Resources and Energy Committee in 2016, they responded by adding language to S.230 (Act 174) acknowledging the Federal preemption of projects under the FPA. Even more to the point, for non-utility projects, the PUC does not even enjoy party status. To provide a metric for the degree to which a federal hydropower project interfaces with the PUC, in approximately 10,000 pages of state and federal documentation and filings, a project might only fill out a 3-page net metering application (plus signature page) for the PUC. The total PUC interface constitutes some 0.03% of the total project licensing process and permitting. This is why Title 10, Chapter 41§1004 unambiguously states "The Secretary [of Natural Resources] shall be the agent to coordinate the State interest before the Federal Energy Regulatory Commission in all matters involving water quality and regulation or control of natural stream flow through the use of dams situated on streams within the boundaries of the State…. The Agency of Natural Resources shall be the certifying agency of the State for purposes of Section 401 of the federal Clean Water Act…. The Secretary shall be the agent of the State and shall represent the State's interest under the provisions of the Federal Power Act…."

The PUC does, as part of its role, provide the valuable rate structure necessary for most projects. Most small, renewable energy projects could not be completed without this work. Yet, as an additional impact to the process and given the lack of jurisdiction and interface with these hydropower projects, the PUC does not focus on hydropower redevelopment. Specifically, the rate setting for hydropower under the Standard Offer program is based on projects no more recent than 1987 (the last hydroelectric project before the 2013 and 2015 project completions). Even more to the case, the valuation of hydroelectric is set in large part against that of fossil fuels on the International Organization of Standardization (ISO) index. However, this rate ignores the valuable and majority of cost inputs that range from subsidies to identifiable health effects. The ISO rate is that which is most frequently used in valuing the cost of coal (currently < 3 cents/kWh). When examining the true cost of coal, experts place the actual costs much higher. The additional externality costs added to the ISO rate "amounted to between 9.42 cents and 26.89 cents per kilowatt-hour. Their best guess put it at 17.84 cents."[31] This is a far cry from what the PUC applies to hydroelectric under the Standard Offer Program, 13 cents fixed for 20 years.[32] Weighted over the project life accounting for inflation, that is just over 10 cents in today's market. Moreover, I was told in 2009 that the Public Service Department "did not think hydroelectric was possible in Vermont, so they were not considering grant applications under the Clean Energy Development Fund." The PUC works with finite resources and appropriately

[30] *see* PUC Docket No. 5325, *Application of Winooski One Partnership*, 8/21/1991
[31] *see* https://www.theatlantic.com/business/archive/2015/08/coals-externalities-medical-air-quality-financial-environmental/401075/
[32] *see* http://www.vermontstandardoffer.com/2017-avoided-costs/

places those resources where they are most central and successful to the charge of the Commission.

Though I have never seen an explanation as elaborate as this of the flaws in the system that prevent successful legislation and implementation, discussion of a disconnect in the process is not new. In 2012's Act 165, "An act relating to expediting development of small and micro hydroelectric projects," the legislature sought to bridge an administrative divide relating specifically to small and micro-hydroelectric. This is a commendable effort, but I understand that its success may be limited. There are many references to the ANR's charge to decrease or mitigate degradation, but these are largely emissions based and mitigative in nature and do not directly address climate change. I believe that the entire administration of the CWA requires redress and reframing from the ground up. The reframing could be simple to implement: direct the Agency of Natural Resources under Title 10 to address climate change as an environmental concern related to water quality.

Historic and Nonpoint Pollution

The CWA, NEPA, ecology and nearly all relevant conversations at the time the CWA was drafted universally stress the importance of the total environment. Yet, as an emission-based policy in application, and in a variety of ways, the CWA is limited. The first among these limitations is history. Vermont has a documented history of water pollution, yet the CWA and the Water Quality Certificates they generate do not recognize past acts. The result is that no value is placed on the removal of existing toxins. The CWA was remarkably successful in preventing the addition of point source pollution which, in effect, saw the Tunney standard met in many cases. However, toxins have been deposited in the riverine habitat, and the natural process merely depletes over time the saturation level of the toxins. At one time, the CWA caused the rivers to become cleaner at a noticeable rate as effluents and toxins ceased and deposition washed downstream. As time progresses, there is a geometric increase to the intervals between benchmarks in improved quality. Thus, there is also a geometric declining rate of return in the progress the CWA facilitates. Moreover, when nonpoint sources such as farm runoff are added to this equation, there is likelihood for levels to increase, with the CWA explicitly inhibiting the prevention of this condition. The Hoosic River in Pownal, Vermont, now has levels of pesticides that exceeded the once formidable polychlorinated biphenyl (PCB) levels of a decade prior. There are numbers, too vast to list here, of NGOs performing amazing work to clean our rivers. These river clean-ups remove all manner of debris from our rivers and successfully help to maintain a higher quality. Though the NGOs are private, Vermont is able to provide assistance and I would hope this will continue. However, currently the only parties of which I am aware who are cleaning toxins from the river in Vermont are hydroelectric plant developers. Moreover, they do so as a byproduct of redevelopment and operation. As discussed below, in 2017 the PUC stipulated precisely zero value in addressing riverine toxins. The CWA

as administered in Vermont has the state place insufficient value on curing preexisting pollution and thus fails to acknowledge the "total environment."

The Facilitation of Complacency

The preceding factors, each or collectively, transition the CWA in Vermont into a nihilistic policy, whereby the goal is to do no harm. There is no acknowledgment of the ability to do good. So little good is done. Even though the Lake Champlain watershed contamination is of major concern to the state, the state could take a decade or more to figure out how to accomplish its goal. In the research I have done, in Vermont no one has actively sought and successfully removed toxins from rivers other than hydroelectric developers, a group that has not yet been invited to the discussion of farm runoff. Most citizens and lawmakers are unaware of this huge, self-funded benefit. Cleaning Vermont rivers has no value in our current political or legal environmental culture. The state, under the administration of the CWA, is working successfully to stave off additional concerns but has not meaningfully considered the value of the clean-up in the equation. The statement that Vermont has placed no value on cleaning up its waters is neither hyperbole nor conjecture. The state, after three years of public, administrative, and legislative discussion placed a value of "Hydroelectric facilities = 0 cents per kilowatt hour"[33] on cleaning toxins from our rivers. Under the Rule 5.100 for Net Metering and ignoring written objection, all non-hydro technologies are afforded an incentive equal to between 7 and 20 percent for developing on Brownfields or Superfund sites. Further, detailed recommendations for inclusion of hydroelectric into the then exclusively Brownfields incentive saw the program expanded for all non-hydro technologies to include Superfund sites. The state cherry-picked details from the pro-hydro clean-up argument and yet still excluded hydro. The Net Metering program is the program most likely to match the capacity and need for the vast majority of hydroelectric plants which would be built at Vermont's extant dams. Hydroelectric plants are the only technology developed within waterways. The state has gone out of its way to devalue and de-incentivize cleaning Vermont rivers.

The CWA is designed to prevent harm, so the resulting policy neutrality described is a predictable outcome, but not even the Hippocratic Oath sets the benchmark of performance as "first do no harm." What the Hippocratic Oath actually says is that one must learn, then diagnose, then treat with a goal of healing, and in the course of these events should limit the harm as much as possible. A do no harm approach is failing in Vermont because this approach either needed to be introduced before technological man or there must be a way to regulate all pollution sources, including international concerns and past events. The current model fails to capture the economics of the "total environment" and has all too soon forgotten the warning of Edmund Burke: *The only thing necessary for the triumph of evil is that good men do nothing*. The CWA fosters complacency as a byproduct, and creates a false logic as projects' economics

[33] *see* Vermont Rule 5.127(C)(2)(e), effective July 1, 2017.

are based on incomplete data and ignore mathematical certainties. The CWA, in the most literal sense, fails to account for negative and positive numbers. It only has the tools to identify harm and not benefit. Projects that, by example, exist at natural falls and clean up riverine toxins can at best hope for a score of zero harm. The CWA simply does not contain the tools to acknowledge a net environmental gain. According to the CWA, generating renewable energy and cleaning up toxins has the same environmental benefit as sitting at home on your hands. Negative point sources exist and should be acknowledged as pollution preventers, sinks or filters. Ecology acknowledges positive and negative values as a scientific necessity (positive or negative feedback loops), yet this has escaped application in the CWA.

Privilege Without Authority

Even more, the CWA fosters an uneven application of the law made most prominent when recalling the failure to acknowledge toxins and climate change. Developers must follow strict procedures and standards under the FPA, CWA, EPA, USACE and other regulatory guidelines. These are reasonable and appropriate measures to ensure the retention of quality of a public trust. Alternatively, dam removal under the guise of environmentalism is not subject to the same standards. Dam removal causes a point source of pollution as sediment and any toxins in the sediment are released downstream, causing die-offs that include endangered species. The assumption, which is likely correct in many cases, is that the river will rebound after some time and be healthier than it was previously. This is a worthy cause, and these actions should continue. However, it is an assumption based first and foremost on climate change not being a mitigating factor. The value of the dam to the health of the river is incompletely assessed. While the river health may increase for ten years, what about the following ten years as climate change factors increase? As I read the statutes, the only projected valuation stipulated for dam removal is that "In the case of a proposed removal of a dam that is under the jurisdiction of the Department [of Environmental Conservation] and that formerly related to or was incident to the generation of electric energy but that was not subject to a memorandum of understanding dated before January 1, 2006 relating to its removal, the Department shall consult with the Department of Public Service regarding the potential for and value of future power production at the site."[34] Though well meaning, this clause brings out two concerns. First, how is it that the potential environmental benefits are not considered? Second, as was discussed on page 16, how legitimate are costs from 1987 in making these assessments? It is not the intent to argue that hydroelectric redevelopment should get a regulatory pass, rather that the law should value and define legal versus illegal acts based on the act and not the actor, as is currently the case. The law should fairly reflect a weighted administration of public interests, not particular ideologies. What Vermont law actually states in Title 10, Chapter 47 §1250 is that it is the policy of the state to "(5) provide clear, consistent and enforceable standards for the permitting and management of

[34] *see* Title 10, Chapter 43 §1086 (d)

discharges." Currently, minority interests see special privilege when it comes to environmental regulation that may be harmful to the environment.

Misconception

Governmental and public misconception helps to fuel misguided efforts. Under the CWA, all dams have been branded as harmful and sources of pollution. One need only get on the internet to find that nearly every environmental group has adopted the general opinion that all dams are harmful to rivers and are sources of pollution. Even in largely unbiased and impressive works such as Owen and Apse's *Trading Dams* there are misleading statements: "Dams cause enormous environmental harms."[35] Statements such as this are factually incorrect and damaging to progress. Clearly not all dams are harmful to rivers, and some, especially run-of-river, offer net environmental benefit. Also, dams don't necessarily cause pollution, but they do necessarily prevent and capture pollution. The typical environmental position places the blame for toxins in the impoundment on the dams with little thought as to (a) if the dam had not captured the toxins, they wouldn't have simply disappeared, rather they would have travelled downstream and (b) the dam capturing the toxins creates an opportunity to remove them that would not otherwise occur. The view that dams are causal to existing pollution is common and can be found in legal reviews such as Rodgers' assessment of the Trail Smelter:

> Law students who believe what they read about the Trail Smelter case should go to the Colville Reservation, and travel by boat around Lake Roosevelt, where they will observe miles of curious black sand hugging the shoreline. These images represent the sludge discharges from the same smelter that was the subject of the pro-environmental rulings in the 1940s. Students will hear of the toxins slowly accumulating in the fish that were made permanent residents by the Grand Coulee Dam. These residues are the products of the smelter at Trail and of the pulp mill at Sellgard, B.C. that pour their wastes into the lake below from which there is no escape.[36]

The views expressed here reflect the then and current sentiment in this country, but they are incorrect or at least incomplete. In this example, the dam didn't cause the pollution, it collected it. The trapping of toxins is a feature that can facilitate their removal. Fish passage is also addressed as an environmental concern. Dams may prevent fish migration, but this is not always the case. Take for example the Village of Swanton's Highgate Falls Hydroelectric Facilities, which exist at a natural bedrock falls where fish passage is not possible, plant or no plant. Moreover, limitations on fish passage can provide benefit. Take for example the Pownal Tannery Hydroelectric Plant on the Hoosic River. Sampling for PCBs are performed on the fatty tissue of the aquatic species. The dam limits migration, allowing the state to perform testing on this highly contaminated river to assess more accurately how specific areas are recovering or degrading.

[35] Dave Owen and Colin Apse, *Trading Dams*, 48 *U.C. Davis L. Rev.* 1043 (2015), page 1057
[36] William H. Rodgers Jr., *Defeating Environmental Law: The Geology of Legal Advantage (1997 Garrison Lecture)*, 19 Pace Envtl. L. Rev. 687 (2002), page 704

To take this discussion to the next step, let's examine how hydroelectric projects within the state can net out environmentally. The first case study is the Vermont Tissue Hydroelectric Plant on the Walloomsac River in Bennington, Vermont, which recommissioned in 2015. The site suffered from, among other things, contamination in the sediment and an otherwise high-quality reach which was ephemeral (dry some 17% of the year). The contaminants primarily included dioxins (up to 55,500 pg/g), PCBs (5,400 ppb), semi-volatile organic compounds (SVOCs), and metals (6 over regulatory levels including arsenic, barium, cadmium, chromium, Mercury, silver and lead at the highest level of 2,080 ppm). In addition to creation of tourism resources, creation of recreational features, creation of jobs, improved fish passage, ongoing trash removal, access to renewable energy, improved grid resilience, a computer optimizing outflows to maximize the instream habitat beyond that which naturally occurs, and a variety of other features, the project removed all contaminated sediment, leaving the levels cited above at zero parts per respective unit (the material was removed down to the bedrock) and turned the ephemeral reach into a permanent reach with dedicated bypass flows greater than previously existed and adequate to support aquatic life. The plant received a Water Quality Certificate on February 27th, 2013, and there is no mention in the WQC of the benefits of renewable energy, the removal of the toxins, or any other project benefits. ANR Rivers Management recognizes this project as one that improved the water quality, and, in fact, this improvement would not have occurred were it not for the thoughtful consideration and added value ANR staff provided. However, in the one document in which the state declares its opinion (the WQC), there is no mention of the benefits. This is the only hydroelectric plant in the country, of which I am aware, that has improved the water quality as a function of redevelopment. The plant is in Vermont, and the language does not exist yet in CWA process to describe or discuss the merits of the project so that they might be replicated.

The second case study is the Pownal Tannery Hydroelectric Plant in North Pownal, Vermont, on the Hoosic River. The site was recommissioned in November 2017. The Hoosic River in Vermont is a Class C Waterway in which the fish are unfit to eat and the water is unfit to swim. Since at least 1988 and in the shadow of the pre-water WQC, the Hoosic River had been saturated with polychlorinated biphenyls (PCBs - up to 8650 ug/kg and from an upstream and presumably out-of-state source), polycyclic aromatic hydrocarbons (PAHs - 15 exceeding regulatory limits) dioxins, metals (5 exceeding regulatory thresholds [arsenic, cadmium, chromium, copper, lead, Mercury and zinc]), and nine pesticides (eight exceeding regulatory limits, including cyanide and DDT at 110 ug/Kg). The inability to address the contamination was causal to the plant going out of service around 1988. The pesticides were only discovered in 2016 as part of the hydroelectric redevelopment. In addition to accessing renewable energy, creating jobs, and other benefits, the project represents the first attempt to detoxify the river. Some 600 cubic yards (after dewatering) of contaminated material was removed from the river and disposed of at a lined solid waste facility. All of the material down to bedrock was removed, taking the values in this highest concentrated area to zero ug/Kg.

We are failing to completely educate the populace. The aforementioned projects exemplify the exact goals and actions the CWA prescribes and should be championed; yet they are largely unknown because they have no place in the CWA as applied. In both cases the detoxification was funded by the redevelopment. The detoxification is an inherent and beneficial byproduct of hydroelectric redevelopment. Imagine the impact on the Lake Champlain pollution discussion if existing methods and existing dams were repackaged as opportunity, because some can be just that.

Designated Use

Designated use becomes another oversight by the CWA in Vermont and beyond. Vermont sets forth under the CWA "Designated Uses" defined as: *any value or use, whether presently occurring or not, for which a water has been designated as Class A(1), A(2), B(1), or B(2).*[37] In brief, Vermont includes in this set aquatic biota and wildlife, supporting habitat, recreation or fishing, and public or commercial use that depends on high water quality. Given the long history of hydropower and the definition of Designated Use, hydropower should be included in this list. These misrepresentations are pervasive among the application of environmental law:

> In the ensuing years, when the EPA interpreted the Clean Water Act, it essentially overlooked the ecological implications of integrity. This is evident in the agency's year 2000 inventory, which evaluates water quality in terms of specific uses – such as fish consumption, agriculture, drinking water supply, or primary contact recreation – rather than variables associated with aquatic ecology or biogeochemical cycles. The Senate Public Works Committee staff had explicitly repudiated such use-oriented designations and had criticized the Tunney standard for retaining them.[38]

The CWA is a systems-based platform that is reliant on complete inputs to garner a valid result. In failing to recognize hydropower as a designated use, Vermont, in effect, creates an economic void in assessing its own history, and hand picks facts, generating erroneous results.

Breaking the Circle

At the heart of the concern is environmental protection and development becoming mutually exclusive concepts. This has had devastating results to the global environment, including Vermont. The CWA as applied in Vermont is, in spite of the best intentions on the part of government, causing harm by failing to administratively acknowledge the "total environment" of water, which includes most notably climate change, existing pollution and the possibility of net benefit. The effect is that in-state regulation is overpowering mission-oriented directives. Add this to inappropriate regional policies, and we foster in-state policy that damages the state's rivers, economy, jobs and pride. It is important to realize that the movement of conservation and

[37] *see* Vermont Water Quality Standards, Environmental Protection Rule Chapter 29A, Definition 11
[38] Paul Charles Milazzo, *Unlikely Environmentalists: Congress and Clean Water, 1945-1972,* page 253

environmentalism is not tasked with improving the total environment, and in many cases, these work counter to that total environment. The current emissions-based CWA is a most impressive document, but now we need more aggressive, comprehensive, and Vermont-specific policies and applications to accommodate the current needs.

When contemplating what that might look like, the Penobscot Project stands as the model to the likely direction we should take. Dave Owen and Colin Apse in *Trading Dams* (2015 UC Hastings College of the Law) elaborately detail the history, opportunity and success of the project. The Penobscot Project serves as a monument to successful efforts across a group of stakeholders, pairing adversaries in a successful effort to accommodate energy needs, job creation, environmental issues, and recreational enhancement as design concerns rather than ideological impasses. These results have been replicated on smaller scale at the Vermont Tissue Plant. Vermont should be bragging about this standalone accomplishment, not ignorant of its existence. Perhaps as a way of expanding on its successes, a statewide effort, partnering dam redevelopment with dam removal could balance the environmental needs with the renewable energy needs and serve to facilitate both interests, likely expediting both goals. The emission-based, do no harm approach is simply inadequate to our needs, but that doesn't mean that progress cannot be made with the best interests of all stakeholders in mind. The state can work to apply the law fairly and evenly and still preserve its preference for dam removal. Ideological environmental beliefs could be considered as design concerns, not just within a project but within a region, and not exclude climate change. These design concerns can then be weighed in robust economic models that value the total environment we see and choose to create. Costs would be borne out through the rate structure, which should consider that "Some of the most important incentives involve creating a favorable economic environment for environmentally sensitive hydropower."[39] This could yield higher energy prices, but markedly lower healthcare and other expenses. Also, the costs in state would become "true costs" reflecting social and policy decisions accurately and rewarding stakeholders appropriately.

The good efforts of those whose concerns are environmental should not be wasted on infighting. The state has a moment to inspire, to promote both access to renewable energy and free-flowing rivers. While the protections of the CWA are essential, we can do better. The most effective path the state could take is to create legislation that facilitates collaboration and embraces the core of the discussions surrounding the CWA: environmental protection and development should not be mutually exclusive. The opportunities abound and, using the same tools that brought federal hydropower under the CWA, all the state need do is to meaningfully connect the dots mentioned above in its water quality standards: the total environment including climate change, all pollution and all designated uses. Create the possibility of action with commonalities to those proposed by Owen and Apse, in which redevelopment and removal are mutually supportive. In working to clean Lake Champlain, acknowledge and enhance some

[39] Dave Owen and Colin Apse, *Trading Dams*, 48 *U.C. Davis L. Rev.* 1043 (2015), page 1107

preexisting dams as negative point sources and let them self-fund these efforts via their production of renewable energy. The need to manage old dams and the need to access renewable energy are inescapable realities. Positive steps are already occurring in Vermont and need only be acknowledged and replicated. Vermont must lead in terms of design concerns and not ideological divides. The tools to date are limiting, but the state now has an opportunity to create rather than punish, to enhance rather than destroy, to reframe the narrative and to usher in an Age of Inspiration rather than one of blame. It can do this simply by asking the agency charged with stewardship of the rivers to address climate change and existing pollution. This little state's voice has frequently charted a course for others and can do so again.

Climate Change
and
The Clean Water Act

Part II

Rip Current

William F. Scully
2017

The Flow

As discussed in Part I Unintended Consequences, addressing climate change as a function of river health is vital. To most, the climate change movement appears on the surface to be advancing calmly and steadily in Vermont. We hear reports regularly of milestones being met. However, there is a destructive undercurrent to the efforts which serves directly to undermine not just renewable energy and efficiency efforts. At stake are the integrity and viability of the state. In retrospect, this undertow has been present now for decades. At the heart of these concerns and the future of Vermont lies the currency of life: energy. Vermonters as a whole have vast misconceptions about how the world works and what our role on that stage must be.

Vermonters tend not to realize the cost of what I have dubbed the energy terroir. State policy follows this trend. Being in a mountainous region above the 42nd Parallel, Vermont will always see a higher cost of energy products reliant upon the sun's energy. Specifically, milk and solar energy will always cost around 39% more to produce in Vermont versus southern states. These costs are unavoidable and will be paid in Vermont, either through the product with savvy planning, or a degraded environment and reduced instate wealth. Now more than ever, we simply cannot continue to be reliant on the least economical energy source available to our energy terroir. This is especially true when considering the vast alternative resources afforded us. Or, put another way, if we continue down the path we are on, those driving us in this direction need to remove protection of the ratepayer from rate increases as a mitigating factor. Their actions lead to a costly result, one which is, for a short while longer, avoidable. Cost is not just dollars per kilowatt hour. It includes jobs, independence, health and all things vital to our survival as Vermonters.

The legislature responded to the issue. However, they did so by disenfranchising their own constituents. In hindsight, what I mistook for a drafting error in early 2017 was just the opening salvo. Vermont has now stripped net metering customers, as a class, of many of their most basic rights, those found under Title I.

Sunny Reflections and their Shadows

Vermont has made enormous progress in successfully rolling out solar-centric renewable energy policy. Since writing Part I, the Vermont Department of Public Service (DPS) has again confirmed the success of solar adding, in the chapter Declining Value of Solar that "peak load in Vermont now occurs after sunset in all months of the year."[40] For most utilities in the state, the installed capacity of solar net metered projects is 15% of the peak load, and 95% of that power comes from solar. The financial implications of this are well articulated by the DPS. The Commission states that the existing and committed resources will only cause short-term increases, while the long-term forecast "are already trending down and likely to fall back to

[40] *See* State of Vermont Public Utility Commission, Case Number 18-0086-INV, Chapter 3, page 9

historic norms over the longer term of the remaining lifespan of existing and committed solar resources."[41] The climate goals have been accomplished with no lasting effect on rates.

While this is a time to celebrate a success, it is also a time for pause. Solar will now begin to see a sharp declining rate of return as its primary benefit in any energy grid is to offset peaking. Solar cannot offset peaking after sunset without being tied to storage technologies. However, if tied to chemical storage, solar energy becomes essentially non-renewable. Gravity storage may be a viable option but is many years from implementation in Vermont, as Vermont has yet to contemplate the implementation of large-scale gravity storage on the environment. Answering what is next for our energy development is overdue.

Modus Operandi Solaris

Understanding the primary economic driver behind the utility-scale solar boom in Vermont, including utility and Standard Offer Program projects, is critical to what's next, as the plan must draw investment. Even beneficial acts must make financial sense to draw the necessary capital from investors. In some cases, the means and motives of what we thought was pure intent may be shocking. At the heart of the rollout of large-scale solar is the Investment Tax Credit (ITC), Production Tax Credit (PTC), depreciation and other tax-based incentives. While standard return on investment (ROI) plays a critical role, the economic driver is not traditional investment or business profitability.

To begin, the major driver, the ITC, offers 30% of the hard costs for project development in dollar for dollar tax credits. For every $100 in equipment and construction an entity spends, the ownership sees a $30 tax credit, distributed by equity stake, which can be used to offset personal tax liability. Next, let's take the PTC, which affords those taking advantage of the ITC an additional $0.012 per kilowatt-hour each year.[42] Then is depreciation, which could be taken at the standard schedule, or accelerated to realize 50% bonus depreciation in the first year.[43] Finally, a low interest rate for private investment would yield 5.00% in 2018, but let's use an extremely low rate of Wall Street Journal Prime plus 0.25%, or 4.5%[44] plus 0.25% to equal 4.75%.

So, what does all this mean? Let's assume that you are a large shareholder in Exxon. Profits are fantastic because some 83% of the company's expenses are paid by external parties.[45] As a result, you likely have an enormous personal tax liability, or what many would call a tax appetite. For this exercise, we will show what can be harvested as a return on investment in the

[41] *See* State of Vermont Public Utility Commission, Case Number 18-0086-INV, Chapter 3, page 10
[42] *See* https://www.energy.gov/savings/renewable-electricity-production-tax-credit-ptc
[43] *See https://www.energy.gov/savings/modified-accelerated-cost-recovery-system-macrs*
[44] *See* http://www.wsj.com/mdc/public/page/2_3020-moneyrate.html on 3/21/18
[45] *See* https://www.theatlantic.com/business/archive/2015/08/coals-externalities-medical-air-quality-financialenvironmental/401075/

first year from a mid-sized, utility-scale solar project. An investment of $5,963,000 at a cost for solar panels at $2.71 per watt[46] buys you a 2.2 megawatt (MW) solar plant. Assuming a 15% capacity factor, the plant would yield around 2.891 gigawatt hours (GWh) per year. In this scenario, the ITC yields you 1.8 million dollars in tax credits, which you will apply to your personal tax payments. The PTC generates an additional pittance of just under $35,000, which will also offset the check you owe to Uncle Sam. Interest on the loan for year one yields $283,242. That totals $2,106,838 added to your pocket before accounting for profit. We can also apply the accelerated depreciation to offset $2,981,500 of income, a subjective value to a tax base, but certainly extremely beneficial. Without trying hard, we have effectively yielded you a greater than 35% ROI *plus* profit and depreciation in the first year. Let's not forget that in the end your six million is paid back with interest. For the balance of the loan, investors tend toward taking a non-ownership role, leaving management and ownership to another party.

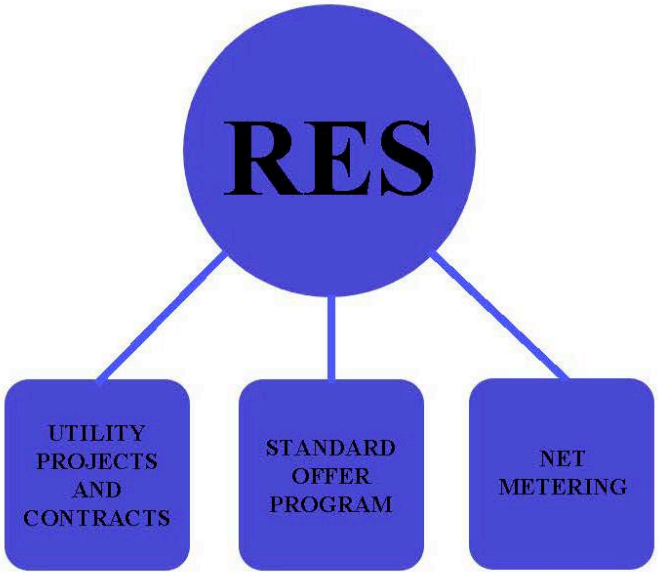
The solar roll out was successful because it was made appealing for investment by the wealthy. It was about the consolidation of wealth for the one percent. Yet, no one complains, because they either don't know, or those who would complain are also the parties vying for more renewable energy. This is how the system works, and it was the means to achieve a successful utility-scale solar roll-out. When this fails to work is the point at which those pushing for more renewable energy, both government organizations (GOs) and non-government organizations (NGOs), forget to mind the shop, and Vermont continues paying for systems from which the citizens cannot reasonably benefit. That is the case currently, when peaking is now occurring after sundown twelve months out of the year and the economic return on investment for the taxpayer begins to sharply decline. This is when the system falls prey to abuses and serves to harm the greater good.

Legislative Rip

In recent years, the Vermont legislature passed a great many acts in an effort to promote the development of renewable energy. These efforts have met with remarkable success and have placed Vermont at number two among US states for transforming to clean power.[47] As is represented in the results, these efforts have focused almost exclusively around photovoltaic solar as a means of reducing the use of fossil fuels to meet peak demand. Most recently, the legislature and Public Service Board, in an unprecedented act, undermined the very programs they fostered, literally stripping net metering project owners, the class comprised most predominantly by Vermonters, of some Title 1 rights.

As shown below, the Vermont Renewable Energy Standard (RES) has three categories: utility projects and contracts, Standard Offer Program, and net metering.

[46] *See* https://www.nrel.gov/news/press/2017/nrel-report-utility-scale-solar-pv-system-cost-fell-last-year.html
[47] *See Clean Energy momentum, Ranking State Progress*, Union of Concerned Scientists, April 2017



The Rule defining standards for net metering, by large margin the most active of the RES programs, was established in 2013 and came under review leading up to 2017. The approved 2013 Rule 5.100 for net metering set no term limit [emphasis added] for the rates for net metering. This entitled the net metering customer to Rate 1 for the life of the project. To limit exposure to ratepayers, the legislature placed a cap on the total capacity that could be commissioned under the Rule 5.100 net metering program.

In 2015, the Vermont Public Utility Commission (PUC)[48] engaged in an extensive and exhaustive public comment period. The public discussion of the Rule began June 12th, 2015 and ended on November 18th, 2016. In total, there were seven public comment opportunities, aside from meetings. The latter public comment was made because: "These changes were substantive and therefore could not be incorporated into a final rule without additional public process."[49] Throughout this period, up to and including the copy dated January 1, 2017, the language in Section 5.125(C) (previously 5.103(B) and 5.124(C)) relating to rate terms evolved as follows:

- 2/19/16 - Removed adders after ten years (see - 5.103(B)) but left the rate intact in perpetuity consistent with the 2013 Rule.
- 3/7/16 draft changed the ten-year term in the previous draft to 20 years.
- All later drafts through 2016 essentially had the same 20 years as the 3/7/16 draft, but stated it as ten years plus ten years to net out to 20 years, and made no mention of subsequent periods:

[48] VTPUC also refers to the Vermont Public Service Board (VTPSB), the name for the entity prior to January 1st, 2017

[49] *See Report to the Vermont General Assembly on the Net-Metering Program Pursuant to Act 99 of 2014,* Vermont Public Service Board, January 20, 2017

(C) Applicable Rates for Pre-Existing Net-Metering Systems. Customers using preexisting net-metering systems shall, for a period of 10 years from the date of the net-metering system's commissioning, receive the incentive provided for in 30 V.S.A. $219a(h)(1)(K), as the statute existed on December 31, 2016. At the end of this 10-year period, for an additional 10 years [emphasis added], such customers using preexisting net-metering systems shall be credited for excess generation at the electric company's blended residential rate.[50]

I was told this was an effort to filter preexisting adders for solar, though I was later led to believe that it was to address non-bypassable charges. Please note, hydropower receives none of the incentives that solar or the other technologies receive. Rule 5.100 goes to great effort to exempt hydro from the incentives for siting, technology and RECs that all other technologies receive. In and of itself and taking into consideration that this is targeted for solar as the vastly dominant technology, this is not great, but solar plants have a practical lifespan of 20–25 years, so the term for solar adders dovetails somewhat with expectations. However, that's not where this Rule landed.

In seventeen months of deliberation and 500 public comments filed in that timeframe, including responses from the PUC, the only opinion stated counter to the proposed term limit was uniformly that twenty years was *not* long enough. The position of record for all stakeholders, including the Generally Assembly from Bennington County,[51] was that a retroactive change to preexisting sites violated Vermont's Vested Rights Doctrine. In a letter to the VTPUC, the Bennington Delegation states accurately:

The Board does not have authority to apply rules adopted under 30 V.S.A. § 8010 to net metering systems for which complete applications were filed before its effective date — January 1, 2017. 2014 Acts and Resolves No, 99, Sec. 10(g) states: "30 V.S.A. § 8010 and rules adopted under that section shall govern applications for net metering systems filed on and after January 1, 2017." (Emphasis added.) In contrast, Sec. 10(f) of that act specifies that "30 V.S.A. § 19a and rules adopted under that section shall govern applications for net metering systems filed prior to January 1, 2017." (Emphasis added.)

In 2015 Acts and Resolves No. 56, the General Assembly confirmed its lack of intent to authorize regulation of these net metering systems through rules adopted under 30 V.S.A. § 8010. Sec. 12 of the act amended the statute and Sec. 28(d) of the act specified that "Sec. 12 shall not affect a net metering system for which a complete application was filed before January 1, 2017."

These provisions of Acts 99 and 56 were included, in significant part, at the request of a member of the Bennington delegation who intended to ensure that the status quo was maintained for such net metering systems, including net metered hydroelectric systems.

In concert with Vermont's vested rights doctrine, these provisions set 30 V.S.A. § 219a and the rules adopted thereunder as the statute and rules applicable to net metering systems for which applications are filed before January 1. The Vermont Supreme Court has held that rights vest "under the then existing regulations as of the time when proper application is filed . . ." Smith v. Winhall Planning Comm'n, 140 Vt. 178, 181 (1981).

[50] *See* Rule 5.100 labelled as "Revised: January 1, 2017", Section 5.124(C)
[51] *See* letter from the General Assembly from Bennington County to the Vermont Public Service Board dated May 3, 2016, Re: Proposed rule 16-P10; net metering systems; revisions to Rule 5.100.

> Contrary to these provisions and the vested rights doctrine, proposed Rule 5.103 seeks to limit the period during which 30 V.S.A. § 219a and the existing rules and tariffs will continue to apply to the systems at issue. For hydroelectric generation facilities, which are long-lived, this proposal threatens to undermine the financial calculations and expectations of the investors in the facilities — calculations and expectations based on existing statute and rules that did not and do not condition eligibility for net metering on such limits.
>
> Instead of the grandfathering provisions in the proposed rule, the Board should simply provide that 30 V.S.A. § 219a and the rules and tariffs adopted under that section, as they exist on December 31, 2016, shall continue to govern net metering systems for which applications were filed prior to January 1, 2017.

Then something funny happened. An interesting change appeared, which may have been a drafting error, but certainly created what may be the most substantive of all changes made to the 2017 Rule.

Here Be Dragons

On January 20th, 2017, the PUC presented to the Legislative Committee on Administrative Rules (LCAR) for approval, the final draft Rule 5.100, which was to have taken effect January 1st, 2017. LCAR admonished the PUC for its tardiness, but it was generally accepted that the delay was a result of such rigorous due diligence with the public comment period. It was at this point the most unsettling edit came to light. The Rule as released to LCAR removed the rate protection after 10 years, in effect posing only a term of 10 years with a specific rate.

> (C) Applicable Rates for Pre-Existing Net-Metering Systems. Customers using pre-existing net-metering systems shall, for a period of 10 years from the date of the net-metering system's commissioning, be credited for generation according to the rates and incentives provided for in 30 V.S.A. § 219a, as the statute existed on December 31, 2016, and the Commission's rules implementing that statute [sic] If the customer's system was commissioned before the electric company's first rate schedule to comply with Section 219a(h)(1)(K) took effect, then the 10-year period shall run from the effective date of the electric company's first rate schedule implementing the incentive. At the end of the applicable 10-year period, customers using pre-existing net-metering systems shall be credited for excess generation as provided in Section 5.126 of this Rule or its successor.

This language terminates the rate after just ten years. This is a concept never presented to the public at any point and fails to meet any standard requiring public input and deliberation. It is uncharted territory. According to the LCAR guidelines, "Proposed rules must go through a public hearing process before they become final proposed rules reviewed by LCAR."[52] In and of itself, the change to 5.125(C) is a major substantive rule change with unknown and likely devastating effects. Further, it paves the way for preexisting projects to migrate to new rules whose guidelines have yet to be contemplated.

This may be a change pointed at solar, but there is substantial collateral damage to other technologies. Hydroelectric in Vermont, for example, sees a greater than twenty-year return on investment and debt service, largely due to stricter environmental requirements. The timelines

[52] *See* https://legislature.vermont.gov/committee/detail/2018/39

for this technology differ from solar where, rather than a twenty to twenty-five-year lifespan, hydroelectric plants can last for a century. The effective project life is not determined by the equipment. It is determined by the Federal License. Hydroelectric projects were able to be developed under the 2013 Rule's guidelines, and that is the moment when the rights became vested. A retroactive change appears unconstitutional, fails to meet the statutory requirements for rule adoption, and creates an impossible burden for the largest class of net-metering hydroelectric developers, Vermonters.

When I relayed my concerns to the legislature, the first response was a question: *Why didn't they just enter into a different program like the Standard Offer Program?* The answer is quite simple. Other programs were not economically viable so, after years of vetting, we chose the option afforded us, in writing, by Vermont under the 2013 Rule 5.100. However, the question asked raises some frightening concerns. I find it troubling that at the legislative level of Vermont government, the go-to response was to blame the victim for what is either an honest regulatory mistake or an unquestionably egregious breach of process.

However, the situation eroded even further when I was able to informally convey my concerns to two members of SNRE kind enough to hear me out. The conversation, I am sure they would agree, was a strange one. They were unable to understand my concern, and I was unable to make sense of their references. They kept referring to the term's ten years, wanting to understand why it was an issue. I assumed they meant the second ten years, when the new term limit in the public drafts terminated. What actually occurred is that there were two drafts being circulated. The draft with consecutive ten-year terms (totaling 20 years) was still listed on the PUC's website as current and was the copy I had in hand. At the same time, the legislature had received the draft with only one ten-year term. We were literally discussing two different things with similar enough language so as not to realize the discrepancy.

Later, when I continued to push, focusing on the fact that the project's rights were vested under the 2013 Rule 5.100, I was told that the rate could change because it was tied to a tariff, which made it mutable. It became evident to me that there was an effort to justify the previously undisclosed term change. Continuing to believe that decisions such as this define the quality of governance, and government should not be deceptive, I fundamentally disagree with the premise that the change in term was acceptable. However, I accepted the challenge and looked into the tariff that was being referenced. The 2013 Rule 5.100, which details the tariff under which rights for these projects were vested, states: "5.107(B) All such requirements shall be pursuant to and governed by a tariff approved by the Commission and any applicable Commission rule or order, which tariffs shall be designed in a manner likely to facilitate net metering." The new ten-year lifespan for rates on preexisting projects coupled with the near thirty-year paybacks for hydroelectric projects, means any substantive change to the tariff would result in insolvency, a condition which clearly fails to meet the standard for the tariff: "designed in a manner likely to facilitate net metering." If there were a meaningful change to the tariff, the only remedy for the

plant owner is a costly lawsuit, which again, due to an improperly drafted rule, places an inappropriate, and potentially insolvency-triggering event in the path of the project and owner. Regardless, the last three words in the final January 1, 2017 Rule 5.100, *or its successor*, are not discussing changing a tariff; they contemplate an entirely new set of standards. The tariff discussion is a distraction from the larger issue of transparent, competent, honest and legitimate governance.

Realizing that the tariff argument may be flimsy, the legislature responded to the questions by digging in deeper and, in effect, retroactively legitimizing 5.125(C)'s unenforceable language and stating clearly that they have no intention of honoring their binding agreements. 2017 Acts and Resolves, in a rider not related to the original bill "H.411 Appliance Efficiency," brazenly states:

> Section 7. 30 V.S.A §8010(c)(2)(F)(ii) is amended to read:
>
> (I) Commencing 10 years from the date on which an existing net metering system was installed, the Board may apply to the system the same rules governing bill credits and the use of those credits on the customer's bill that it applies to net metering systems for which applications were filed on or after January 1, 2017, other than any adjustments related to siting and tradeable renewable energy credits.
>
> (II) This subdivision (ii) shall apply to existing net metering systems notwithstanding any contrary provision of 1 V.S.A. § 214 and 2014 Acts and Resolves No. 99, Sec. 10.

The second paragraph states that even if this will force bankruptcy, breach of contract, or a litany of other rights guaranteed under the General Provisions of the Construction of Statues in Vermont[53], the legislature is going back on its binding agreement and allowing the utilities and PUC to do as they choose, and at the cost of those they asked to invest in Vermont and the environment. Simply put, the second paragraph entitles the state to now effect upon those who net meter, though rule change, <u>any right, privilege, obligation, or liability, including penalty, forfeiture and violation</u>.

A simple amendment I posed to place a term limit equal to the project life, which would allow for flexibility between technologies, would likely have satisfied the concerns without laying waste to over 10,000 Vermont net-metering customers. Instead, the state made a very strange choice to violate its own governing doctrines and disenfranchise its citizens as an intent— and to what end? Is this an elaborate plan on the part of the legislature to disenfranchise a class of Vermonters in an effort to facilitate lower consumer rates?

<u>One Size Does Not Fit All</u>

When examining what might be going wrong and trying to answer the question posed in the last paragraph, I discovered a fundamental misunderstanding which seems to weigh upon a broad

[53] *See* 1 V.S.A. § 214 Effect of amendment or repeal

sector of Vermont. In fact, I am certain that until awareness is raised on this issue, all efforts will result in Vermont continuing to fall into decline in wealth and population. The issue is the basic misunderstanding of Vermont energy and natural resources. Though the changes to Rule 5.100 may run back to cost to the ratepayer, the higher electricity rates are a result of geography mismatched with policy, not caused by the net-metering program.

To detail this issue, I will take up a well-known discussion taking place now, that of dairy farming's impact on clean water in Vermont. Vermont is addressing a clean water issue, in large part the impacts of farm runoff. This discussion quite accurately reflects the heart of the policy issue and the misunderstanding.

The farm runoff discussion has been on the minds of many for some time. Dairy farmer James H. Maroney, Jr., in his book *The Political Economy of Milk, Reinvigorating Vermont's Family Dairy Farms,*[54] writes about the concerns of modern Vermont farmers. At the heart is the economy surrounding the price of milk, or more specifically, the ability of Vermont farmers to compete in the marketplace. The book is filled with supporting facts and concludes, generally, that Vermont dairy farmers must develop a premium product. Mr. Maroney wisely recommends organic milk, which can demand a higher price in the marketplace. While this does not entirely frame the perspective of the Vermont dairy farmers, it does highlight the overall issue: the cost to produce versus what the market can bear for a gallon of Vermont milk, and, by extension, whether Vermont dairy farms can remain viable entities.

On the other side, farm runoff, primarily phosphorous, has led to severe damage to the waters of Vermont. As mentioned in Unintended Consequences, farms are specifically exempted from the 1972 Clean Water Act. The state agencies and legislature, as well as NGOs, have been grappling with how to maintain water quality affected by farm runoff. This year the Senate Natural Resources and Energy Committee (SNRE) has introduced S.220 to address this issue. The bill would see farm runoff regulated by requiring farms to apply for a water quality permit and placing them under an emission-based jurisdiction of the 1972 Clean Water Act and the Environmental Protection Act.

The dairy farmers see the introduction of this bill as increasing costs to farms, which is likely true, thereby putting an end to a century of family-owned Vermont Dairy farms. Those vying for regulation see the existing practices as causing degradation to the waters of Vermont, which is also true. The debate has been lively, even hostile at times. My reason for using this example is that in this case, everyone is right, but no one is actually discussing the correct subject. This is not a farming or an environmental problem. It is an energy problem.

[54] James H. Maroney, Jr., *The Political Economy of Milk, Reinvigorating Vermont's Family Dairy Farms,* Gala Books LTD, 2018.

Reintroducing Vermont

Let me begin by saying that I totally agree with Mr. Maroney's solution, but he has missed the problem, as has everyone else. Vermont milk costs more and always will. This is not the fault of government, transportation, compacts, the farmers or NGOs. Milk will always cost more to produce in Vermont because it is the product of solar energy. Here is a simple proof:

	Yields (tons per acre, dry)		**Yields (pounds per head)**
	Hay and Haylage	Corn Silage	Milk
Vermont	4	17	21,147
California	6	27	22,755
Variance (VT->CA)	147%	161%	
Mean	154%		107.60%
Compounded production deficiency for Vermont versus California			**-66%**[55]

Pulling the most basic information and taking for granted that Vermont farmers are as competent as California farmers, California produces 66% more gallons of milk than Vermont as a function of the available solar energy. The simple and unavoidable reality is that milk will always cost at least 39% more to produce in Vermont.

California sees at least 57% more solar energy than Vermont. Sacramento, California, which is further north than the largest agricultural center in California (the Imperial Valley), sees some 3,608 hours of daylight per year.[56] The Imperial Valley is closer to 4,000 hours. Burlington, Vermont, which is atypically sunnier than average for the state, due its proximity to Lake Champlain, sees some 2,295 hours of sunlight per year.[57] Fostering commercial dairy farming in Vermont can be likened to fostering commercial fishing in Vermont or maple syrup in Florida. Geographically, the state does not contain the necessary natural resources in the abundance required for solar-centric farm products to be cost competitive. It can be done, but it will be more expensive.

The cost of solar energy products as a function of geography is unavoidable and will be paid either in the price of milk, the economic viability of farms, the environment, or a combination of these as we see now. In order to solve these issues for both the farmers and water quality, the

[55] *See* https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=CALIFORNIA and https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=VERMONT

[56] *See* https://en.wikipedia.org/wiki/List_of_cities_by_sunshine_duration - or *see* https://www.currentresults.com/Weather/US/average-annual-sunshine-by-city.php

[57] *See* https://www.currentresults.com/Weather/US/average-annual-state-sunshine.php

conversation must be about the economics of energy within a region. Farming practices that do not match the Vermont energy terroir increase food costs. Vermont has a history of agriculture, but not dairy farming as suggested by Mr. Maroney. Rather, this is hunting and foraging land, and it is similar agricultural practice that will produce cost-competitive products.

Fighting the Flow Above the 42nd

The economics of energy within a region, or the terroir of an energy sector described above, also extends to our electrical needs. We have, for the time being, largely reached the practical climax in the application of conventional photovoltaic solar in our location above the 42nd Parallel. As an energy source, beyond reducing peaking, solar in Vermont costs 39% more per kilowatt to generate than solar in Arizona or other regions closer to the equator. Specifically, on average across types of arrays, Arizona generates 164% of the power using the same solar array.

Average (kWh/m²/day) at latitudinal tilt					
	Flat Plate	1-Axis tracking	2 -Axis tracking	Direct Beam, 1-axis	Average
Phoenix, Arizona	6.5	8.6	8.9	5.2	7.3
Burlington, Vermont	4.3	5.4	5.6	2.5	4.45
Variance	151%	159%	159%	208%	164%

Take note of the similarity between the lower production and resulting higher cost of Vermont farm products, and the lower production and higher costs to produce Vermont solar energy. They match simply because the geographic factors relating to the sun are a constant, and it is impossible to change them because they are physical properties. It is the reality of Vermont's energy terroir.

The reader may note that for comparison with Vermont, I used California for dairy farming and then Arizona for solar. The reason for this distinction was available data. The production per acre for Arizona "Hay and Haylage" was not available. However, other data leads to the reality of Vermont energy terroir costs being substantially higher relative to other states than represented above. California is not an outlier.

	Yields (tons per acre, dry)		Yields (pounds per head)
	Hay	Corn Silage	Milk
Vermont	3	17	21,147
California	5	27	22,755
Arizona	8	31	24,680
Variance (VT->CA)	208%	161%	
Mean	184%		107.60%
Compounded production deficiency for Vermont versus California			**-99%**[58]
Variance (VT->AZ)	302%	188%	
Mean	245%		116.71%
Compounded production deficiency for Vermont versus Arizona			**-186%**[59]

Vermont yields staggeringly less solar production than southern states using the same effort and equipment. Yet, Vermont has done little to no hydro redevelopment in the past 30 years, has limited wind resources,[60] and forced decommissioning of the only nuclear power plant. With this history and aside from fossil fuels, in-state utility-scale energy options are limited to solar. This has an unavoidable result of higher energy costs.

Yet, like Slim Pickens near the end of Dr. Strangelove, the state has dedicated itself to an unusual path of nearly exclusive solar development. Now it appears that, upon realizing the cost of this decision, lawmakers wish to get back on board the plane by shooting it out of the sky. If our aim is for the state to see both renewable energy development and reduced rates, we must, as a function of the energy terroir, develop hydroelectric resources. Instead, the legislature has placed all recent development in jeopardy and made no meaningful action to promote future redevelopment.

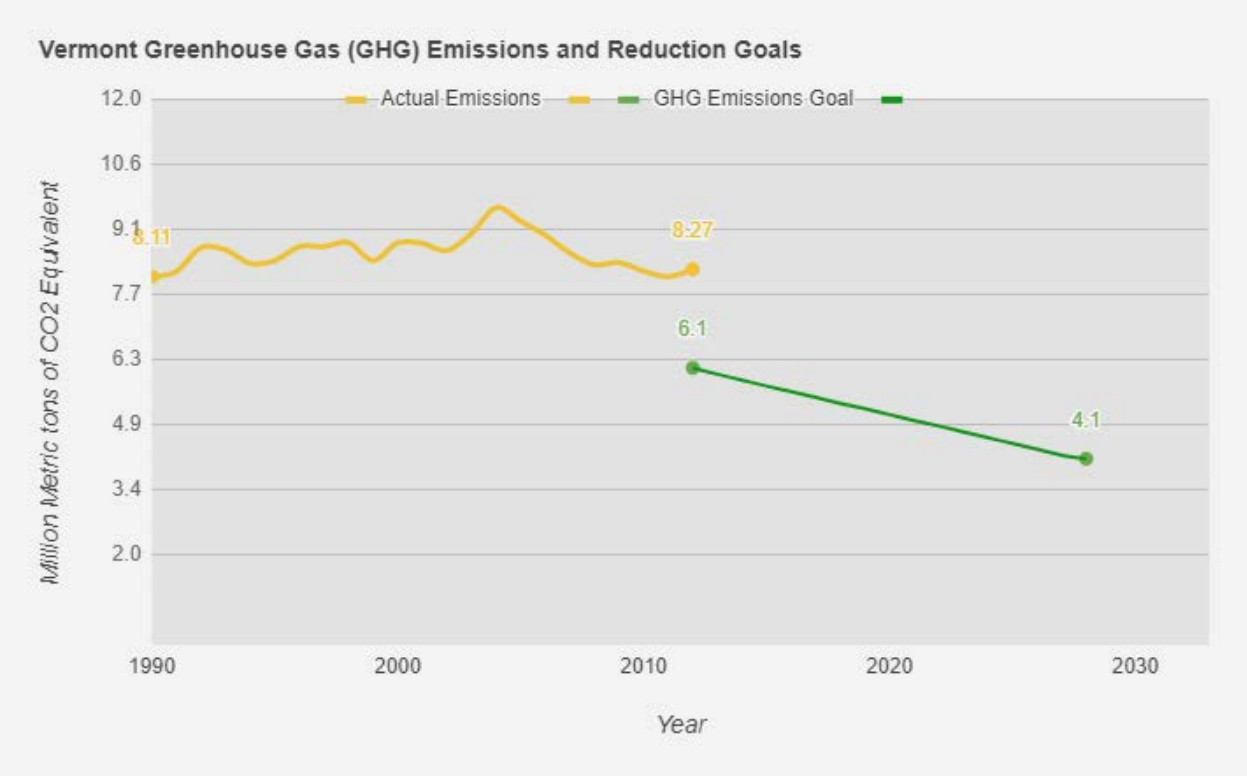
Please keep in mind that even if the legislature sought to promote hydroelectric tomorrow, it would require further legislative action likely to last a year. Then it would take an additional eight years to see the first plants redeveloped. Knowing this and examining the progress on

[58] *See* https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=CALIFORNIA and https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=VERMONT

[59] *See* https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=ARIZONA and https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=VERMONT

[60] Vermont has limited and erratic wind resources on ridgelines and causes environmental costs to areas necessary to providing habitat for wildlife, in terms of habitat connectivity and water and soil nutrient quality (re. nutrient quality, *see* Likens, Bormann, Johnson, Fisher and Pierce, *Effects of Forest Cutting and Herbicide Treatment on Nutrient Budgets in the Hubbard Brook Watershed Ecosystem*, 1970).

renewable energy goals to date, the 2006 call for a 50% reduction of the state's greenhouse gas emissions below their 1990 levels by 2028 seems highly improbable. Drastic measures are now required.



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The legislature should stop vacillating at the expense of their constituents. They should either take this seriously, or not pursue the renewable objectives.

Protect the Environment and Citizens Together (PECT)

The path to healthy waters in Vermont must acknowledge the energy terroir. Whether the practice is farming or energy production, there are realities to face for our inhabiting this area. Paying it environmentally violates the Clean Water Act. Vermont simply cannot compete with most of the country on energy harvested from the sun. Solar electricity is valuable to Vermont offsetting peak load demands, but it is enormously costly to sustain our base load requirements. However, Vermont is rich with water energy resources, including highly varying topography and low population density. Yet the most recent legislation has had devastating effects, the worst of which shall impact Vermont-owned hydroelectric projects. Specifically, Vermont has exempted hydropower from all incentive but made it most vulnerable to the penalties of undermining

[61] *See* http://climatechange.vermont.gov/vermonts-goals#emissions

existing statute. Hydropower is the technology we now need to focus on developing in order to meet our energy and economy goals.

It is understandable that the legislature would seek to keep rates low, but it should first and foremost protect the health and welfare of all the citizens. In this case, the legislature has disenfranchised a class who was acting to help the state achieve its goals, and a class that has yet to be informed that many of its Title 1 rights have been stripped. A class that is almost exclusively environmentally responsible Vermonters has lost some of the most basic guarantees in the General Provisions Title of Vermont's legal framework. The effect will be financially ruinous for many and is sure to have a substantially negative effect on future renewable energy development. Addressing climate change and protecting clean water are vital to the health and welfare of the citizens of Vermont.

Even though the state values river cleanup at $0.00,[62] I would encourage the legislature not to make matters worse—even more, not to penalize those who responded to their government's call to action. Until the Vermont legislature elects to promote farming the resources that are abundant in Vermont, all other efforts will fail, and the state will continue to fall into decline, as Vermonters will no longer be able to inhabit Vermont.

I urge Vermont lawmakers to change course and advance the RES program by adding to it the much needed PECT.

[62] *See* this document, page 18