Climate Change Mitigation in New Jersey: Taxation Policy Proposal

Sean M. Harris

Bloustein School of Planning and Public Policy, Rutgers University

34:970:618, Environmental Planning and Management

Andrea Restrepo-Mieth, Ph.D.

December 15, 2023

Executive Summary

Introduction

In 2021, the United States rejoined the U.N Paris Agreement in response to the global warming crises. The United States has set an economy-wide target of reducing its net greenhouse gas emissions by 50-52% below 2005 levels by 2030 (UN, 2023). New Jersey can support this Nationally Determined Contribution (NDC) commitment by diversifying and intensifying its efforts that reduced statewide GHG emissions by 25% (97.0 MMT CO2e, GWP100) between 2006-2020 (Appendix A).[1] In accordance with Governor Murphy's Executive Orders No. 28 and No. 100, New Jersey has set a new target that seeks to double its reduction progress at an increased rate of 25%. This new target is set to achieve 60.6 MMT CO2e by 2030 and 24.1 MMT CO2e by 2050. This 80% emission reduction target below 2006 levels by 2050 is known as the "80x50" goal. Additionally, these initiatives look to convert the state energy infrastructure to 100% clean energy by 2050.

The state's recent action in publishing the New Jersey Energy Master Plan (NJEMP) supported by the Global Warming Response Act (GWRA) Report, Solar Act of 2021, and Clean Energy Act (CEA) of 2023 established a comprehensive platform essential in achieving its 80x50 goal. The NJEMP and GWRA provide a critical review of the State's current energy systems though production, uses, and management in a way that is consistent with future economic, climate, and societal demands. It defines clean energy generation as 100% carbon-neutral by 2050, with maximum electrification of the transportation and building sectors. These two sectors are the largest GHG contributing sectors in the state followed by electricity generation (NJDEP, 2022; State of New Jersey, 2019).

Problem Statement

To achieve 100% clean energy and 80x50 goals there needs to be a broad replacement of fossil fuels in electricity generation, rapid adoption of electric vehicles, and sweeping electrification of commercial and residential heating ventilation and cooling (HVAC) systems. NJEMP indicates

[1] MMT CO2e is termed to describe different GHGs in a common unit. CO2e signifies the global warming effect, relative to carbon dioxide, based on the GHG global warming potential over 100 years or GWP_{100} (Barr, et al., 2020)). Within the scope of New Jersey contributions, measurements are weighed in million metric tons (MMT).

that renewable power supply capacity must increase from 3.3 Gigawatts (GW) to 16 GW by 2030, annual electric vehicle sales must increase from 8,000 to 110,000 by 2035, and 90% of buildings must be converted to 100% clean energy by 2050 (NJ, 2020).

The NJEMP and GWRA report present two common problems within clean energy sourcing, EV adoption, and green building initiatives. They demand timely action to achieve their goals and require robust support in public opinion and end-users. The GWRA 80x50 report states plainly that policies in place provide a significant "first step" for a clean energy infrastructure transition, but at best leave the state missing its 2050 target by a magnitude of 300% (Figure C1, Figure C2, Figure C3). It further states that emission reduction will not substantially decrease unless policies are adopted that promote widespread deployment of alternative technologies, and renewable energy resources (Barr, et al., 2020).

Currently, New Jersey has a policy gap in setting the necessary conditions within end users and public opinion for rapid mitigation investment. Though its intention to alleviate undue burden on the public and private businesses is appropriate, New Jersey policy must take additional steps to ensure the pressure of transition is realized by all members of the political economy. It must then reward actors within the political economy who take valuable political and economic action to advance climate mitigation investment. Broadly, the current energy policy climate provides incentives for PSE&G, Atlantic City Electric, and Jersey Central Power & Light utilities to decarbonize their energy portfolios, while increasing decentralized carbon free sourcing. However, the programs in place struggle to breach marketing, financing, and contracting barriers to meet 80x50 targets.

Existing Policy Review

Current State

New Jersey currently employs instate and regional initiatives to achieve its clean energy goals. The most notable programs are the Regional Greenhouse Gas Initiative (RGGI) and the New Jersey Clean Energy Program (NJCEP). The RGGI cooperative is a market-based effort among states within the region, which caps and reduces CO2 emissions from the power sector.[2] It

[2] The participating states within the regional commitment are: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York

represents the first cap-and-invest regional initiative in the United States (RGGI, Inc , 2023). Administered by the New Jersey Board of Public Utilities (NJBPU), NJCEP, established the Successor Solar Incentive (SuSI) Program in 2021 under the authority of the Clean Energy Act of 2018 and Solar Act of 2021. The SuSI program provides incentives, which enable solar energy development throughout the state (NJBPU, 2022). SuSI is the umbrella program for the Administratively Determined Incentive (ADI) Program and the Competitive Solar Incentive (CSI) program. These programs work alongside NJCEP's SREC Registration Program (SRP).

RGGI

The Regional Greenhouse Gas Initiative is composed of individual CO2 Budget Trading Programs (BTP) within each participating state. Through state independent regulations, each state issues CO2 allowances and establishes regional CO2 allowance auctions. Fossil-fuel electric power generators with 25+ megawatt capacity are required to hold allowances equal to their emissions over a three year period. CO2 allowances represent limited authorization to emit one short ton of CO2 from a regulated source as issued by participating states. Allowances can also be purchased through secondary markets. States can reinvest proceeds from their CO2 allowance auctions in consumer benefit programs that improves renewable energy technology adoption. Programs funded with RGGI proceeds have benefited local businesses, low-income communities, industrial facilities, and households throughout the region (Figure D2).

New Jersey's has fully employed the $187.2 million from RGGI proceeds from 2020 through 2022. These proceeds have been distributed throughout New Jersey's administrative agencies to meet strategic funding initiatives. These funding initiatives include catalyzing clean and equitable transportation ($162.8M); promoting blue carbon in coastal habitats ($16.8M); and enhancing forests and urban forests ($6.7M). This was achieved through the administrative action of NJ Board of Public Utilities, NJ Department of Environmental Protection, and NJ Economic Development Authority (NJ EDA, 2022) (NJ DEP, 2022). This program provides an exemplary political economic model that captures the supply-side GHG emission externality, while generating funding to foster investment through public action. Though a compelling part of the current policy prescription for clean energy investment, it requires high levels of government

administration. It also does not address the demand-side GHG emission externality from consumers.[3]

Administratively Determined Incentive (ADI)

The ADI Program provides administratively set incentive values for net-metered residential projects, non-residential projects, and community solar projects under 5 Megawatt Hours (MWh) or 5,000 kilowatt hours (kWh). It uses the Solar Renewable Energy Credit- II (SREC-II) incentive instrument (NJBPU, 2023). This is a clean energy credit in the form of a tradable certificate used for demonstrating compliance with the NJ Utility Renewable Portfolio Standard (RPS).[4] Producers of 1000 kWh receive one SREC, which is sold separately from any net-metering benefit customers may receive.[5] This is a great program for engaging in strategic source diversification and clean energy generation. However, the economics that support this program require a capacity block, which limits solar energy investment to maintain the SREC market. Though this provides adequate opportunity for early adopters, it restricts the rapid adoption strategy required in the 80x50 report.

Community Solar Energy Program (CSEP)

The CSEP program operates within ADI and follows similar principles of the program. The variation between programs is the focus of community solar investment strategies on site types such as: rooftops; carports and canopies; floating solar; contaminated sites and landfills. Additionally, its cap restrictions are managed directly from electric distribution companies. Once the company achieves its MWh capacity it closes its registration for program participants (NJBPU, 2023). This program serves to increase the development of community solar projects, but runs the down-side risk associated with capping investment opportunity found ADI.

Competitive Solar Incentive (CSI)

---

[3] Supply-side GHG emission externality is created from carbon inefficient energy production from producers. Demand-side GHG emission externality is created from carbon inefficient sourcing demand and overuse consumer behavior. Addressing the externality from both ends streamlines decarbonization within energy supply chains.

[4] Renewable Portfolio Standard requires 35% of the energy sold in the state comes from qualifying energy sources by 2025 and 50% by 2030.

[5] In New Jersey, Electric Distribution Companies and third-party electric suppliers are required to engage in net-metering practices. Net-metering credits customers with solar systems or other renewable energy generators that reduce demand during the monthly billing cycle with any excess generation being credited at retail rates on the following month's bill.

The CSI program follows similar principles of the ADI program. The variation between programs is a focus of larger solar facilities within the SuSI program. The CSI program is open to qualifying grid supply solar facilities, non-residential net-metered solar installations with a capacity greater than five megawatts, and can provide energy supply/ storage. It is open to 5 tranches, which address a range of clean energy capacity solutions. The tranches are broken into: basic grid supply (140MWh), grid supply on built environment (80MWh), supply on contaminated sites (40MWh), net metered non-residential (40MWh), and storage (160MWh) (NJBPU, 2023). This program has benefits of improving specific grid capacities and targeting otherwise underrepresented areas of investment in the clean energy transition. Additionally, it also runs the downside risk of capped investment opportunities that may exist within more privatized markets.

Green Fund (Green Bank)

The NJEDA has been planning to develop the establishment of a Green Fund. As outlined in the 2019 NJEMP, it will look to mobilize strategic funding initiatives under the RGGI Funding Plan. The fund will reduce greenhouse gas emissions and promote a clean energy economy through providing necessary capital to proven clean energy technologies. Similar to green banks across the country, the Green Fund will specifically work on projects that are cost effective, and use private/ public funding. This approach fosters fully private financing for similar projects in the future as markets mature over time. It has been discussed that this fund will activate in 2024 after the requirements inquiry by the NJEDA is complete.

The Green Fund will help leverage loan programs for small contractors to access the resources they need to compete for projects in New Jersey's clean energy space, and allow contractors to undertake retrofit work without waiting for "performance periods" under pay for performance programs. This greater access to capital will assist in rapid energy efficient building construction (NJEDA, 2023). This program offers the necessary economic principles that fully supports more competitive marketplaces, while developing investment expertise within the 21st century clean energy economy. As the Green Fund is still in its conception stages, this fund can be used to employ strategic capital across transportation, infrastructure, and energy production. The Green Fund policy is in line with the expansion requirements of capital markets to meet the investment goals outlined in the 80x50 report.

Policy Proposal

Strategic Aim

This policy proposal looks to supplement existing state ran initiatives while opening competitive market forces to develop expeditious economic solutions, while commanding responsive political action. Its aim is to overcome the *Business-as-Usual* scenario projection outlined in the GWRA 80x50 report (Figure C3). This policy expands upon the political economic principles found in RGGI, while developing NJEDA's Green Fund into the NJ Green Bank. It will galvanize public opinion to hold policy makers accountable for local and state regulatory frameworks, while improving end-user consumption behaviors. Lastly, this policy will mobilize the necessary forces consistent with the projected transition path outlined in NJEMP least cost scenario (Figure C4, Figure C5, Figure C6, Figure C7, Figure C8, Figure C9).

This proposal uses a utility tax combined with a non-zero-sum reinvestment strategy. This utility tax will be imposed on end users who receive their electricity from carbon-based sources. Utility tax imposed on end users will drive a bottom-up strategy that improves consumption behavior, incentivizes energy efficient product purchasing, and demands clean energy sourcing. Additionally, utility tax imposed on citizens and business owners will develop urgency within public opinion to hold policy makers accountable to prioritize green infrastructure accommodations within capital improvements plan, strategic plans, and comprehensive plans.

Addressing Current Policy Weakness

This utility tax would improve shortfalls of the current policy's administrative reach in awareness building, funding shortages, restrictive investment incentives, lethargic political action, and end-user consumption behavior. The utility tax observed on end-users' bills will bring direct attention to the externality costs of their energy consumption, and spur economic and political action across all actors within the state. This directly addresses the absence of policies to address demand-side GHG emissions from consumer behavior. Depending on the individual capitalization of end-users they will: modify consumption behavior, purchase energy efficient products, or engage in clean energy investments to reduce their utility tax exposure.

Tax Mechanics

The amount of utility tax imposed on end-users will be directly correlated to the CO2e, GWP_{100} of their electricity sourcing. The funds derived from the utility tax will go to the New Jersey Economic Development Authority's (NJEDA) Green Fund until a state green bank is established. These funds will be used to subsidize investment in clean energy sources, grid modernization, and energy storage systems. The subsidy from this tax will pay its highest rates for early actors and decline in tandem with the clean energy infrastructure adoption rate. At the end of the clean infrastructure transition the utility tax will self-conclude (Figure E1).

Non-Zero-Sum Mitigation Strategy

The success of this utility tax will be the application of a non-zero-sum reinvestment strategy. To alleviate the burden of the utility tax, cooperative investment contracts will be permitted between businesses, investment institutions, municipalities, and induvial property owners. Cross-agency oversight of the NJEDA and NJBPU will permit net-zero parties to reinvest in other tax paying entities to decarbonize their energy portfolio. This policy gives net-metering benefits to investors while relieving the tax burden of those invested (Figure E2). In addition, investing entities will be eligible to participate in New Jersey Board of Public Utilities' (NJBPU) clean energy programs: ADI, CSEP, CSI, on behalf of the invested entity. This model expands upon the principles within RGGI framework and adopts a methodology that enables fit for purpose market forces to utilize competitive technologies broadly across the state. This utility tax, combined with cooperative investment contracts, creates broad political and economic demands to develop solutions that addresses the 7 strategies of the NJEMP (see appendix B).

Conclusion of Evaluation Criteria

Evaluation criteria used within this policy proposal looks to address the urgency required within public opinion and private investment as per the 80x50 GWRA report. It evaluates policy efficacy to reduce electricity demand while maximizing energy efficiency in the energy supply chain. It assesses the ability of policy to deleverage administrative effort where private competitive markets can be established. It reviews the ability of policies to ensure the greatest flow of capital moves unrestricted to desired investment locations with minimum government intervention. It looks for policy to establish investment channels with expediency, and rapidly create domestic supply chains. Most importantly, this evaluation looks for policy mechanisms that can deliver

commanding action to meet capacity requirements within this century, and will inherently decomission upon success.

Appendix A

Climate Change in the Global Context

Environmental Issue

Human activities have primarily contributed to global temperature rise above 1850-1900 levels by 1.1°C between 2011-2020. This increase is attributed to unsustainable greenhouse gas (GHG) emissions from: consumption patterns, production processes, energy use, land use, and development planning.[6] Rising global temperature produces regional climate change, which results in significant damage or irreversible loss within: terrestrial, coastal, open ocean, freshwater, and cryospheric ecosystems. Environmental damage distributes its cost through climate-exposed economic affairs such as: agriculture, forestry, fishery, energy, and tourism. Furthermore, climate change, weather extremes, and pollution magnification from GHG emissions are driving population displacement in Africa, Asia, and North America. Individual livelihoods have been affected by: health complications, food insecurity, destruction of infrastructure, loss of property and income, and magnification of social inequity. All aforementioned destabilizing influences share a positive relationship with global temperature increases (IPCC, 2023). Moreover, this is a systematically progressive issue. Burdens of cost are firstly observed in capital deficient regions locally and globally, however, burdens of costs will dramatically spread to all members of society if left unresolved.

GHG/ GDP Relationship

It is important to understand the concentration dynamics of GHGs through emission sources and collection sinks (EPA, 2023). Understanding emission sources (industry, energy supply, transportation, agriculture, waste management, etc.) and sinks (ocean, soil, forests, etc.) give insight to the accounting balance required to maintain regional and global sustainability. For example, if the carbon intensity within the energy requirement of Gross Domestic Product (GDP) is greater than the net collection capacity of sinks, the GDP production is generating a destabilizing excess of CO2. The cumulative net CO2 emissions recorded from 1850 to 2019 is 2400 ± 240

[6] GHG absorb infrared radiation, and are the primary influence on global temperature rise. The greenhouse gases that have increased atmospheric concentration from anthropogenic emission include: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and several fluorine-containing halogenated substances (HFCs, PFCs, SF6 and NF3).

Gigaton of Carbon Dioxide (GtCO2). More than half of these emissions occurred between 1850-1989, and about 42% occurred between 1990- 2019. This amassment and intensification is due to the increase of GDP outpacing the increase of carbon efficiency in the energy production for GDP (IPCC, 2023). It is imperative that all anthropogenic GHG emission dynamics within global GDP improve to net zero by 2050 and remain net negative thereafter to halt and reverse the effects of climate change within the 21st century.

Barriers to Balancing GHG/ GDP

Key barriers for the United States to achieve balanced GHG emission within GDP are: partisan politicization, insufficient financial mobilization, private sector inaction, low climate literacy, and underwhelming public urgency (Pew Research Center, 2022; MacInnis & Krosnick, 2020; IPCC, 2023; Net Zero Tracker, 2023). Regardless of barrier entrenchement and complexity, deep, rapid, sustained climate change mitigation is essential for global temperature to stay below the International Panel on Climate Change's (IPCC) 1.5°C threshold guidance. Projected adverse impacts, related losses, damages, and risks from climate change escalate with every increment of global warming beyond the 1.5°C threshold (Figure A1). Non-climatic and climatic risks previously addressed will increasingly interact, creating compound and cascading risks that are more complex and fiscally impractical to manage. Taking immediate quantifable action reduces feasibility risks in solution spheres: employment of efficient GHG infrastructure designs, increased ecosystem protection/ restoration, deployment of low-to zero-emission technlogy, implemention of behavioral changes, and increased technological efficiency and adoption (IMF, 2023; Peter G. Peterson Foundation, 2023; IPCC, 2023).

The Paris Climate Agreement

The United Nations (UN) adopted The Paris Agreement in Paris, France, on December 12, 2015 to meet political and economic demands required of the science put forth from the IPCC. 196 sovereign states at the UN Climate Change Conference (COP21) agreed to the overarching goal in holding global temperature below 2°C pre-industrial levels, and limit temperature increases above 1.5°C pre-industrial levels. This is done through best available science that works on a five-year cycle that establishes a basis for increasingly ambitious climate mitigation action. The action plans set forth to address climate change within each soverign state is known as the nationally

determined contribution (NDC). Each successive NDC is meant to reflect an increasingly higher impact in reducing GHG effect on the planet. (United Nations, 2023)

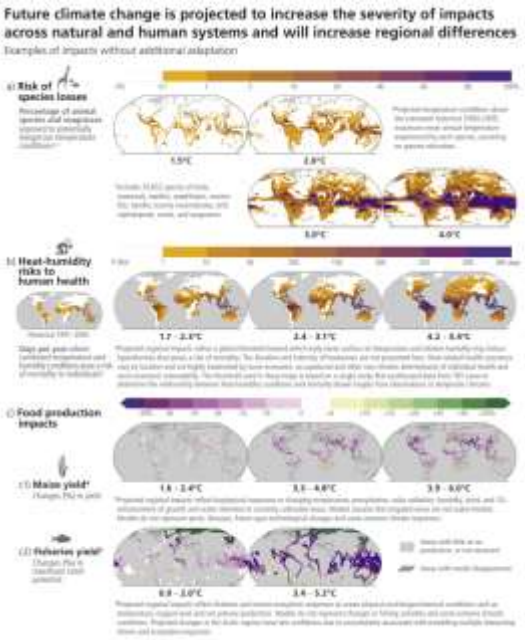

Figure A1. The Projected Impacts of Temperature Increase by Centigrade (IPCC, 2023)

Appendix B

Energy Master Plan: Significant Facts & Figures

Supported Energy Master Plan Strategies of Policy Proposal

Strategy 1: Reduce Energy Consumption and Emissions from the Transportation Sector

1.1.2 Deploy electric vehicle charging infrastructure throughout the state

1.1.3 Encourage electric vehicle adoption through the purchase of electric vehicles and incentives for charging station installation in certain locations

1.3.3 Support community solar developments on port property

Strategy 2: Accelerate Deployment of Renewable Energy and Distributed Energy Resources

2.1.1 Meet the 50% Renewable Portfolio Standard by 2030 and explore possible regulatory structures to enable New Jersey to transition to 100% clean energy by 2050

2.1.2 Ensure at least 75% of electricity demand is met by carbon-free renewable generation by 2050 and set interim targets

2.1.4 Explore regulatory authority to achieve 100% clean energy by 2050

2.1.5 Update interconnection processes to address increasing distributed energy resources and electric vehicle charging

2.1.6 Develop mechanisms to compensate distributed energy resources for their full value stack at the regional and federal level

2.1.7 Develop low-cost loans or financing for distributed energy resources

2.1.8 Coordinate permitting and siting processes for renewable energy development

2.1.9 Begin stakeholder engagement to explore rules to limit carbon dioxide emissions from electric generating units

2.2.1 Develop offshore wind energy generation

2.2.2 Develop the offshore wind supply chain

2.3.1 Continue to grow New Jersey's community solar program

2.3.2 Transition to a successor solar incentive program

2.3.3 Maximize solar rooftop and community solar development in urban and low- and moderate-income communities using the local workforce

2.3.6 Develop mechanisms for achieving 600 MW of energy storage by 2021 and 2,000 MW of energy storage by 2030

Strategy 3: Maximize Energy Efficiency and Conservation and Reduce Peak Demand

3.1.2 Increase awareness of and access to New Jersey's Clean Energy Program and its suite of statewide programs

3.1.3 Establish strategic and targeted energy efficiency programs to increase energy reductions and customer engagement

3.1.5 Adopt equitable clean energy financing mechanisms that enable greater penetration of energy efficiency opportunities for all customers

3.1.6 Streamline and increase marketing, education, awareness, and program administration

3.2.1 Support and incentivize new pilots and programs to manage and reduce peak demand

Strategy 4: Reduce Energy Consumption and Emissions from the Building Sector

4.1.3 Expand and accelerate the current statewide net zero carbon homes incentive programs for both new construction and existing homes

4.1.4 Study and develop mechanisms and regulations to support net zero carbon new construction

4.1.5 Develop electric vehicle-ready and demand response-ready building codes for new multi-unit dwellings and commercial construction

Strategy 5: Decarbonize and Modernize New Jersey's Energy System

5.1.1 Require utilities to establish Integrated Distribution Plans to expand and enhance the location and amount of distributed energy resources and electric vehicle charging on the electric distribution system

5.1.2 Support bi-directional grid power flow and modernize interconnection standards

5.2.1 Exercise regulatory jurisdiction to review and approve the need for transmission projects

5.2.2 Advocate for Return on Equity reform

5.3.1 Evaluate a strategic and coordinated rollout of Advanced Metering Infrastructure

5.3.2 Develop standards to ensure customers have control of and accessibility to free and standardized energy management data

5.3.3 Pilot and implement modified rate design to encourage customer-controlled demand flexibility, manage electric vehicle charging, and support demand response programs

5.3.4 Assess existing and modified utility rate structures and consider how to ensure rate structures are aligned with implementation of state energy goals

5.4.3 Evaluate and support innovative efforts to decarbonize the state's energy system, and perform a study of regulatory and programmatic mechanisms that support, incentivize, or otherwise bolster the natural gas industry to determine if continued support aligns with state goals

Strategy 6: Support Community Energy Planning and Action with an Emphasis on Encouraging and Supporting Participation by Low- and Moderate-Income and Environmental Justice Communities

6.1.1 Develop a comprehensive Community Energy Plan program in concert with local community groups to identify energy needs and establish ways to participate in and benefit from the clean energy transition at the local level, prioritizing education and incentives in low-income and environmental justice communities

6.1.2 Encourage communities to incorporate land use, zoning, and multimodal transportation plans into their Community Energy Plans

6.1.3 Prioritize energy efficiency programs in low- and moderate-income and environmental justice communities

6.2.1 Support community-led development of community solar projects

6.2.2 Incentivize maximum installation of rooftop and community solar by the local workforce

6.2.4 Target distributed energy resource incentives to support local clean power generation in low- and moderate-income and environmental justice communities

6.3.3 Build or incentivize electric vehicle charging infrastructure and incentivize the adoption of electric vehicles in low-income communities

Strategy 7: Expand the Clean Energy Innovation Economy

7.3.1 Establish a New Jersey Green Bank

Appendix C

New Jersey's Global Warming Response Act 80x50 Report: Significant Facts & Figures

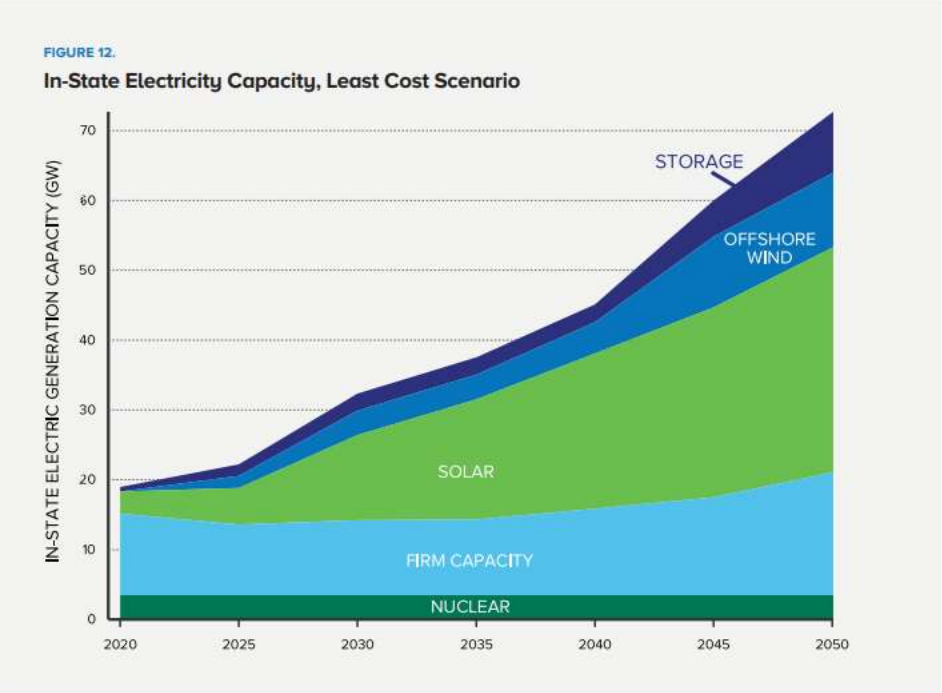

Figure C1. Instate Electricity Capacity, Least Cost Scenario

As solar and wind capacities expand, firm and dispatchable capacity is available to fill in supply gaps when needed. However, this dispatchable capacity is only used infrequently in later years due to effective storage and load management, and transitions to biogass after 2045.

Resource Type	2020	2025	2030	2035	2040	2045	2050
NJ Solar	3.5	5.2	12.2	17.2	22.2	27.2	32.2
Offshore Wind	0	1.1	3.5	7.5	8.8	10.1	10.7
Nuclear	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Fossil Gas	11.7	10.1	10.7	10.8	12.4	13.7	0
Biogas, Biofuels and Hydrogen	0	0	0	0	0	0.3	17.6
Storage	0.6	1.6	2.5	2.5	2.5	5.2	8.7
Other[A]	0.97	0.25	0.26	0.22	0.19	0.16	0.15
Total	**20.3**	**21.8**	**32.7**	**41.7**	**49.6**	**60.2**	**72.9**

Figure C2. In-State Installed Capacity Goals by Year in GW

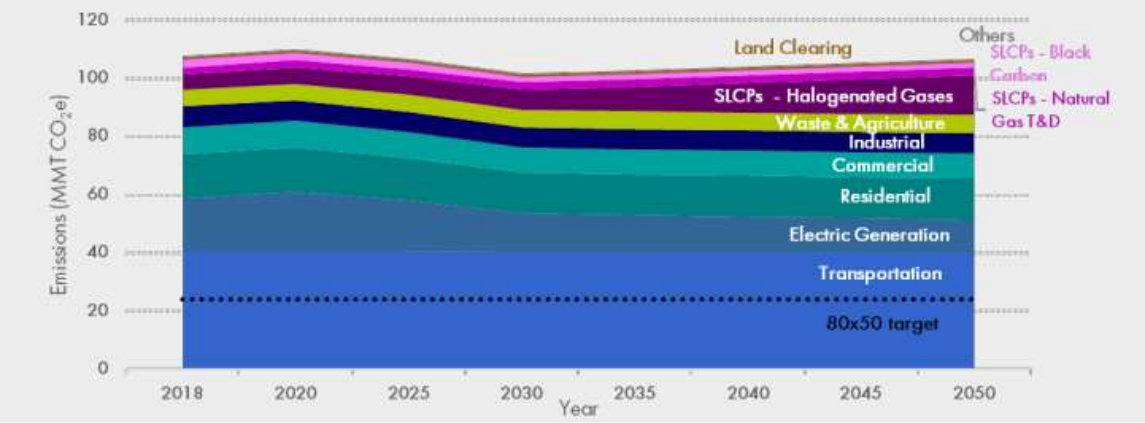

Figure C3. Business-as-Usual

The state has deployed policies and programs aimed at facilitating a transition to a clean energy economy, which are still in their early stages but will promote substantial emissions reductions. These efforts, however, cannot on their own achieve the 80x50 goal. On a "Business-as-Usual" course, which includes implementation of Murphy Administration initiatives as of 2019, our 2050 GHG emissions would be at best 12% below 2006 levels. Emissions will not decrease substantially unless alternative technologies are widely deployed, and renewable energy resources are greatly expanded.

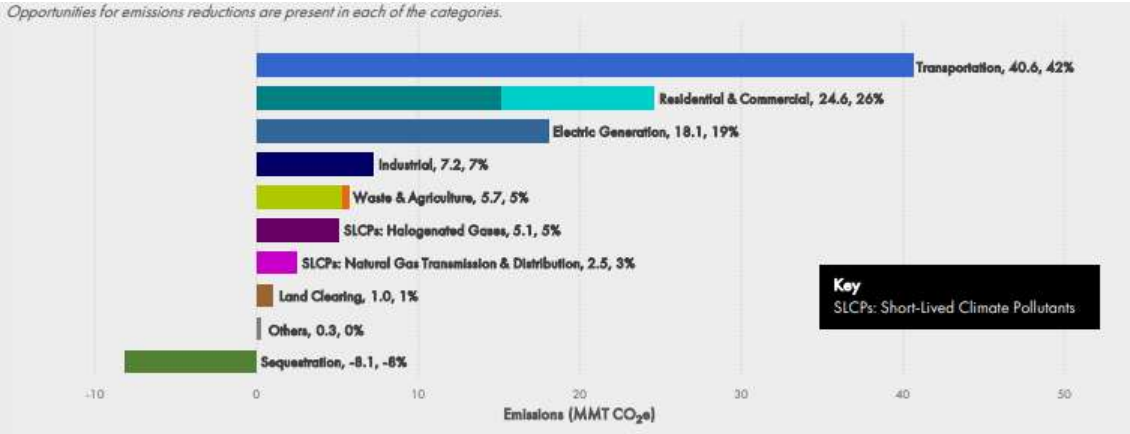

Figure C4. New Jersey's Current GHG Emissions

The transportation sector represents the largest source of GHG emissions in New Jersey (42%), followed by the combined residential and commercial sectors (26%), and electric generation (19%) (NJ, 2020).

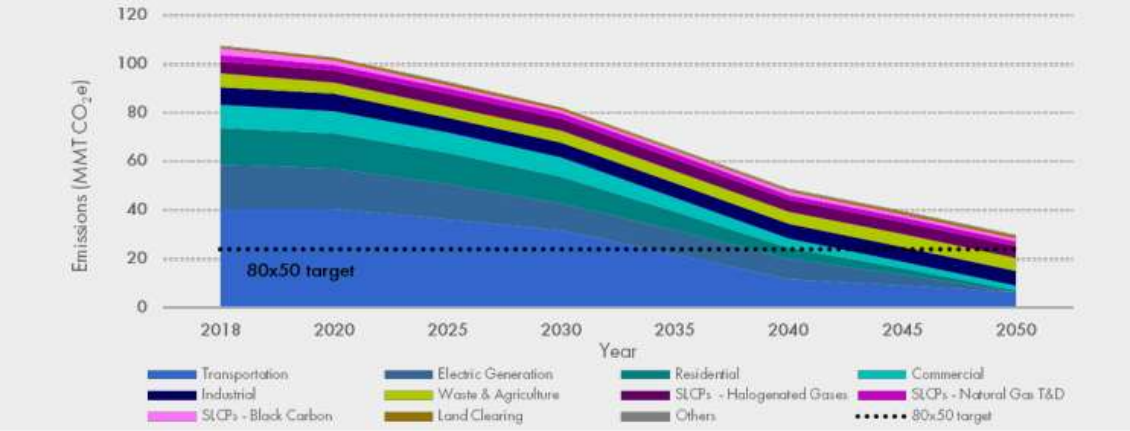

Figure C5. New Jersey's GHG Emissions Pathway to 2050 (MMT CO2e)

The 2019 EMP least cost pathway combined with non-energy sector strategies, and carbon sequestration (not shown) have the potential to reduce net emissions below the 80x50 target prior to 2050.

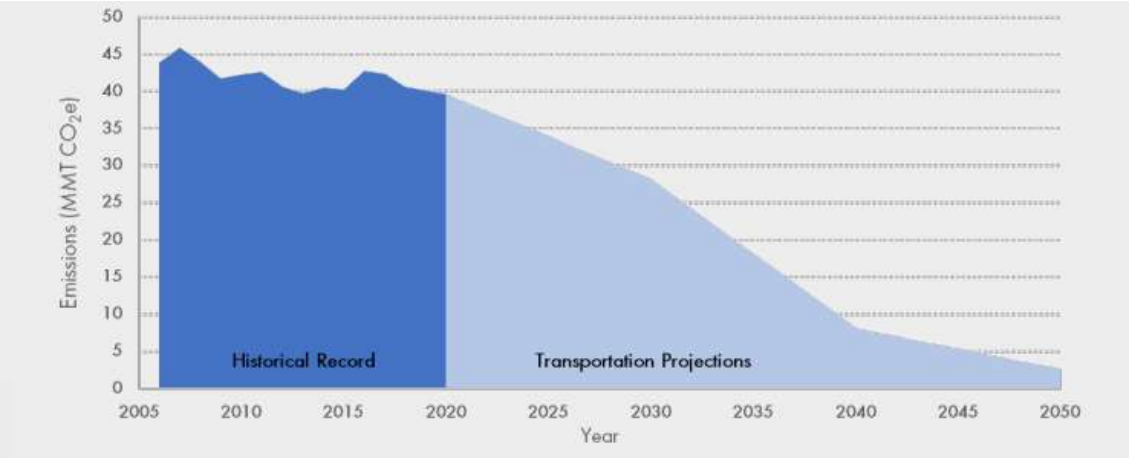

Figure C6. Transportation Sector Historical GHG Emissions & Projected Pathway to 2050 (MMT CO2e)

Currently, gasoline-fueled vehicles account for over 70% of the transportation sector's emissions. The 2019 EMP's least cost scenario modeling calculated that 88% of new light-duty vehicle sales (passenger cars, SUVs and light-duty trucks) will need to be electric or hydrogen-powered by 2030, rising to 100% by 2035, to achieve the 80x50 goal.

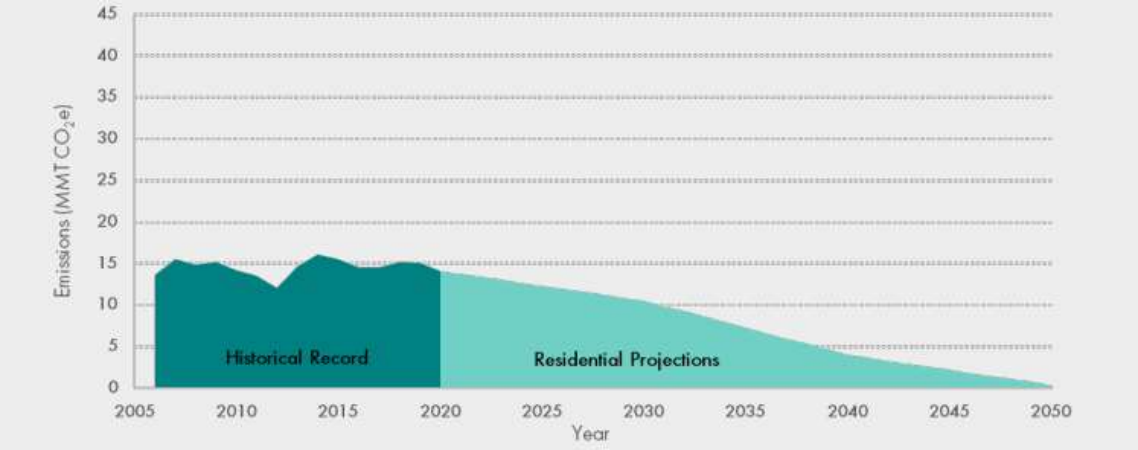

Figure C7. Residential Sector Historical GHG Emissions & Projected Pathway to 2050 (MMT CO2e)

Residential and commercial buildings account for the second largest share (26%) of the state's GHG emissions, accounting for 24.6 MMT CO2e in 2018. In order to achieve the 80x50 goal, emissions from the residential and commercial building sectors must be reduced by 89% to 2.7 MMT CO2e by 2050.

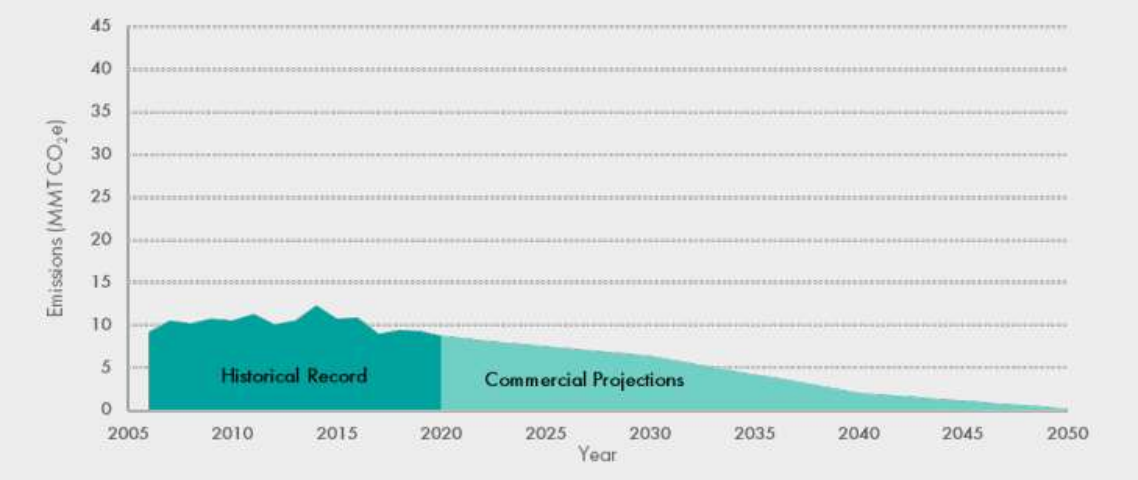

Figure C8. Commercial Sector Historical GHG Emissions & Projected Pathway to 2050 (MMT CO2e)

Space and water heating account for the majority of emissions from these sectors, with 87% of residential buildings and 82% of commercial buildings relying predominantly on natural gas. The least cost scenario modeling performed for the 2019 EMP calculated that 90% of buildings must be converted to 100% clean energy systems to meet the 2050 emission goals.

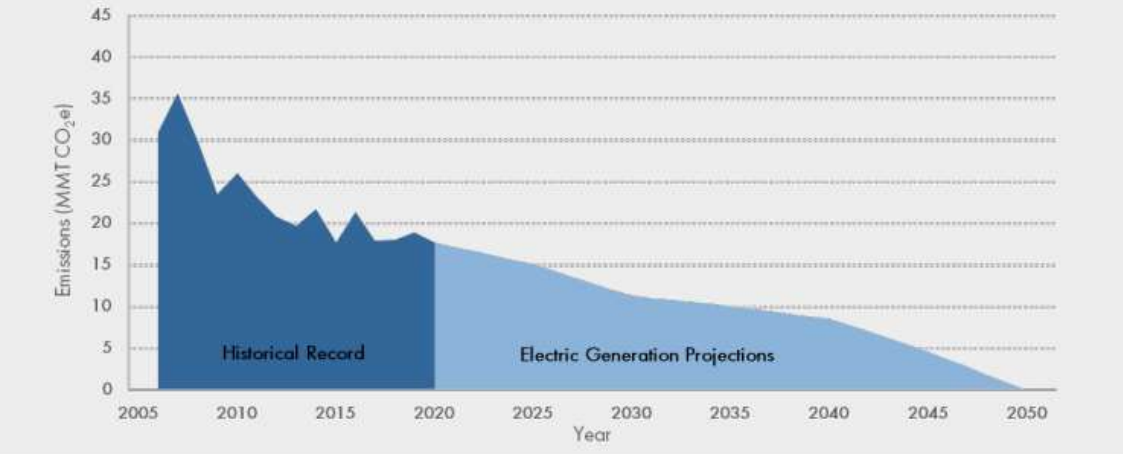

Figure C9. Electric Generation Sector Historical GHG Emissions & Pathway to 2050 (MMT CO2e)

This sector remains the third largest contributor to the state's total CO2e emissions (19%), accounting for 18.1 MMT CO2e in 2018. The majority of these emissions are from natural gas fired electric generating units (83%), with coal fired units contributing 11%, and waste-to-energy facilities contributing 6% of the total emissions from this sector. Deployment of renewable electric generation in tandem with electrification of other sectors will ensure emission reductions are realized against the backdrop of increased electric demand.

Appendix D

The Regional Greenhouse Gas Initiative Investment Proceeds 2020 Report & NJ RGGI Strategic Funding Plan: Figures

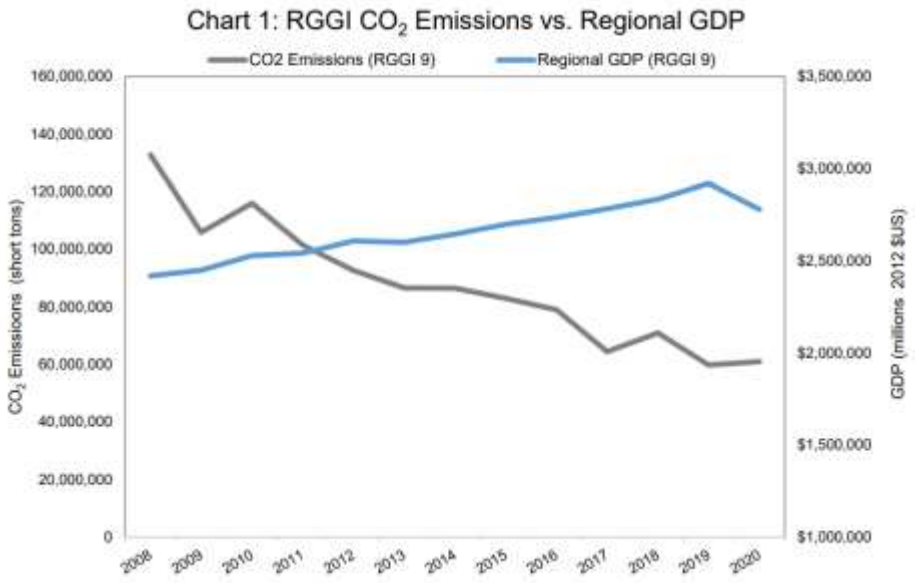

Figure D1. RGGI CO2 Emissions vs Regional GDP

The nine RGGI states that participated from 2009-2020 experienced a reduction of over 90 million short tons of annual power sector carbon emissions, even as the regional economy grew. This represents a reduction in power sector carbon emissions of over 50% (RGGI, 2022)

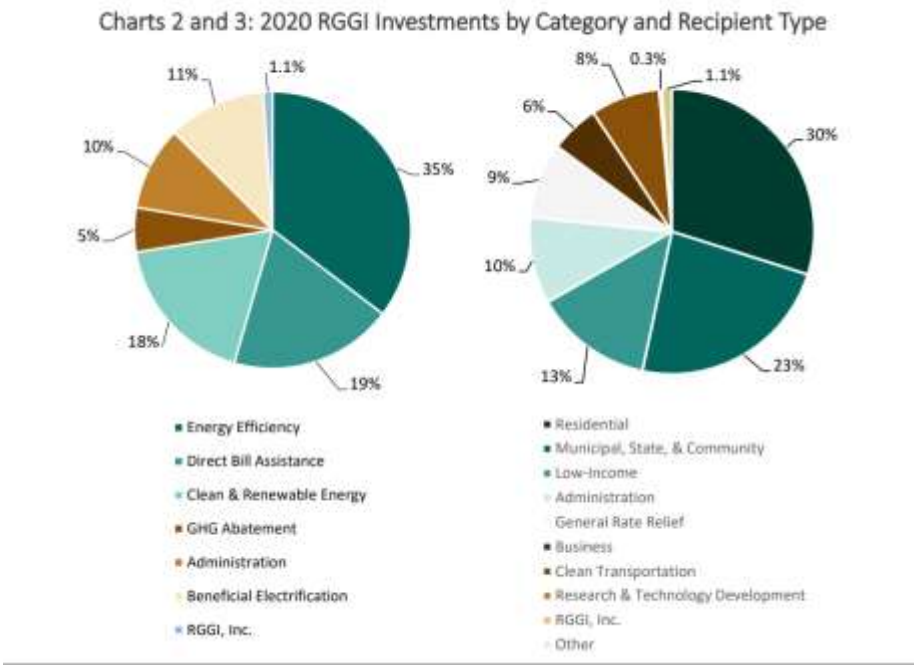

Figure 2D. RGGI Investments by Categories and Recipient Type

The report estimates that $196 million of benefits arise from RGGI investments. RGGI investments as defined within this report include investments in energy efficiency, clean and renewable energy, beneficial electrification, greenhouse gas abatement, and direct bill assistance, as well as administrative costs associated with these programs (RGGI, 2022).

Figure 3D. NJ RGGI Funding Allocation

Percentage of expenditures within NJ's RGGI fund allocated $162,860,838 to Transportation, $17,608,091 to Blue Carbon in Coastal Habitats, and $6,741,460 to Enhance Forests and Urban Forests. Though 15% was determined to be allocated to NJ Green Fund, according to RGGI Strategic Funding Initiative Plan, it has yet to be established due to NJEDA Green Fund requirements inquiry.

Appendix E

Utility Tax Policy Graphs

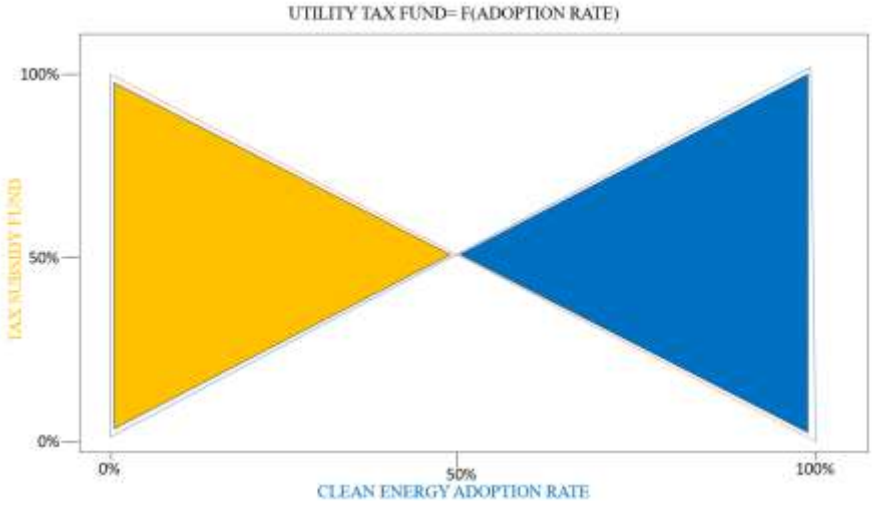

Figure E1. Funds from the utility tax will be at its highest when adoption rates are at their lowest. This will allow for a greater sized subsidy issuance to reward early actors. In later adoption stages, matured markets will provide lower costs for final adopters.

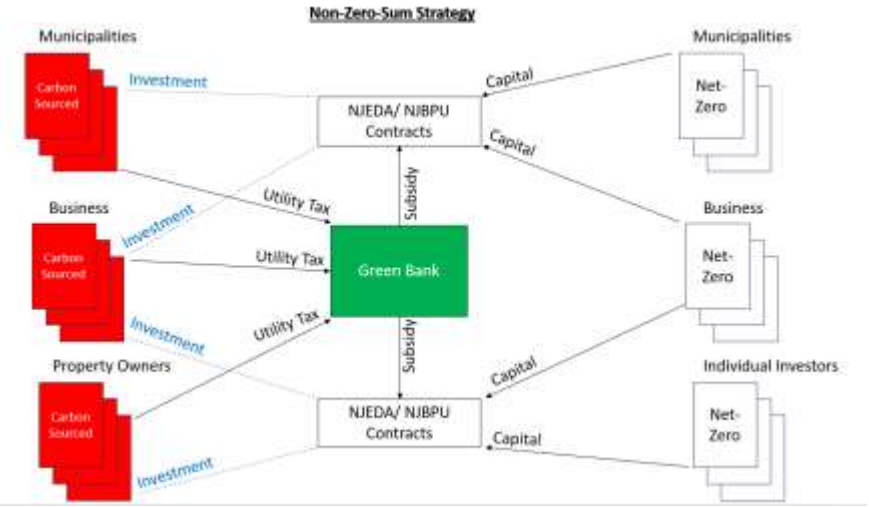

Figure E2. The Non-Zero-Sum Strategy allows for capital to flow freely from any willing market participant to fulfill outstanding contracts within the state economy looking to be relieved of the utility tax.

Works Cited

Barr, H., Orlando, P., Kettig, R., Barry, C., Karmarkar-Deshmukh, R., & Kamel, M. (2020). *New Jersey's Global Warming Response Act 80x50 Report.* Trenton, NJ: Department of Environmental Protection .

EPA. (2023). *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2021.* Washington D.C: Environmental Protection Agency.

IMF. (2023). *Fiscal Monitor: Climate Crossroads: Fiscal Policies in a Warming World.* Washington D.C : International Monetary Fund.

IPCC. (2023). *Climate Change 2023 Synthesis Report Summary for Policymakers.* Geneva, Switzerland : Intergovernmental Panel on Climate Change.

MacInnis, B., & Krosnick, J. (2020). *Surveying American Public Opinion on Climate Change and the Environment.* Washington D.C: Resources for the Future.

Murphy, P. (2020, January 27). Executive Order No. 100 . Trenton, New Jersey.

Net Zero Tracker. (2023, October 19). *Net Zero Tracker.* Retrieved from Net Zero Stocktake : www.zerotracker.net/analysis/net-zero-stocktake-2023

NJ. (2020). *New Jersey's Global Warming Response Act 80x50 Report.* Trenton: The State of New Jersey .

NJ DEP. (2022, December 1). *NJ DEP Maps.* Retrieved from New Jersey RGGI Climate Investments: https://njdep.maps.arcgis.com/apps/dashboards/71e62ee3de2d4a6585bf4766881406c6

NJ EDA. (2022). *RGGI Strategic Funding Plan.* Trenton: New Jersey Economic Development Authority.

NJBPU. (2022, December 1). *Successor Solar Incentive (SUSI) Program*. Retrieved from New Jersey's Clean Energy Program: https://njcleanenergy.com/renewable-energy/programs/susi-program

NJBPU. (2023, Decemeber 1). *Administratively Determined Incentive Program*. Retrieved from New Jersey's Clean Energy Program: https://njcleanenergy.com/renewable-energy/programs/susi-program/adi-program

NJBPU. (2023, December 1). *Community Solar Energy Program*. Retrieved from New Jerseys Clean Energy Program: https://njcleanenergy.com/renewable-energy/programs/susi-program/csep

NJBPU. (2023, December 1). *Competitive Solar Incentive Program*. Retrieved from New Jersey's Clean Energy Program: https://njcleanenergy.com/renewable-energy/programs/susi-program/csi-program

NJDEP. (2022). *New Jersey Greenhouse Gas Inventory Mid-Cyle Update Report.* Trenton, NJ: New Jersey Department of Environmental Protection.

NJEDA. (2023, December 1). *Press Release*. Retrieved from NJEDA: https://www.njeda.gov/njeda-issues-rfi-seeking-input-on-green-fund-program-to-help-energy-efficiency-contractors-bridge-financing-gaps/

Peter G. Peterson Foundation. (2023, July 26). *Higher Interest Rates Will Raise Interest Costs On The National Debt*. Retrieved from Peter G. Peterson Foundation: https://www.pgpf.org/analysis/2023/07/higher-interest-rates-will-raise-interest-costs-on-the-national-debt

Pew Research Center . (2022). *Climate Change Remains Top Global Threat Across 19- Country Survey.*

RGGI. (2022, May). *The Investment of RGGI Proceeds in 2020.* Retrieved from RGGI, Inc: https://www.rggi.org/sites/default/files/Uploads/Proceeds/RGGI_Proceeds_Report_2020.pdf

RGGI, Inc . (2023, December 1). *Welcome*. Retrieved from The Regional Greenhouse Gas Initiative : https://www.rggi.org/

State of New Jersey. (2019). *2019 Energy Master Plan.* Trenton: New Jersey.

UN. (2023, October 20). *United Nations Climate Change.* Retrieved from Nationally Determined Contributions Registry: https://unfccc.int/sites/default/files/NDC/2022-06/United%20States%20NDC%20April%2021%202021%20Final.pdf

United Nations. (2023, November 24). *The Paris Agreement*. Retrieved from United Nations on Climate Change: https://unfccc.int/process-and-meetings/the-paris-agreement

US Department of Energy. (2023, November 15). *Electricity Laws and Incentives in New Jersey*. Retrieved from US Department of Energy Energy Efficiency & Renewable Energy : https://afdc.energy.gov/fuels/laws/ELEC?state=NJ#:~:text=By%20December%2031%2C%202025%2C%20there,use%20at%20minimally%20200%20locations.