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CLEAN ENERGY AND EDF+BUSINESS

Financing New Jersey's Clean Energy Economy

PATHWAYS FOR LEADERSHIP

About this report

This report provides an analysis of clean energy finance options that will accelerate the deployment of clean energy and energy efficiency in the state of New Jersey. In an environment of limited public sources of taxpayer and ratepayer funds, dedicated clean energy finance institutions and innovative finance approaches that leverage public resources to catalyze private investment have served as effective engines for innovation and job creation. They have also helped states make progress against their renewable portfolio standards (RPS). This report evaluates the feasibility and attractiveness of three institutional clean energy finance solutions based on their (1) ease of creation, (2) fit for purpose, and (3) operational abilities. It also explores innovative financial structures and mechanisms that the State of New Jersey could employ to accelerate the deployment of clean energy and energy efficiency.

The primary purpose of this report is to provide public sector decision-makers who are leading New Jersey's efforts to establish a clean energy economy with guidance to meet the state's RPS, and reduce greenhouse gas emissions in support of compliance with New Jersey's Global Warming Response Act. Additionally, the report is intended to inform other mainstream, impact and philanthropic investors interested in scaling up clean energy and energy efficiency investment in New Jersey. Clean energy finance institutions are one of the most cost-effective solutions for deploying clean energy and energy efficiency because they mobilize large-scale private investment, can be self-sustaining and eliminate concerns that other state institutions and agencies will suffer as a result of pressure on limited public capital.

The report's findings draw from a review of best practices and in-depth interviews with leading experts in the field of clean energy, energy efficiency, and clean energy finance. Interview participants included representatives from the public, private and nonprofit sectors with deep expertise in energy finance, technologies, services and programs.

The structure of the report begins with an executive summary of the report's approach, research and conclusions. This summary is followed by an overview of NJ's current energy market, policy conditions and investment need, analysis of institutional clean energy finance solutions to catalyze private investment, and additional financial structures and mechanisms for supporting investment in clean energy and energy efficiency. The report concludes that there is ample need and potential for clean energy finance solutions that would catalyze private investment in clean energy and energy efficiency in NJ, and that there are existing structures and mechanisms in other states that NJ can learn from to determine the best path forward.

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Executive summary

New Jersey (NJ) has made significant progress to date on renewable energy and energy efficiency deployment, but current programs and funding—primarily driven by mandates and rebates—are insufficient to help the state spark large-scale deployment and achieve its goals of a clean, resilient and low-cost energy system. Based on NJ's current energy mix, clean energy market potential, policies, and programs, this analysis finds there is a significant opportunity to increase clean energy uptake in NJ by driving much greater private investment to these projects. The state can play a catalytic role in mobilizing this investment, using public funds to finance clean energy through dedicated institutions and mechanisms that leverage private capital from a range of sources into renewable energy, energy efficiency, and clean transportation. NJ could establish this focused financing operation within a new public State Bank, by expanding the NJ Environmental Infrastructure Trust (EIT), or by creating a new stand-alone Green Bank. This paper analyzes these institutional options, as well as additional financial mechanisms that can help the state leverage private investment to achieve its clean energy goals.

NJ clean energy market potential

NJ has a multibillion dollar clean energy investment opportunity that could power the entire state, yet today only 5% of power comes from renewable sources.[1] NJ primarily relies on three fuel sources for its energy: petroleum for transportation; natural gas for electricity generation and building heating; and nuclear fuel for electricity generation. Nearly half of the power produced in the state is from natural gas, and the remaining is almost entirely from nuclear. The share of power in NJ from renewables is far below the national average.

Further, the need and opportunity for clean technology deployment will grow as the existing energy mix in NJ changes. Nuclear power plants in the state are aging and retiring, as evidenced by the pending retirement of the Oyster Creek plant in 2019. In the absence of stronger support for renewables, much of the generation to replace these plants is likely to come from natural gas, which together with continued reliance on petroleum products for transportation would reverse progress toward a clean and domestically-sourced energy economy in the state. A focused, robust policy and finance approach to support not only renewables, but also energy efficiency beyond existing rebate programs, as well as clean transportation technologies, would help abate this trend. Such an approach could be designed to draw in private investment to make scarce public dollars go further and access greater sources of capital. It could also drive economic development and job creation, supporting the growth of 21st century industries and a new, clean energy economy in NJ.

NJ has created a number of public and quasi-public institutions and programs intended to meet the market opportunities described above by supporting the deployment and financing of clean energy and environmental infrastructure, including the Board of Public Utilities, Clean Energy Program, Environmental Infrastructure Trust, and the Energy Resilience Bank within the Economic Development Authority. However, there are opportunities to expand the mandate of these institutions and better leverage private capital through them in order to address the scale of the state's goals.

There are three key areas of investment needed for the state:

- *Supporting Renewable Energy Generation*: Despite having the 5th most installed capacity for solar of any state in the country, NJ has only begun to penetrate its solar market potential. According to estimates from the National Renewable Energy Laboratory (NREL), this could be as much as a $40 billion investment opportunity. In addition, NJ has large offshore wind resources that have not yet been tapped. NJ's primary mechanism for driving renewable adoption is its renewable portfolio standard (RPS), which includes a carve-out for solar. However, the RPS alone does not position the state to meaningfully penetrate the full market, and it is not paired with tools that could support the financing and investment needed to deploy renewables at scale.
- *Scaling Energy Efficiency Investments*: While NJ has long supported energy efficiency in order to reduce overall energy consumption through robust rebate programs managed by the Board of Public Utilities' (BPU) Clean Energy Program, these programs today only achieve one-eighth of the estimated economic potential for efficiency savings.[2]
- *Spurring Large-Scale Electric Vehicle Deployment*: Clean technologies have similarly been held back in the transportation sector, which accounts for over 50% of the state's energy-related carbon emissions. Policymakers have only taken small steps to support electric vehicle (EV) adoption and necessary charging infrastructure in NJ, and as a result, the state is only 2.2% of the way towards its goal of EVs making up 15% of sales by 2025.[3]

The opportunity for private investment

Private investment can be additive to existing programs in New Jersey and achieve several goals: addressing key barriers related to high capital costs of investments, increasing the total amount of capital available for energy

investments, and reducing energy costs to users. The upfront costs of energy projects are typically too high to be paid for with cash on hand—a problem that could be addressed through private, third-party financing to cover these upfront costs, paid back over time through the economic savings of the projects. In the state's most recent Energy Master Plan, NJ policymakers recognized the potential for new public financing strategies designed to catalyze and "crowd-in" private capital to fill financing gaps while lowering energy costs to users. Public capital could be deployed in specific ways that leverage, or encourage, private investment. This approach would allow public capital to be used more efficiently and turn clean energy into an opportunity for outside investors, rather than a cost to be borne by the public sector and NJ residents.

New institutional models and mechanisms can be deployed to achieve this approach and better leverage a range of private capital sources—such as market-rate investment, impact investment, and philanthropic capital—into cost-effective clean technology projects.

Institutional and financing solutions

This paper explores three potential pathways for NJ to form dedicated investment capacity for clean technologies within an institution. The role of such an institution would be to:

- Drive more private investment using limited public resources
- Provide financing to underserved market sectors, like low-to-moderate income households
- Increase consumer protection and information transparency
- Be steadfast through changing political landscapes, budget changes, and administrative priorities
- Be market-oriented, and flexible and adaptable to react to market changes

The institution could use credit enhancements, co-investment, and warehousing or aggregation tools to leverage private investment into clean energy projects. The three institutional approaches identified for NJ to consider are:

1. **Creating a ring-fenced clean energy investment division of a newly formed public State Bank**

If NJ were to form a new public State Bank, a ring-fenced unit could be formed within it to specifically focus on clean energy and clean transportation projects, like charging stations. As a dedicated public financing entity designed to leverage private investment into the state, a State Bank would be a natural home for such an operation. The existing model, the Bank of North Dakota, can provide insights into best practices for designing a State Bank in NJ.

2. **Expanding the EIT/NJIB to have the mandate and resources to also finance clean energy**

The NJ EIT, soon to become the NJ Infrastructure Bank, could be expanded to also finance clean energy projects across multiple markets and sectors. This would follow the approach taken by the Rhode Island Infrastructure Bank, where the existing state clean water financing agency had its mandate and funding expanded to serve clean energy projects in addition to water.

3. **Establishing a stand-alone Green Bank, modeled on successful examples of neighbor states**

NJ could also create a stand-alone Green Bank, based on the models established by Connecticut and New York. A Green Bank is a dedicated public, quasi-public or non-profit institution that finances the deployment of renewable energy, energy efficiency, and other clean energy and clean energy infrastructure projects in partnership with private lenders.

In all cases, there are pros and cons related to ease of implementation and suitability within NJ, which are explored in detail in the report and in Table 1. A range of funding sources, both public and private, should be considered for each approach.

TABLE 1: SUMMARY OF CLEAN ENERGY FINANCE INSTITUTION OPTIONS PROS & CONS

Criteria	State Bank Green Unit	Expanded EIT	New Green Bank
Ease of creation	+ Green unit could be created easily at formation stage of the State Bank	+ EIT already on pathway to expand its mandate and activities to new sectors	+ As a stand-alone entity, may be easier to define role to policymakers + Successful examples in region may bolster support
	- Creation of overall State Bank likely requires legislation - Complex to form, given need to move public funds out of current investments	- Further expansion into energy will likely require new legislation, as well as new dedicated funding	- Could require legislation - Formation of new institution may seem unneeded
Fit for purpose	+ State Bank concept is founded on idea of driving private sector investment	+ EIT was designed to finance infrastructure by drawing in private capital	+ Green Banks specifically designed to fill this need, and would be tailored to NJ conditions + Growing body of best practices to draw on to fit the need
	- Has never been used to finance clean energy projects - The one existing State Bank example (North Dakota) only uses one of multiple possible finance tools to leverage private capital	- The need to finance non-muni projects likely requires new tools and expertise - Will need to become a direct balance-sheet lender, beyond conduit bond issuance	- Misses potential synergies across types of infrastructure served by other entities
Operational abilities	+ Can be designed to contribute profits to state budget	+ Leverages track record and abilities of existing entity + Does not require forming whole new entity, building on existing operational capacity	+ Capacities and skills can be built up over time to meet needs as they arise + Can leverage capacities from existing Green Banks
	- Requires building large amount of trust with private lenders to demonstrate need	- New staff is likely needed to expand capacity and serve new markets with new finance techniques	- Creation of a new entity is a complex process that can take time

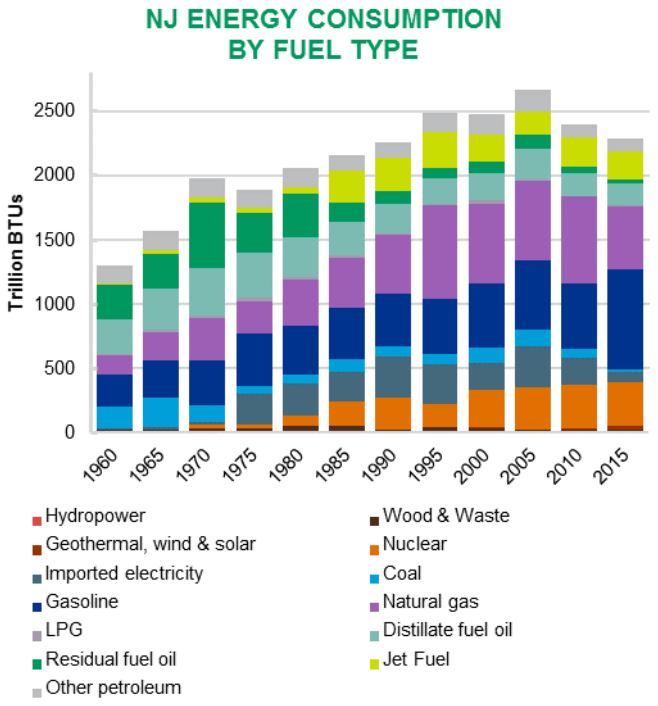
NJ can also consider additional financing tools that could complement an institution to draw in private investment for clean energy (see Table 2). These include purpose-built bonding structures, like Green Bonds, Environmental Impact Bonds, and Qualified Energy Conservation Bonds. NJ could also move forward on Property Assessed Clean Energy (PACE) legislation to allow commercial buildings to finance energy upgrades directly on their tax bill. Finally, additional considerations could be made to address resilience needs and low-income communities. Community solar can open up the benefits of rooftop solar to those who cannot directly put solar on their roof, including low-to-moderate income households typically left out of the economic savings of solar.

TABLE 2: SUMMARY OF ALTERNATIVE FINANCE MECHANISMS PROS & CONS

Financing tool	Pros	Cons
Green Bonds Traditional bond instrument where use of proceeds is for environmental and energy projects	• Leverages private capital • Does not require any new legislation - takes advantage of existing bonding authority • Engages new and place-based investors • Attractive to some investors for tax advantages, since municipal green bonds can be tax-exempt • Flexible—could be issued by any of the institutions considered here or by other existing public institutions	• Counts against the debt capacity of issuing body • Restrictions may exist on the use of proceeds to keep tax-exempt • May require some regulatory/administrative effort to enable certain bodies to issue bonds • Attractiveness of bond to investors (and interest rate) depends on credit rating of the issuing body, which may make this a less attractive option for some issuing bodies
Environmental Impact Bonds A "Pay for Success" mechanism where investors provide up-front capital and are repaid according to the achievement of energy or other outcomes	• Transfers risk to private investors • Protects taxpayer dollars • Helps deploy pilots, scale successful interventions • Presents possibility of engaging new 'payors' • Engages place-based investors	• Best for initial investments (piloting or scaling an intervention) rather than larger-scale investments • Requires additional time and resources for structuring the deal and deal terms
Property Assessed Clean Energy (PACE) Mechanism in which financing for clean energy upgrades is secured and repaid through property taxes	• Low-risk and attractive tool for private property owners to install clean energy technologies • Leverages public resources (the ability to collect taxes) to draw in private capital • Long terms of PACE financing help spread out payments	• Requires significant legal, administrative, and financial set up • Concerns about consumer protection and predatory lending for residential PACE • Passing legislation not sufficient—must enable careful program design and implementation • Residential PACE may not be politically expedient
Community Solar Solar projects developed as a shared asset among a small network of subscribers, enabled by group or virtual net-metering through which multiple individual customers can subscribe to a solar project and lease or purchase power from that off-site solar project	• Benefits Low and Medium Income households, renters, etc. • Enhances grid resilience through distributed generation assets and microgrids • Realizes scale economies through larger solar projects	• Requires buy-in of utilities to play role in administration and billing • Requires proper siting, approvals, financing, and maintenance for shared solar assets • Requisite legislation not yet passed in New Jersey • Experience nationally is relatively new; best practices are still being learned

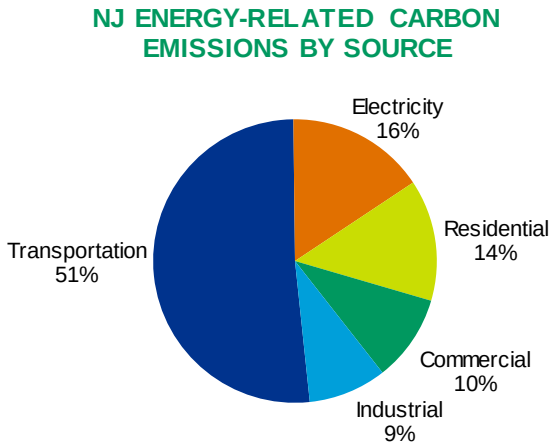
Energy market & policy conditions in NJ

NJ primarily relies on three fuel sources for its energy—petroleum for transportation, natural gas for electricity generation and building heating, and nuclear fuel for power generation. NJ does not produce fossil fuels, and uses a small amount of coal for power generation. Transportation accounts for 37.2% of all energy consumption.



NJ ranks 16th for energy-related carbon emissions of any state. Energy-related carbon emissions in the state come almost entirely from oil and natural gas. From 1980 to 2014, emissions have been flat, with the share from natural gas increasing slightly. Per capita emissions have declined by 17% over this period.[4] Today, over 50% of energy-related emissions come from the transportation sector.[5]

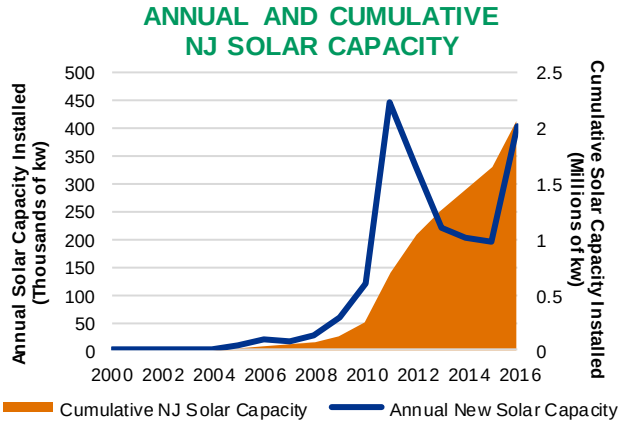
NJ has one of the cleanest electricity mixes in the U.S. Nearly half of the power produced in the state is from natural gas, and the remaining is almost entirely from nuclear. The state has recently increased reliance on natural gas, growing from 33% to 44% of the fuel mix from 2011 to 2014, while reducing consumption of coal and nuclear.[6] The shift away from coal gives NJ's power sector the 10th lowest CO_2 emissions per MWh of any state in the country, and 6th and 4th lowest SO_2 and NO_X emissions per MWh, respectively, as of 2015.[7] Between 1990 and 2014, total electricity consumption in NJ has increased at only half the national average growth rate.[8] Over that same quarter century, electricity prices in NJ have



increased by roughly 50%. NJ has the 9th highest residential electricity prices of any state.[9]

Renewables in NJ

The share of power in NJ from renewables is far below the national average, with only 5% of generation from renewables in 2016.[10] Much of the in-state renewable generation is from solar photovoltaics (PV). As of 2017, NJ has installed the 5th most solar of any state in the U.S., with almost 2.2 GW of solar PV installed through Q1.[11] However, solar deployment has been inconsistent due to fluctuating values in the state's market for solar renewable energy credits (SRECs).



Of the installed solar capacity to date, 25% is residential, 51% is commercial or industrial, and 24% is grid-supply.[12] Within the residential space, 85% of all installed systems were financed through "third-party ownership" structures. Under this model, homeowners do not own the solar on their roof. Rather they lease the system or pay for the power generated by the system, which is owned by a third-party.

Despite its national leadership position, NJ has barely begun to penetrate its solar market potential. NREL estimates that economic solar potential in NJ (meaning

the solar power produced would be cheaper than the grid) is as high as 24.5 GW. That means market penetration to date is less than 10%.[13,a] Depending on the installed cost, realizing that full economic potential will require nearly $40 billion of investment.[14]

The state's primary mechanism for driving renewable adoption, the renewable portfolio standard (RPS), is not designed to reach this level of market penetration or to spur the investment required. NJ's RPS calls for just over 20% of all power sold by utilities to be from renewables by 2021, and then for an additional 4.1% of power to come from solar by 2028.[15] Through 2016, wind power had fulfilled 52.4% of that non-solar component of the RPS, with landfill gas and waste-to-energy filling most of the rest. But 81% of this power is coming from out of state.[16] To put NJ's in-state solar potential in context, the total economic solar potential amounts to 32.2 TWh/yr, or 43% of the total electricity consumed in NJ in 2015.[17] The RPS alone does not position the state to achieve this level of adoption, and it is not paired with tools that could support the financing and investment needed to deploy this amount of renewables.

In addition to solar, NJ also has a sizable offshore wind opportunity that as of yet remains untapped. NREL found the state has 165 GW of technical potential, which could yield nearly 300 TWh/yr of generation (far greater than the entire state's current consumption).[18] NJ has begun to take steps to realize this opportunity. In 2010 it passed the Offshore Wind Economic Development Act, directing the BPU to develop an RPS mandate for at least 1.1 GW of offshore wind. Rulemaking on that matter is pending.[19] An early attempt at a small offshore wind demonstration project, in state waters off Atlantic City, has stalled and is unlikely to proceed.[20]

The federal government has also taken steps to support offshore wind development off the coast of NJ. In late 2015 the Bureau of Ocean Energy Management auctioned off commercial leases to two ocean parcels in federal waters off of New Jersey that could add up to 3.4 GW of offshore wind power.[21] The leases were sold for $2 million to two developers, and officially went into effect in March 2016.[22] In both cases, the projects have a long development road map that requires site assessment and securing offtake agreements for the power.[23] Offshore wind development has been hampered by recent state policy uncertainty and the lack of implementation of RPS provisions to support offshore wind. As NJ's largest carbon-free power source, nuclear, begins to go offline, offshore wind could help fill this gap.

[a] Actually deploying all of this solar may require addressing critical land-use issues. The data point is meant to demonstrate, though, that cost-effective solar opportunities exist in NJ.

EV development

Policymakers have only taken small steps to support electric vehicle (EV) adoption in NJ. 13,824 EVs have been purchased in NJ, 7th most among all states.[24] However, this represents only 0.4% of the 2.9 million private cars on the road in NJ.[25] And EVs make up only 0.82% of new car sales in the state.[26] NJ is a party to the multi-state zero emissions vehicle (ZEV) mandate, which requires automakers to reach a level where 15% of their sales are ZEVs by 2025. But based on the low sales trajectory, NJ is only 2.2% of the way to meeting this goal.[27]

Full EV purchases are exempt from state sales tax, and there is a state-run grant program that provides cash rebates to employers that install charging stations in their parking lots for workplace charging.[28] However, funding for this program is fully expended. There are no direct cash incentives for EV purchase or use, and no programmatic efforts to drive infrastructure investment into charging stations statewide. A positive development on this front is that the BPU recently opened an EV stakeholder group to begin EV and charging infrastructure planning. In addition, ChargEVC, a new coalition, has released a roadmap for New Jersey EV market development.[29] This demonstrates that the state is now taking its first steps towards concerted EV policy, which will likely need to include solutions for charging station investment.

Energy efficiency opportunity

NJ has long supported energy efficiency adoption in order to reduce overall energy consumption. Installing energy efficiency measures in buildings reduces overall energy needs and lowers energy costs for users. This can eliminate or delay the need to build new generation capacity, and reduce peak demand capacity requirements. Energy efficiency is broadly cost-effective, meaning the upfront cost of installing efficiency can be paid for over time through savings on energy costs. However, end-user demand for energy efficiency benefits is persistently low. Therefore, NJ incentivizes efficiency adoption with robust rebate programs managed through the BPU's Clean Energy Program (discussed in detail below).

Those rebate programs incentivize the adoption of energy efficiency measures in residential and commercial buildings to reduce electricity and gas consumption. The American Council for an Energy-Efficiency Economy (ACEEE) tracks the cost and impact of these programs through its "Scorecard." The outcome and rankings of NJ's program are in the table below. NJ consistently ranks in the middle of the pack, reducing electricity consumption by roughly 0.5% annually and gas consumption by half that. Leading states are able to save four or five times that

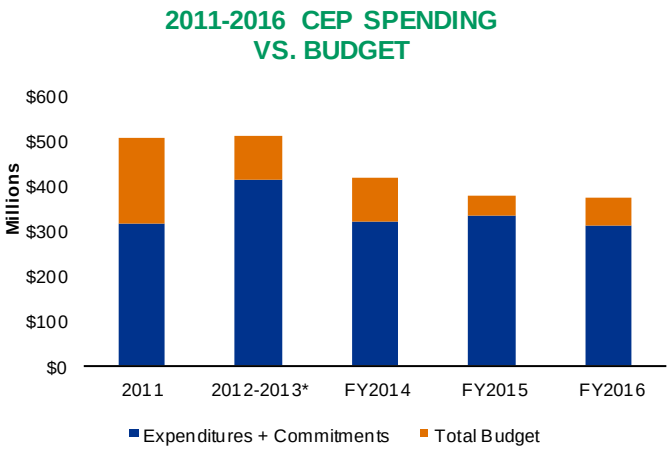
much through their programs, though this is primarily achieved simply by spending more money on rebates.

	2013	2014	2015	2016
ACCEE State Rank	19th	21st	24th	23rd
Electric savings as % of sales	0.56% (26th)	0.68% (23rd)	0.55% (32nd)	0.44% (30th)
Gas savings as % of sales	0.24% (24th)	0.32% (23rd)	0.21% (23rd)	0.26% (26th)

The rebate programs have only begun to penetrate NJ's efficiency investment potential. The state has no official annual energy efficiency target. (The Energy Master Plan (EMP) in 2008 advised that a goal should be set at 20% savings by 2020.[30]) However, a 2012 study by EnerNOC found the potential for annual electric savings under current rebate program structures was as high as 1.5% (3x current levels), and that full economic potential was 3.4% (nearly 8x current levels).[31] The study found that the total efficiency investment needed to reach the 1.5% annual level was $1.4 billion. It also found that, under the current rebate structure, 76% of this investment would come from ratepayer-funded rebates.[32] The current programmatic structures to drive efficiency adoption in NJ make it unlikely that the efficiency market will be penetrated with private investment beyond the level achieved through rebates.

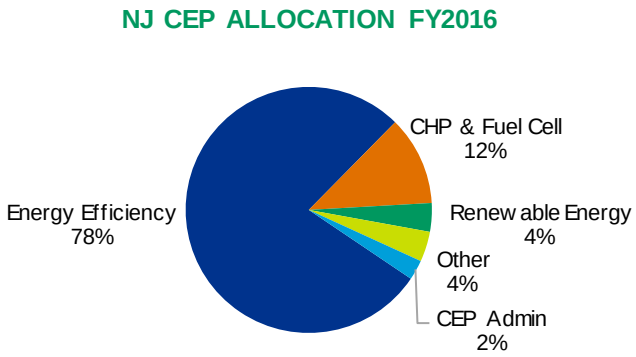
Relevant existing entities & programs in NJ

NJ has created a number of public and quasi-public institutions and programs to support clean energy deployment to meet the market opportunities described above. They are designed to support the adoption and financing of clean energy and environmental infrastructure.



Clean Energy Program

The NJ Clean Energy Program is the primary mechanism for direct public expenditure on clean energy. Between 2001 and 2016, the CEP used $7.0 billion of ratepayer funds to incentivize and deploy a range of clean energy resources. Over its full history, 60% of those funds have been used for energy efficiency rebates, and 36% for renewable rebates.[33] In its most recent program year (FY 2016), total program spending was $310.8 million (actual and committed expenses), with most funds going to efficiency rebates. Program spending had the following allocation:



The full budget was $372 million. This shortfall in spending is common, as ratepayer dollars collected to fund the Clean Energy Program are often "swept" by the state to fill budget gaps. In the last 5 years alone, $491 million of funds intended and budgeted for the CEP were spent elsewhere.[34]

The only financing (rather than rebate) program supported through the CEP is the Home Performance with Energy Star Program (HPwES). HPwES provides rebates to homeowners for comprehensive energy efficiency upgrades. To support these larger projects with higher

upfront costs, financing is made available through a number of partners. The CEP provides interest rate buy-downs to a specialized efficiency lender, as well as a number of credit unions who have enrolled. In both of these channels, loan capital is offered by the partner lender, and the CEP buys down the loan to a zero or low interest rate, providing an incentive payment directly to the lender. The utilities also directly offer on-bill financing in some parts of the state, supported with CEP interest rate buy-downs.[35] No ratepayer funds are used for direct lending.

Board of Public Utilities

The NJ Board of Public Utilities (BPU) is both the electricity market regulator and the state energy office. The BPU supports energy policymaking and operates various programs, in addition to its role of setting electricity and gas utility rates. Two of its primary functions related to clean energy are the management of≈the state's RPS, and oversight of funds under the state's Clean Energy Program (CEP). The BPU is the enforcement office for the RPS, where utilities must report≈their level and method of compliance on an annual basis.[36]

NJ's Electric Discount and Energy Competition Act (EDECA) of 1999 created a societal benefits charge (SBC), collected from ratepayers, to fund the rebates designed to incentivize adoption of renewable energy and energy efficiency through the Clean Energy Program, overseen by the BPU. The BPU determines annual funding levels, approves program-specific budgets, andmanages program evaluation. The actual implementation of the programs is contracted out to a private third-party. In addition, the BPU allows utilities to directly offer clean energy programs, including financing for clean energy.

Environmental Infrastructure Trust

The New Jersey Environmental Infrastructure Trust (EIT) was formed as an independent financing authority of the state in 1985. The EIT provides financing to either local governments within NJ or to private water companies to construct and upgrade environmental infrastructure projects, through the state's Clean Water State Revolving Fund (SRF).[37] The EIT primarily provides loans to finance water projects, which are then secured by a guarantee from the borrowing local government. These long-term loans are mostly financed through conduit-bond issuances from the EIT. Under this structure, the EIT issues a bond to finance the underlying project, but the EIT is not responsible for repaying the bond. Rather, the underlying project and the associated local government must repay the EIT, which in turn repays the bond. The EIT collects fees on these issuances to support operations. The EIT does also make small direct loans using its own cash on hand. Much of the EIT's water project lending is done in partnership with the NJ Department of Environmental Protection, with interest-free loans to projects leveraging the federal and state resources devoted to the EPA's clean and safe water programs.[38] New legislation in late 2016 and early 2017 has created a transition period for the EIT, where it will become the state's new Infrastructure Bank. This is discussed in greater detail below.

Economic Development Authority and the Energy Resilience Bank

The New Jersey Energy Resilience Bank (ERB) is a program operated by the state's Economic Development Authority (EDA). The program was designed after Hurricane Sandy to drive greater investment into resilient energy supply systems at critical facilities like hospitals, water and wastewater treatment facilities. The program was seeded with $200 million of federal disaster relief funds ("CDBG-DR funds") in May 2014.[39] When originally launched, the ERB was to be operated as a partnership between the EDA and the BPU.[40] Currently however, the ERB is solely operated by EDA.

As originally described in the state's Action Plan to the federal government, the ERB was meant to operate much like the Green Banks in states like Connecticut and New York (described in more detail below). For example, the Plan said, "the Bank could be scaled by utilizing a portion of the CDBG-DR funds to encourage private sector investment in resilient energy projects. For example, the Bank could—to support specific eligible projects—use CDBG-DR funds as necessary and reasonable as a loan loss reserve." And further, "As a provider of a loan loss reserve, the Bank could seek financing from the private sector, to ensure that the seed funding has an expansive multiplier effect. The Bank could provide financial assistance in a variety of forms, including direct loans, loan guarantees, early stage grants and loan loss reserve coverage for private lenders to support eligible projects."[41]

However, the complexity of forming such an operation and urgency of deploying funds led to the ERB taking a different form. It offered its funds to the market through two discrete RFPs—one for hospitals and one for water and wastewater treatment facilities.[42] Through these RFPs, eligible locations could seek funding to deploy Combined Heat and Power (CHP), fuel cells, or storage attached to solar PV (though not the PV itself).[43] The ERB will cover 100% of project costs. Funding for a project is made available in three forms:

- A grant/forgivable loan (not to exceed $25 million) for all eligible Resilient Costs, as described in the Program Guide and defined above;
- A grant/forgivable loan equal to 40% of the remaining eligible project costs; and,
- An amortizing, 2% interest rate loan with a term up to 20 years, for the balance of ERB project funding.[44]

While the program is now officially closed, most projects accepted into the program still have not begun construction. Preliminary board approval from the EDA has been given to 10 projects, but those now need to go through environmental impact review and other federal reviews before construction can begin. Of those 10

applications, nine are CHP projects. Seven projects are at hospitals with three at water facilities. As of the time of writing, only one project has begun construction. A typical project may be a 2 MW CHP facility, with costs around $8.5 million for construction. The typical funding breakdown is approximately 65% grant funding and 35% loan funding from the ERB to the project. No private capital is required. More projects are in the pipeline, and the ERB expects that the current set of projects will fully expend the $200 million in federal funding.

The ERB program staff expects that several more years of application processing and then project monitoring are necessary to fully wind down the program. After that, the loans will be serviced by the EDA, with payment flowing back to the Department of Community Affairs where funds will be comingled with existing CDGB funds.

The need for clean energy and climate investment in New Jersey

Taken together, NJ's energy mix, clean energy market potential, policies, and programs point to a significant need and opportunity for investment in clean energy and transportation technologies. NJ is reliant on just three energy sources, two of which are fossil fuels. Nuclear, the third source, will soon be reduced with the pending retirement of Oyster Creek plant in 2019. And threats of premature retirement of other nuclear plants continues. There will soon be a need for new generation capacity. If the state is not proactive in investing in its domestic renewable resources, primarily solar and offshore wind, this gap will likely be filled with imported natural-gas-fired generation. The need for new generation can be at least partially alleviated with increased investment in energy efficiency, a market which to date has not been tapped close to its full potential.

Transportation accounts for over a third of all state energy use and over 50% of all state GHG emissions. Though the state's electricity grid has become cleaner with the phase-out of coal, its overall energy profile remains highly carbon-intensive because of heavy use of gasoline-based vehicles. This points to a need for large investments (and complementary policy) to support the build-out of an electric vehicle-based transportation economy and charging infrastructure. And to ensure that electric-fueled transportation is powered by renewables, the power grid will need to maintain its current low-carbon profile while new carbon-free generation is added to support transportation.

NJ has implemented strong rebate programs for efficiency and supported resilience in focused, but limited ways. It has also established strong institutions to utilize traditional public and municipal finance tools to support an increasing set of environmental and infrastructure challenges. NJ has shown leadership and innovation (particularly with the ERB) in implementing these solutions.

However, these approaches do not add up to the focused, robust approach required to address its energy needs and draw in requisite private investment. Without efforts to spark investment at a greater scale, the state may slide back to greater dependence on imported fossil fuels. None of the programs or institutions created to date in NJ focus specifically on providing finance, or catalyzing private investment in the ways needed to ensure the state realizes a strong clean energy future. Mandates and rebates set the table for market opportunity, but mechanisms have not been created to actually draw in investment at scale to satisfy that opportunity. There is still a sizable institutional and investment gap to fill.

Investment, or finance from third-parties, is critical to tapping this market because the upfront cost of a project is typically too high to be paid for with cash on hand. Whether a corporation wants to go 100% solar to save money on its electricity bills, or a homeowner wants to do a whole-home energy retrofit, the upfront cost of these projects is often a barrier to adoption. Financing to cover this upfront cost, paid back over time through the economic savings of the projects, can reduce this barrier to adoption.

For a number of reasons, economically viable, low-risk clean energy projects are often unable to access affordable or attractive private financing. For example, lenders are unsure how to underwrite the value of the savings generated by a clean energy project, or are unable to extend loans to long terms that make the projects attractive to customers. The state can use methods designed to "crowd-in" private capital to fill financing gaps that reduce real and perceived risk, and allow private investors to learn about a new market opportunity with the security of government partnership. As private lenders gain experience and information about the processes, risks and addressable market size in clean energy, they can become increasingly comfortable and confident investing in the state's clean energy markets.

The state recognized this need itself in the last EMP. For example, in the 2011 EMP (and carried forward in the 2015 update) it established the goal to, "consider new ways to provide capital for renewable energy and energy efficiency to eventually eliminate the need for cost incurrence through the [SBC]." And in reference to the ERB's original design to leverage private capital with limited public funds, it said, "this financing program can serve as a model for the transition of the NJCEP to other incentive models that advance this EMP goal."[45] Evaluation of the existing rebate programs also found an

opportunity to use more financing techniques to reach deeper energy efficiency savings.[46]

New public initiatives meant to catalyze greater private investment need not come at the expense of existing programs—they should be additive. But this statement from the official energy policy of NJ demonstrates the level of priority policymakers should place on finding new ways to spark investment.

Rebates can incentivize demand and can partially offset upfront project costs. Nevertheless, the state cannot practically incur the expense of meeting the entire market opportunity. The capital for upfront investment should not come solely from the public sector, and limited pubic funds can be used more efficiently by offering financing and leveraging private investment. Clean energy deployment can be viewed primarily as an investment opportunity for the private sector, rather than a cost to the public sector. New techniques and institutional models can be deployed that are specifically designed to leverage more private investment into cost-effective projects that can lower energy costs for users.

Leveraging private capital

Given the scale of investment required to meet New Jersey's energy and efficiency goals, the state will need to leverage outside investor capital to accelerate the deployment of its investments in renewable energy, energy efficiency and clean transportation.

Traditionally, investors have been focused on financial outcomes of investments generating a market return. These investors - such as retail investors, academic institutions, and pension funds - have supported state investments primarily through participating in state and municipal bond issuances. For these investors, the state's efforts to set up an institutional mechanism for clean energy investment can work to normalize clean energy investment simply due to strong risk-adjusted financial returns and regardless of impact. However, "impact" and philanthropic investors are also increasingly attempting to find investments that generate a financial return as well environmental, social, and governance outcomes, and would likely be interested in opportunities to invest in accelerating clean energy and energy efficiency investments in New Jersey. These investors can be envisioned along a spectrum from return-focused to impact-focused (see Appendix - Types of Private Capital).

Institutional models to catalyze clean energy investment

Given the need for increased private investment, this paper explores three potential pathways for NJ to form dedicated investment capacity within an institution. There is a track record of governments, including NJ, establishing investment and finance entities that use public capital to drive greater private investment in a focused and scalable manner. The EDA and EIT are just two examples. The institutional gap for climate investment in NJ can be filled by an entity that is capitalized with limited public funds and designed to drive private investment into clean energy solutions.

The three institutional approaches for NJ to consider and discussed below are:

1. Creating a green ring-fenced division within a newly formed public State Bank;
2. Expanding the EIT/NJIB to have the mandate and resources to also finance clean energy; or,
3. Establishing a stand-alone Green Bank, modeled on the successful examples of neighbor states.

The role of such an institution would be to:

- Drive more private investment using limited public resources
- Provide financing to underserved market sectors, like low-to-moderate income households
- Be market-oriented and increase consumer protection and information transparency
- Be steadfast through changing political landscapes, budgets, and administrative priorities
- Be flexible and adaptable to react to markets

This kind of dedicated, institutional investment approach can produce numerous economic, fiscal and environmental benefits. For example, it can:

- Reduce barriers to adoption by providing 100% upfront financing
- Lower energy costs for households and businesses
- Create more local jobs through direct local investment
- Preserve public capital by using it for financing, which is repaid and creates a return

Finance tools and mechanisms

This institution could use a range of financing techniques to drive clean energy investment. Relevant finance structures can be categorized into three buckets:

- *Credit Enhancement*—NJ can use various credit enhancement mechanisms to mitigate risks for private investors and incentivize investment on better terms. This can be in the form of a first or second loss reserve, a partial loan guarantee or subordinated debt.
- *Co-Investment*—NJ could directly lend into a project alongside a private sector partner. This technique is most useful when there is a specific gap in capital needed to complete a project. It might also provide better financial returns for the state's lending institution.
- *Aggregation, Warehousing & Securitization*—Aggregation is a critical method of lending to and bundling small clean energy projects that are traditionally difficult to finance. Many clean energy projects, like distributed generation and building efficiency, are inherently small, scattered and operate under varying regulatory and incentive programs. This makes them unappealing for private lenders. A state lending institution can directly originate, or aggregate these kinds of loans to achieve scale and diversity of risk. This can lead to securitization, and capitalization of the portfolio.

Specific examples of transactions using these approaches are discussed below.

Three institutional clean energy finance approaches for New Jersey

If NJ were to create a dedicated investment institution, it could do so under one of the recommended institutional approaches, outlined below. These include creating a ring-fenced fund within a new public State Bank, expanding the EIT/new NJIB, or creating a new stand-alone Green Bank entity. Each of these options is evaluated, considering the complexity of implementation, how suitable the structure is for meeting the identified need in NJ, and the forms of operational capacity required.

1. Create a green ring-fenced division within a newly formed public State Bank

If NJ were to form a public State Bank, a ring-fenced unit could be formed within it to specifically focus on clean energy and clean transportation projects, like charging stations. As a dedicated public financing entity, designed to leverage private investment into the state, a State Bank would be a natural home for such an operation. A State Bank has been successfully operated for decades in North Dakota, and provides lessons on how this model might be applied to NJ.

The North Dakota example

The Bank of North Dakota (BND) is a unique U.S. institution as a state-owned depository bank. The state government is its sole shareholder, and BND only takes deposits from state government. Rather than deposit its revenue and cash reserves in large private banks, the state government deposits all funds in BND. Because BND was created and received its mandate through legislation, this ensures that those deposits are then reinvested directly into the state for predetermined purposes. Funds deposited with large private banks may be invested anywhere and for many potential purposes.

BND was founded in 1919 with the primary goal of supporting the local banking community in the state and spurring economic development. BND is a participation lender, meaning that it primarily doesn't originate loans. Instead, it offers capital to local private banks to encourage and enable their own lending, typically buying loans from the private banks to create liquidity. BND was originally capitalized with $2 million in state funds, and that was supplemented with another $72 million. As of the end of 2016, the total equity of BND, including accumulated annual net income, was nearly $900 million. BND has been profitable every year since at least 1971.[47] It had $7.3 billion in assets ($4.7 billion of which were loans), and $6.4 billion in liabilities ($4.9 billion of which were the state government's deposits).[48]

Because the BND is the depository bank of the state, its funds are often transferred back to the government as part of the annual budget process. The amount of money transferred from BND to the government has varied widely, but has typically equaled roughly two-thirds of BND's annual profit.[49] BND's transfers do not account for a large portion of the state budget. The highest annual share of the budget paid for by BND was only 1.82% of all expenditure. (The state also operates a Rainy Day Fund for fiscal stability. Comparatively, BND is used more as a revenue source from a state-owned operation.[50])

The BND's loan portfolio allocation is 41% business, 14% agriculture, 15% mortgages and residential lending, and 29% student loans. Only the student loan business involves direct loan origination through BND. Nearly all other lending activity is conducted through BND's local lending partners, with the bank participating in the loan by supplying supplemental capital and/or purchasing the loan entirely from the local lender.[51]

Key considerations in bringing the model to NJ

Some parts of the BND model were designed to fit the needs of the North Dakota banking market. The small population and large area of North Dakota meant that it could be difficult for residents to find banking services or for small, local lenders to stay in business. BND was built to ensure banking was available writ large. In NJ, there is already a strong banking industry, so arguments in support of an NJ state bank would be different, and would likely focus on sector or community-specific needs. For instance, a NJ State Bank could be created to foster more lending to underserved communities and/or underfunded sectors including clean energy and EV infrastructure.

Creating a State Bank in NJ would almost certainly depend on new legislation, as it would require the creation of a new purpose-built entity, and its mandate for investment would need to be clearly defined. NJ would also have to engage in a perhaps complex process of moving its reserve cash out of its current investments, and putting it into the State Bank. NJ would also have to define going forward how the state, and potentially local governments, would deposit funds into the Bank. In addition, if the Bank is expected to return profits back to the state to support the budget, that would need to be defined as well. Finally, more broadly, NJ would need to engage with local private lenders to ensure they understand the role of the Bank, and how the Bank is meant to drive more lending and business activity for them, rather than compete.

A clean energy unit within such a State Bank would be a natural fit. The kind of clean energy finance entity needed would use the same kinds of leverage-oriented techniques as BND. And much like BND, the new unit would be built to re-invest public capital into the state economy, and fill certain market gaps where private capital is not flowing or inaccessible. And the unit would be self-sustaining, generating a profit that could be used to support state budget needs, just like BND.

PROS & CONS TO GREEN RING-FENCED STATE BANK APPROACH

Criteria	Pro	Con
Ease of Creation	Green unit could be created easily at formation stage of the State Bank	State Bank overall may be difficult to implement because of complexity of moving public funds out of current investments; legislation likely needed
Fit for Purpose	State Bank concept is founded on idea of driving private sector investment	Has never been used to finance clean energy projects
Operational Abilities	Can be designed to contribute profits to state budget	Requires building a large amount of trust with private lenders to demonstrate need

2. Expand the EIT/NJIB to finance clean energy across markets

The NJ EIT, which is now becoming the NJ Infrastructure Bank, could be expanded to also finance clean energy projects across multiple markets and sectors. This would follow the Rhode Island approach, where the existing state clean water financing agency had its scope and funding expanded to serve clean energy markets, in addition to its existing water mandate.

The Rhode Island example

Rhode Island passed legislation in 2015 that turned its existing quasi-public Clean Water Finance Agency into the Rhode Island Infrastructure Bank (RIIB). In doing so, it expanded its mission and scope to support clean energy financing in addition to its historical focus on water, and was seeded with a small amount of initial funding from the Regional Greenhouse Gas Initiative (RGGI) and ratepayer funds. Because RIIB has bonding authority and a strong credit rating, it is able to borrow funds to support its clean energy investment. Since founding, RIIB has focused on launching a new statewide commercial PACE program, and operating the Efficient Building Fund, which finances upgrades for municipal buildings.

The Fund works in the following way:

- RIIB partners with the state energy office to identify and evaluate priority clean energy projects in municipal buildings through an open RFP. RIIB works with the utility to provide a number of free audits.
- RIIB then evaluates and underwrites the actual projects, and finances the individual projects by purchasing municipal bonds issued by each town.

- RIIB aggregates all of the municipal bonds, and finances that transaction through a private loan.
- As a result, projects are financed at a much lower cost of capital, providing direct savings to towns and a pathway to finance cost-saving energy projects at scale.

How to expand the EIT/NJIB

Through a combination of legislation in late 2016 and in 2017, the EIT has been renamed the NJ Infrastructure Bank and given a new scope.[52] Per the legislation, the NJIB will have two program areas—the existing EIT functions to finance environmental and water projects through the state's Clean Water Finance Agency SRF program, and a new set of financing programs to support construction of public transportation projects. The new program area, called the State Transportation Infrastructure Bank, will be designed under the terms established by the federal Department of Transportation's (DOT) State Infrastructure Bank Program.[53] This will allow the state to leverage both federal and state funds to finance roads, highways, bridges and public transportation infrastructure.

Similar to what happened in Rhode Island, and given the new scope and moniker of the entity, the scope, powers and funding could be expanded one step further to include clean energy. There are natural synergies that the organization can realize by financing a broader suite of types of infrastructure. And from the state's perspective, this solution would potentially minimize confusion around institutional roles and names. Under this pathway, the NJIB would have three "divisions" for environment/water, transportation, and clean energy.

Practically, implementing this plan would require three additional changes to the NJIB:

- Its mandate would have to expand to include clean energy technology, as right now it is only authorized to finance certain kinds of water and transportation projects;
- Its scope of eligible borrowers would have to change to allow for commercial or other private borrowers, as currently the NJIB can only lend to municipalities, quasi-public entities and utilities; and
- It would have to be given a corpus of funding to form a dedicated balance sheet, as all of the NJIB's current funding is legally ring-fenced and can only be used for the federally-backed Clean Water SRF and DOT State Infrastructure Bank programs.

The second point may be particularly important, as the EIT would move beyond its traditional space of municipal financing. This will involve underwriting and evaluating different kinds of projects and credits, and engaging with a whole new set of market actors. This likely requires an expansion of new staff with direct familiarity with lending to non-public projects.

PROS & CONS TO EXPANDING EIT/NJIB APPROACH

Criteria	Pro	Con
Ease of Creation	EIT already on pathway to expand its mandate and activities	Likely requires new legislation to move beyond current mandate
Fit for Purpose	EIT was designed to finance infrastructure by drawing in private capital	The need to finance non-muni projects likely requires tools beyond conduit issuance
Operational Abilities	Leverages track record and abilities of existing entity	New staff is likely needed to expand capacity and serve new markets with new finance techniques

3. Create a new stand-alone Green Bank

A Green Bank is a dedicated public, quasi-public or non-profit institution that finances the deployment of renewable energy, energy efficiency, and other clean energy projects in partnership with private lenders. A number of Green Banks have recently been formed in the U.S, including in New York and Connecticut. Green Banks have shown that with experience and data, private investors are encouraged to enter clean energy markets at scale, eventually without any Green Bank support. In addition to attracting outside capital, Green Banks ensure there is demand for that capital and for clean energy solutions. With an equal focus on market development and demand generation, Green Banks can help bridge the gap between capital supply and market demand. As an institution, Green Banks are meant to be profitable, receiving interest and returns on investments great enough to cover operating expenses and any losses.

Green Banks around the world have driven $29 billion in investment with $9 billion in public funds.[54] Green Banks in the U.S., like the Connecticut and New York Green Banks, are able to leverage around 3 to 4 private dollars of investment per public dollar invested. Many more states and cities are now creating their own Green Banks. This model can be applied in New Jersey, tailored to meet the state's specific institutional and market conditions.

What about the Energy Resilience Bank?

Why shouldn't the ERB fill this need? This idea was raised directly in the state's EMP, under a recommendation titled, "Create Long-Term Financing for Local Energy Resiliency Measures through an ERB and other Financing Mechanisms":

> "In addition to financing energy resiliency measures, EDA and ERB should coordinate with BPU to assist in achieving the Energy Master Plan's energy efficiency and distributed generation goals. ERB customers should also be introduced to New Jersey's Clean Energy Program (NJCEP). The ERB program should coordinate with the Energy Saving Improvement Program (ESIP) and the NJCEP EE programs to address energy efficiency and resiliency."

However, the ERB as currently constructed and funded is not, in reality, positioned to expand its scope, serve new markets, or operate as a long-lived institution. In its current form, it exists to manage the current set of applications to the ERB's funding program until all federal funds are expended. It is not designed to operate, or even exist, beyond the completion of that mandate. It is also not so much a finance entity as it is an intake channel supported by the EDA's overall finance capacity.

The Connecticut, New York & UK Green Bank examples

A number of national and sub-national Green Banks presently operate around the world. They use varying business models and have different goals, but they all operate with the same principles as those described above. A review of the business models, products and institutional forms can help identify the applicable Green Bank practices that are most suitable for NJ. Three currently operating Green Banks are explored below, with more detail on their history and structure provided in the Appendix.[b]

Connecticut Green Bank

Connecticut Green Bank (CGB) is a quasi-public entity created through state legislation in 2011. Its funding comes from RGGI proceeds and a ratepayer system benefits charge. It operates close to markets, often as a direct retail lender, and creates standard-offer products to fit identified market gaps. These products leverage private capital through multiple structures. CGB has used $186 million in public capital to leverage $755 million in private investment. It has deployed over 200 MW of solar and created nearly 12,000 jobs in the state.[55] And in cases where private capital has come into markets at scale, CGB has stepped back to let private actors take over.

Product examples include:

- CGB provides loan loss reserve credit enhancements to a network of local banks, to enable them to make loans at better terms to homeowners to pay for energy upgrades. This is paired with contractor training and outreach to build relationships between the lenders and contractors. Public capital has been entirely preserved, as the program has experienced almost zero defaults, and (unlike with an interest rate buy-down), public capital is only spent upon default.
- CGB administers the state-wide commercial PACE platform (discussed more below) and provides direct loan capital through a warehouse facility that has private co-investors. Upon observing no private lending activity, CGB proved out the market opportunity by originating $24 million in loans with its own capital and then selling the assets to private investors. With that data point, CGB raised a $100 million loan warehouse where the majority of capital is private.
- CGB created a residential solar lease product to support local installers who did not have access to financing. The Green Bank provides credit enhancement, which draws in debt and tax equity from private investors. The product has had a 5:1 leverage ratio of private to public capital.
- CGB finances low-to-moderate income (LMI) household rooftop solar combined with energy efficiency through a tailored solar lease plus energy savings agreement product. CGB works with a private partner, who directly markets the product to LMI households, with CGB providing a credit enhancement to the financing structure. The product uses alternative underwriting criteria, looking at customer utility bill repayment history, rather than FICO score. Households have saved up to 60% on their electricity bills, including finance repayment.

The Connecticut Green Bank model shows NJ the value of a product-based approach, where the Green Bank proactively identifies market gaps and constructs standard-offer solutions in partnership with the private sector. The Connecticut approach also demonstrates the value of flexibility, as the Green Bank often adapts and reshapes products as markets move.

New York Green Bank

New York Green Bank (NYGB) is structured as a specialized public investment fund, operated within the

[b] Interest in Green Banks globally is increasing. There are Green Banks in California and Hawaii. New Green Banks are being formed in Montgomery County, Maryland and Nevada. Legislation is pending in DC to create the DC Green Finance Authority. There are Green Bank creation efforts under way in several more states. There are also Green Banks in operation or development outside the U.S. including in Canada, India and South Africa.

state energy office. It does not offer any products or programs. Rather, it makes its capital available in various forms and asks market actors to make proposals for investments. This is done through an open RFP. As of its latest quarterly report in June 2017, NYGB has committed $409.4 million in public capital to support between $1.2 and $1.4 billion in total investments. It has an active pipeline of application projects of nearly $600 million, and to date it has received applications requesting over $2 billion in NYGB capital.[56] Like in Connecticut, it can play multiple possible roles in a transaction, filling gaps and supporting credit worthiness as necessary. As an institutional, or wholesale investor, it supports projects through intermediary actors and developers. Transactions include:

- NYGB provided a $5 million warehouse line of credit to a company deploying an innovative energy efficiency finance structure that allows households to "pay as they save." The NYGB is positioned to sell that warehouse when loans have been made.
- NYGB provided a construction loan to a developer of distributed wind projects to enable the further deployment and off-take financing of wind projects through a new lease product.
- NYGB provided a bridge loan to a developer of community solar projects to support upfront development costs, which would enable the deployment of 168 MW of solar.

NYGB is willing to participate at multiple stages of the transaction, not just for long-term project finance. And it is comfortable providing upfront capital with the expectation of private investment, or leverage, to come at a later stage of the project. NYGB is now profitable, reaching a point of self-sustainability a year ahead of schedule. This demonstrates how the state can use public dollars in a cost-effective manner, support market growth and drive private investment all through a Green Bank. NYGB also shows how NJ might pair a product-based approach with a market-responsive approach as a technique to identify and pull out suitable projects. This method allows markets to show the Green Bank what financing gaps need to be addressed.

UK Green Investment Bank

The UK Green Investment Bank (GIB) was the state-owned national Green Bank of the UK government, launched in November 2012.[c] It was funded with £3.8 billion and operated much like an infrastructure investment fund, with a double bottom line goal of being both green and profitable. The GIB directly invested in or lent to large infrastructure projects and also raised funds with private co-investors. 60% of GIB capital went to offshore wind and 23% to bioenergy and waste. 50% of investment is in the form of direct equity investment, with only 19% in the form of debt, and the remaining 31% in fund investments or managed accounts. This is unique among Green Banks, as most Green Banks primarily offer debt capital.[57] The Bank has financed offshore wind in multiple ways:

- The GIB provided direct loans and equity investments to support refinancing of existing offshore wind projects, allowing the developers to make new renewable investments.[58]
- The GIB established the world's first offshore wind equity investment fund to invest in operating offshore wind farms in the UK. The GIB is a limited partner in the fund with a £200 million equity investment, and co-investment from pension funds, endowments and other private capital sources. The objective of the fund is to provide long-term institutional investors the opportunity to invest in a nascent market and help project developers use proceeds from refinancing to fund new projects.[59]

Though the UK GIB was a far greater scale than what is likely contemplated in NJ, the GIB proved out the value of Green Bank investment in nascent clean energy sectors like offshore wind. Some of the products used by the GIB could be replicated in NJ. As a model of how public finance institutions can unlock and lead the transition to private capital markets for clean energy investments, the UK GIB was sold and privatized in August of 2017.[60]

Institutional forms and design considerations

A new Green Bank could be formed under three legal approaches:

- Direct part of government—A Green Bank could be formed as a new government organization, much like the New York Green Bank is part of the state's energy office.
- Quasi-public entity—A Green Bank could be incorporated, likely through legislation, as a quasi-public entity, which is effectively a government-owned corporation. This entity would be governed by a Board of Directors. This is the structure of the Connecticut Green Bank.
- Private non-profit—A Green Bank could be incorporated as a private non-profit corporation and be designated by the state to operate as the Green Bank. This is the model used by the Montgomery County Green Bank.[61]

[c] The UK government sold the UK GIB and its assets to Macquarie in 2017. It is now operated on a private basis under the name Green Investment Group (GIG).

If considering a blank-slate, brand new entity, key considerations include:

- Is legislation required, or are executive action or private sector (non-profit) routes an option?
- Where will the initial corpus of public funds come from to capitalize the entity?
- Will it be restricted in the kinds of roles it can play in the market (wholesale vs. retail), or will its operations be self-determined?

PROS & CONS TO GREEN BANK APPROACH

Criteria	Pro	Con
Ease of creation	As a stand-alone entity, may be easier to clearly define to policymakers what the role is	Could require legislation; some may consider it unnecessary to form a whole new entity when other related institutions exist
Fit for purpose	Green Banks are specifically designed to fill this need, and would be tailored to NJ conditions	Misses opportunity to realize potential synergies across types of infrastructure served by other entities
Operational Abilities	Capacities and skills can be built up over time to meet needs as they arise	Creation of a new entity is a complex process, which can take time

Institution funding

If the State Bank approach is used, then the clean energy division of that institution would use the same funding source as the State Bank itself—state revenue and cash reserves. In the case of the other two approaches, where the NJIB is expanded or a new Green Bank is formed, a new funding source would be needed to capitalize the lending operation. Potential categories of funds include:

- General state budget appropriations
- New RGGI auction proceeds from NJ rejoining the cap-and-trade program
- Revenue collected by the BPU through Alternative Compliance Payments to satisfy the RPS
- SBC funds
- Private investment from impact investors, philanthropy, CRA credit-driven lenders and other mission-oriented, "public-purpose" capital sources

In all cases, funds for the Green Bank could be given in an upfront lump-sum, spread out over time with a defined cap (like the NYGB and the pending DC Green Finance Authority[62]), or spread over time with an indefinite stream (like Connecticut). The goal is to build up a capital base at the Green Bank large enough to operate in a self-sustaining manner, leverage significant private investment into the state, and meaningfully penetrate the clean energy market opportunity.

Additional financial tools for supporting the deployment of clean energy

The three approaches described above to establish a green financing institution can be augmented through the state's utilization of policy-driven tools for accelerating investment in renewable energy and energy efficiency. This section explores four possible approaches that can be supported in tandem with the institutional finance efforts: Green Bonds, Environmental Impact Bonds, PACE, and Community Solar.

Green bonds

Since the first green bond issuance by the World Bank in 2008, the green bond market has grown rapidly to over $83 billion in global issuances in 2016.[63] According to the ICMA Green Bond Principles, green bonds are "…any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance in part or in full new and/or existing eligible Green Projects… [Green Projects] address key areas of environmental concern such as climate change, natural resources depletion, loss of biodiversity, and air, water or soil pollution."[64] While there is no one definition of what "green" means, renewable energy generation and energy efficiency qualify as a legitimate use of proceeds for green bonds under both the Green Bond Principles and the Climate Bonds Initiative definition.[65]

Across the country, a number of states have issued municipal green bonds to finance a broad range of energy and environment projects. In 2015, Washington led total state issuances with over $1 billion in green bonds issued, with Massachusetts at $915 million and New York with $479 million.[66] As of 2016, 23% of the use of proceeds for the total U.S. municipal green bond market was allocated toward energy projects.[67]

Case Study: Massachusetts green bond issuance

In 2013, the Commonwealth of Massachusetts was the first state to issue green bonds, with $100 million earmarked as "green" as part of a larger $475 million general obligation bond issuance.[68] The green bonds were issued under the full faith and credit of the Commonwealth, and the use of proceeds went toward a range of environmental projects in the state, with 48% of the proceeds going toward energy efficiency projects in state buildings.[69] A key benefit to the Commonwealth was attracting new large institutional investors to participate in this issuance, including TIAA-CREF. The Commonwealth has gone on to issue additional green bonds in 2014 and 2017.[70]

Relevance in NJ

New Jersey has yet to fully take advantage of the green bonds mechanism to support energy and energy efficiency projects. The NJ Environmental Infrastructure Trust (EIT), with a AAA bond rating, has completed three green bond issuances in 2016 and 2017.[71] However, according to EIT's bonding authority, all use of proceeds has gone to water and stormwater infrastructure upgrades in municipalities across the state.[72] EIT has also not elected to include an independent review of these green bonds,[73] a process impact investors are often interested in to verify the "green" impact of such labeled bonds. Finally, the State's credit rating has been downgraded several times in recent years, making it potentially less attractive for a state-level issuance.

Moving forward, New Jersey could raise private capital for energy projects by issuing green bonds either at the municipal level, or through state-level investment institutions. Any institution that has bonding authority, as well as the credit worthiness and/or ability to repay can issue green bonds for renewable energy and energy efficiency. Assuming they were empowered with bonding authority, the three institutional options evaluated in this paper could use green bonds as a mechanism for further leveraging and augmenting the institution's impact—though each institution would need to determine how bonds would be repaid or rely on the backing of the state. The bonds could be issued either as a General Obligation bond under the full faith and credit of the issuing body, or could be backed by anticipated revenue streams such as energy efficiency savings or renewable energy revenues from a wind or solar project. In 2014, Sean Kidney of the Climate Bonds Initiative noted that the NJ Energy Resilience Bank could leverage green bonds: "…Green bonds provide a way for the Energy Resilience Bank to scale up its loan programs and raise capital beyond the $200 million of initial public funding. There are two options here: the bank can issue green bonds backed by the entity, or it can issue green asset-backed securities by packaging together its energy resilience loan portfolio once a sufficient size of lending has been achieved."[74] While theoretically the ERB had this capability, the organization did not ultimately leverage it.

Further, New Jersey could embrace and promote the use of Qualified Energy Conservation Bonds (QECBs). QECBs are taxable bonds allowed by the federal government that can be structured as tax credit bonds where investors receive tax credits instead of interest payments, or as direct subsidy bonds where bond issuers receive rebates from the U.S. Department of Treasury to subsidize interest payments. These bonds can be used for energy efficiency projects that reduce a public building's energy usage by 20% or more, renewable energy production, and other energy-related uses.[75] QECBs must be issued by a public entity, though 30% of the proceeds can be used for private activity. In 2008, Congress

approved $3.2 billion in appropriations for this program, and allocations were made to states according to population size.[76] New Jersey has been allocated over $90 million of QECB capacity, but has yet to use any of this capacity - it is one of just thirteen states that has not used any of its allocation.[77]

PROS & CONS OF NJ'S USE OF GREEN BONDS

Pros	Cons
• Leverages existing resources by drawing in private capital • Engages new and place-based investors who might be drawn to the environmental focus of these bonds • Does not require any new legislation—takes advantage of existing bonding authority • Attractive to investors for tax advantages, since municipal green bonds can be tax-exempt • Flexible—could be issued by any of the institutions considered here or by other existing public institutions	• Counts against the debt capacity of the issuing body • To keep bonds tax-exempt, there will be restrictions on the use of proceeds on public vs. private assets • May require some regulatory/administrative effort to enable certain bodies to issue bonds • Attractiveness of bond to investors (and interest rate) depends on credit rating of the issuing body, which may make this a less attractive option for some issuing bodies

Environmental Impact Bonds

Across the country, states and municipalities have embraced the concept of "Pay for Success" (PFS) - structuring investments such that they are measuring and paying for outcomes of successful programs. This approach was pioneered in the social finance space, focusing on piloting and scaling interventions related to issue areas such as reducing recidivism and increasing high school graduation rates. An Environmental Impact Bond (EIB) is an innovative financing tool that applies this Pay for Success approach to provide up-front capital for environmental programs, either to pilot a new approach whose performance is viewed as uncertain or to scale up a solution that has been tested on a small scale. In its most basic form, private investors participating in a PFS model pay the upfront costs for deploying these environmental solutions. Following deployment and program evaluation, the "payor", the public agency or private institution that benefits from these solutions, makes a repayment to investors linked to the achievement of agreed-upon outcomes of the program (such as avoided stormwater runoff).

These EIBs can be issued as true municipal bonds, either as general obligation or revenue bonds under the bonding authority of the issuing body, or they can be set up as a performance contract or loan that would not count against the debt capacity of the issuing body.

The bonds can also be backed or "guaranteed" by a philanthropic organization that agrees to make part of the repayment to investors in the event that an intervention does not achieve its intended results. This guarantee can back just the interest payments or part or all of the principal as well. The involvement of such a philanthropic "backstop" can help provide assurance to investors in projects or interventions whose outcomes are viewed as riskier.

Case Study: DC Water Bond

The DC Water and Sewer Authority (DC Water) pioneered the Environmental Impact Bond approach in 2016 with a $25 million issuance to finance deployment of green infrastructure projects (e.g., permeable pavement and bioretention) on 20 acres of land in Washington, DC. DC Water chose this approach because the performance of green infrastructure was viewed as uncertain, and they wanted to observe the outcomes of the projects before deploying their broader 360+ acre green infrastructure investment strategy. The EIB was issued as a private placement bond with Goldman Sachs and Calvert Foundation as the investors. The EIB includes performance tiers that tie outcomes to the payments that these investors receive: if the green infrastructure significantly under-performs, the investors will receive an interest rate close to zero; if it performs as expected, they receive an interest rate near DC Water's typical cost of capital for more traditional issuances; and if the green infrastructure performs significantly above expectations, they receive a higher interest rate.[78]

Relevance in NJ

New Jersey could employ Environmental Impact Bonds or other Pay for Success approaches to leverage private capital toward innovative renewable energy and energy efficiency programs. These EIBs can be issued by a range of different institution types (including any of the three explored in this report), whether or not they have bonding authority.

New Jersey has explored these mechanisms previously in the social space. In 2012, the NJ Legislature passed a bill entitled "The New Jersey Social Innovation Act" aimed at creating Pay for Success programs in the health space that would be enacted by the NJ Economic Development Agency.[79] This act was vetoed by the Governor in 2012 and again in 2015.[80]

The New Jersey Energy Savings Improvement Program (ESIP) administered by BPU embodies the same principles of Pay for Success financing - allowing local governments and school districts to invest in energy efficiency improvements in their facilities using the value of energy savings for repayment. In this case, the energy savings from efficiency investments made on properties is channeled toward debt service. The normal term on these leases is 15 years, which can be extended to 20 years if

there is a Combined Heat and Power (CHP) component to the project.[81] While ESIPs have generally funded energy efficiency programs, they can also include renewable energy projects if a Power Purchase Agreement (PPA) contributes to repayment.[82]

Environmental Impact Bonds might be a particularly useful tool in New Jersey for clean energy projects or investments that are viewed as riskier, such as those that take place in municipalities that do not have a strong credit rating. Examples of the types of projects that could be financed with an EIB include pilot residential energy efficiency programs or facility upgrades that are expected to either generate revenue from electricity production or energy savings through efficiency.

Various local resource pools could be leveraged to provide a guarantee for these EIB issuances. For instance, local philanthropies may be willing to protect part of the interest payments or principal should the investments fail to generate anticipated outcomes. Additionally, where projects exist at the intersection of water and energy - such as efficiency or renewable energy upgrades for wastewater treatment plants - State Revolving Funds, currently administered through the EIT, could be used as a guarantee on these investments.[83] With an expanded EIT, or a new State or Green Bank, these institutions could play a role in deploying EIBs for energy or other environmental projects either directly as a product offering (as a payor) or through guarantees incentivizing the participation of third-party payors or investors.

PROS & CONS OF NJ'S USE OF EIBS

Pros	Cons
• Transfers risk to private investors, allowing the government to take on new or unproven projects • Protects taxpayer dollars • Helps deploy pilots, scales successful interventions • Presents the possibility of diversifying the pool of organizations that repay investments, based on who benefits from the outcomes of those projects • Engages place-based investors	• Generally makes sense for initial investments (piloting or scaling an intervention) but may not be best suited for larger-scale investments • Requires additional time and resources for structuring the deal and deal terms

Property Assessed Clean Energy (PACE) Programs

Property Assessed Clean Energy (PACE) is a mechanism by which the financing for clean energy is secured and repaid through property taxes. For example, a commercial building might finance the installation of energy efficiency equipment to reduce building energy costs through a PACE transaction, and repay that financing on the regularly occurring property tax bill. By attaching repayment to property tax liens, lenders have highly increased security for repayment and are therefore more comfortable making otherwise unsecured clean energy loans.

PACE programs typically rely on "land-secured financing district" or assessment district vehicles to provide repayment mechanisms for the financing of energy efficiency or renewable energy projects. Depending on the state, these districts are either municipal, county or state-based. Berkeley, California was the first municipality in the United States to extend these "special assessment" districts to cover such clean energy technologies in 2008.[84] PACE typically needs to be enabled through state-level legislation, with adoption at the municipal level. PACE programs are currently active in 19 states plus the District Columbia, with PACE-enabling legislation on the books but no active programs in an additional 14 states.[85]

In a typical PACE market, finance companies will make PACE financing available to building owners who want to upgrade their buildings. The financing might come from a commercial bank, a specialized PACE financier or from quasi-public entities like a Green Bank. When the building owner agrees to the PACE project, the PACE administrator will facilitate the transaction. This includes issuance of note, or a loan, from the finance company to the project, and the municipality intermediating to place the necessary tax lien. The tax lien is then assigned to the finance company. PACE programs are complex to operate because it requires careful coordination of building owners, contractors, tax collectors, serving agencies and private lenders. Therefore, PACE administrators—who can be a single public agency, aggregated public agencies, or a private non-profit or for-profit entity—play an important role in enabling PACE programs and markets to operate. States like Connecticut, Rhode Island, and Colorado have a single designated statewide administrator to ensure market consistency, while many other states' policies have program landscapes with differing PACE rules across the state.

The repayment mechanism for PACE—unique among clean energy financing options—comes through a special tax assessment on the property as an off-balance sheet lien that stays with the property itself, and not with the property owner if the property changes hands. While the vast majority of PACE issuances have been used to finance energy efficiency or renewable energy, new and amended statutes could also allow for more improvements related to resilience or water conservation. PACE is divided into residential and commercial programs:[86]

	Commercial	Residential
Number of states active	13	3
Number of states enabled	19	22
$ invested (million)	$482	$3,670
Number of properties	1,097	158,000
Number of jobs created	7,222	30,000
Efficiency / Renewables mix	63.5% / 36.5%	58.0% / 37.0%

Though the amount of residential PACE issuances has far exceeded that for commercial PACE, residential PACE is only active in three of the 22 states in which it is enabled, while commercial PACE is active in 13 of the 19 in which it is enabled—enabling PACE legislation does not guarantee a PACE market. Residential PACE programs have historically been less politically expedient, stemming from the 2010-11 guidance of the Federal Housing Finance Authority (FHFA), which regulates the two biggest mortgage lenders in the US—Freddie Mac and Fannie Mae—against underwriting mortgages for homes enrolled in a PACE program, because PACE takes a first lien position. No state has activated residential PACE since this ruling, but the residential PACE market in the three states in which it is already active has continued to grow. After filing an unsuccessful lawsuit against the FHFA, California created a $10 million loan-loss reserve in case of default by PACE homeowners.[87] In 2016, the Federal Housing Authority (FHA) issued new rulings authorizing mortgages so long as the PACE lien takes a subordinated position and PACE payments are escrowed, as with other property taxes.[88]

Growing comfort with PACE as a subordinated lien, and evidence indicating that due to energy improvements, foreclosed homes with PACE obligations still have higher resale value than those without, could help continue to grow the market for residential PACE.[89] But concerns about consumer protection have remained, and new federal proposed legislation introduced in April 2017 along these lines could threaten the future of residential PACE.[90] These issues should not affect commercial sector PACE, where legislation and successful programs currently operate where the PACE lien is senior to the existing mortgage. Good policy has required existing mortgage holds on commercial buildings to give written approval before allowing a PACE lien to come in senior to their mortgage. This structure has helped commercial PACE avoid much of the controversy and argument between PACE supporters and mortgage lenders.

Case Study: Connecticut Green Bank's C-PACE

States in which commercial PACE (C-PACE) is enabled and active vary in the degree to which state-level actors and agencies are involved. In some states like California, the market was organically driven and championed by municipalities and private industry actors, and concerns over respecting local autonomy and the resource burden for statewide administration outweighed any marginal benefits that could have come from state involvement. As a result, though it is supportive of PACE, the state does not participate in its administration.[91]

Connecticut municipalities were concerned about their constrained ability to allocate financial and staffing resources to administer PACE on a local, disaggregated basis, and state-level stakeholders wanted to create consistency in the PACE market.[92] Therefore, legislation was passed in 2012 that amended the state's PACE-enabling statute from a year earlier, designating Connecticut Green Bank (CGB) as the sole administrator of PACE throughout the state. In Connecticut's C-PACE framework, local or private entities are not allowed to create their own PACE administration programs or policies, but municipalities are still involved in recording, collecting, remitting, and assigning the assessment. Further, through its open market model, CGB not only allows but encourages the participation of multiple private capital providers in addition to or in lieu of its own PACE loans, reviewing and presenting available financing options to the borrower, and is also allowed to employ the services of third-parties for administration support.[93]

Though CGB relied on its own balance sheet to issue loans for the first few C-PACE projects in the program's early days,[94] up to 90% of C-PACE investments are now provided by private capital.[95] As of June 2016, cumulative C-PACE investment amounted to $72.5 million in the state (second only to California), placed in 114 projects representing 15.7 MW of renewable energy or energy efficiency resources.[96] On July 24, 2017, CGB announced that C-PACE investment had surpassed $100 million.[97]

Relevance in NJ

Enabling legislation for PACE in New Jersey, sponsored by State Senator Bob Smith, was enacted in 2012.[98] However, to date, no PACE financing has been issued in the state. Two primary barriers have impeded the operationalization of PACE.

First, the 2012 legislation does not allow for the participation of private sources of capital to finance PACE administration programs. The alternative—relying on public municipal-level bond issuances—has been a non-starter for mayors of municipalities across New Jersey. Some interest has grown in the potential to use county-level issuances from County Improvement Authorities. Opening up PACE for more direct private financing, and disentangling municipal bonding from PACE, should be

considered prerequisites for a functional PACE market in the state.

Second, all PACE financing must be controlled and approved by the Division of Local Government Services (DLGS) of New Jersey's Department of Community Affairs, an intermediary agency between the state and local governments. Industry actors have been concerned that these approvals take too long and DLGS lacks sufficient technical capacity to oversee PACE development, and thus that this stipulation will be a cumbersome and politically challenging barrier. New iterations of the 2012 PACE legislation have been proposed in recent years with amendments that would allow for private capital and minimize the role of DLGS, but these have all been met with conditional vetoes from the Christie administration containing conditions that would be infeasible to execute. However, indications are that PACE has overwhelming backing from the state legislature, who would support revised enabling legislation.

PACE and green institutional mechanisms

PACE is a financing tool that could be administered by a Green Bank or related entity in New Jersey. In Connecticut, state legislation designated the Connecticut Green Bank to be the sole program administrator for commercial PACE throughout the state. An earlier draft of the bill for the 2012 PACE legislation in New Jersey proposed that the Economic Development Authority act in a similar role, authorizing and administering PACE for the entire state, but this was struck down. Under the current legislative framework, a New Jersey Green Bank would still be allowed to administer PACE, though without additional changes, the Green Bank might compete with private actors. Given the complexities and fraught history of residential PACE, and in the interest of political expedience, it should be left out of amended enabling legislation, at least in the first iteration. A 2015 amending bill, conditionally vetoed, allowed PACE to be used for water conservation and hurricane and flood resilience,[99] and future amending legislation should similarly consider such provisions for other critical environmental issues besides energy.

PROS & CONS OF NJ'S USE OF PACE

Pros	Cons
• Off-balance sheet financing allows obligations to stay with the property, making it a relatively low-risk and attractive tool for private property owners to install clean energy technologies • Leverages public resources (the ability to collect taxes) to draw in private capital that would otherwise be unwilling to finance unsecured clean energy projects, helping to conserve general public funds • Long terms of PACE financing help spread out payments	• Requires significant legal, administrative, and financial set up • Concerns about consumer protection and predatory lending for residential PACE • Passing legislation not sufficient—must enable wise program design and implementation • Residential PACE may not be politically expedient, and new proposed federal legislation could further threaten the residential PACE market nationally

Community Solar

Community solar refers to solar power projects developed as shared resources among a network of individual customers. These subscribers can lease or purchase shares of the off-site solar project on a monthly or up-front basis, and are then credited on their utility bills, proportionally to their shares, for the electricity that is generated from the project and sold to the grid. Community solar replicates the traditional net metering and net billing structures that make residential roof-top solar economical, but for households that cannot place solar directly on their roof to take advantage of these traditional structures (e.g., households that are in multi-unit buildings, are not owner-occupied, do not have suitable rooftops, and/or cannot afford to purchase or lease solar arrays). Though customers are not actually directly consuming electricity generated by the shared solar project (it is placed on the distribution grid), the net economic and billing result for the customer is similar to traditional net metering - the savings from the reduced utility bill exceed the monthly subscription payment, thus allowing the customer to save money through solar. This structure also allows developers and customers to realize the economies of scale from building a single large solar project instead of multiple small rooftop projects.

Currently, 26 states have at least one community solar project active, and 15 states plus the District of Columbia have some kind of enabling community solar program or policy.[100,101] With nearly 3 GW of community solar projects in development, annual installed capacity in the United States is expected to grow from 52 MW per year in 2015 to 410 MW per year in 2017.[102] Both enabling policies and demand from electricity customers for greater choice, particularly those who cannot benefit from

traditional net metering schemes, are driving the continued growth of community solar across the country.

Community solar projects can be developed either by utilities themselves or by third-party developers. The enabling legislation for community solar must allow for the aggregation of electricity meters from multiple subscribers, and the bifurcation of these customer meters from the electricity generated from interconnection of the off-site solar project. Best practices for community solar legislation also typically allow for the inclusion of other public policy initiatives, for instance through a carve-out for low- to moderate-income (LMI) households. For example, the District of Columbia's October 2016 enabling legislation mandates that the Solar for All Program, which includes a community solar component, "reduce by at least 50% the electric bills of at least 100,000 of the District's low-income households with high energy burdens by December 31, 2032."[103] Meanwhile, the Oregon Public Utilities Commission's June 2017 ruling, which established a pilot 160 MW community solar program, requires that both 5% of capacity for each project and 5% of the total program capacity be designated exclusively for low-income residential customers.[104]

Additionally, enabling community solar policies typically provide for one of two rate-setting strategies—"virtual net metering" and "value of solar." Virtual net metering replicates traditional net metering rate design, with customers credited on a one-to-one basis for the retail rate of electricity, or in certain circumstances at some percentage of the retail or wholesale rate, often accounting for continuous distribution costs (short-term interconnection costs and approvals are borne by community solar developers). Value of solar strategies include additional compensation, beyond the retail rate of electricity, for monetized economic benefits and costs from solar. These could include enhanced grid resilience, merit order effects, fuel price hedging, greenhouse gas emissions and other environmental impacts, local economic and job growth, opportunity cost of land, and domestic energy security.[105] Therefore, value of solar strategies are thought to better capture the full economic impacts of community solar installations.

Relevance in NJ

New Jersey has already benefitted since 1999 from a strong net metering policy applied to roof-top solar on individual households and buildings.[106] However, as of 2016, 37.1% of housing units in the state were in multifamily buildings and 36.8% of housing units were not owner-occupied.[107] Additional considerations like ability of households to finance traditional rooftop solar arrays, and physical suitability of roofs mean that the majority of New Jersey families—at least 50.8% of households, or 4.3 million residents—are left out of the traditional rooftop solar economy from existing net metering policy.[d]

These households would benefit most from community solar, but to date, the state has not enacted enabling policy, and thus no community or shared solar projects have yet been installed.[108] An initial bill for enabling legislation requiring BPU to create a "Neighborhood Solar Energy Investment Program" was introduced in February of 2016, but has not yet passed the state Assembly or Senate.[109] Pending enabling legislation for community solar provides an opportunity to address broader public policy initiatives, and the state should take advantage of this, for example by mandating a carve-out for low to moderate income households or incentivizing the siting of community solar projects in environmental justice communities, for example through the redevelopment of brownfields. Finally, given that value of solar rate-setting is relatively new and complex, the state should first focus on virtual net metering, perhaps drawing on its existing traditional net metering policy, to enable community solar more quickly before considering value of solar.

Community Solar and green institutional mechanisms

A New Jersey Green Bank could support community solar through credit enhancement, both to get projects built in general, and to better enable projects targeted at low- and moderate-income customers. For example, in 2017, the Maryland Public Service Commission launched a three-year community solar pilot program, assigning portions of the 193 MW total to the service territories of different utilities in the state. The Commission further designated 30% of the program's total capacity to come from small installations or those on brownfield redevelopments, and an additional 30% to come from projects with 10% or more electricity generated allocated to low-income subscribers and 30% or more allocated overall to either medium- or low-income subscribers. However, to date, the LMI category has been underpenetrated across the state, largely due to concerns over the credit quality of these customers by private lenders for the projects. There is ongoing work to evaluate the role of a Green Bank-like mechanism to serve in a credit enhancement role to encourage private lenders in LMI community solar projects. This includes development of credit enhancement to be used in the event that repayment rates for LMI projects fall below those of the program overall.

[d] Calculated based on solar suitability data from the National Renewable Energy Laboratory (NREL) and housing and demographic data from the US Census Bureau American FactFinder. Does not include additional households which cannot afford to install or finance traditional residential rooftop solar arrays.

PROS & CONS OF NJ'S USE OF COMMUNITY SOLAR

Pros	Cons
• Benefits low- and medium-income households, renters, etc. • Enhances grid resilience through distributed generation assets • Realizes economies of scale through larger solar projects	• Requires utilities to administer and bill customers • Requires the passage of enabling policy

Conclusion

This report finds that there is ample opportunity and need for NJ to adopt more innovative institutional and structural approaches to clean energy finance that would catalyze more private investment. The state can learn from others who have already implemented similar models and used new finance mechanisms to address clean energy investment needs. Creating a dedicated institutional home for clean energy finance will ensure NJ builds the focused capacity needed to drive billions of dollars of investments and keep the state on a clean energy pathway. By implementing alternative finance mechanisms, already deployed to great effect in other states, NJ can crowd-in further private investment with reduced reliance on public capital. These efforts would also lower energy costs, increase clean energy access for low-and moderate-income households, and spur local job growth. By providing the context and the pros and cons of the options considered, this report is meant to give policymakers and stakeholders the information they need to act.

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Appendix—Types of private capital

Investment Category	TRADITIONAL	RESPONSIBLE	SUSTAINABLE	MARKET-RATE	CONCESSIONARY	PHILANTHROPY
Spectrum of philanthropic offerings		Mission-Related Investing (MRI)		Program-Related Investing (PRI)		Grantmaking
Spectrum of ESG / impact	Competitive returns	ESG risk management	ESG / Impact opportunities	High impact solutions		
	Finance Only	The New Paradigm: ESG and Impact Investing				Impact Only
Description	Focus on maximizing financial return with little or no focus on ESG factors	Focus on ESG risks, primarily based on negative screening of harmful products	Focus on ESG opportunities, through investment selection, portfolio management and shareholder advocacy	Focus on opportunities where social or environmental need creates a commercial growth opportunity for market-beating returns	Priority is placed on achieving a social or environmental impact, with investment strategies that may require a financial trade-off	Focus on one or a cluster of issue areas where social or environmental need requires 100% financial trade-off
Examples	Traditional public and private investments focused on returns only, e.g. many hedge funds, mutual funds, pension funds	Private equity firm integrating ESG risks into investment analysis; Ethically-screened public equity investment fund	"Best-in-class" socially responsible (SRI) fund; Long-only public equity fund using deep integration of ESG to create additional value	Clean energy mutual fund; Emerging markets healthcare fund; Microfinance structured debt fund	Patient capital; Community Development Finance Institutions (CDFIs); Investments in high-risk projects or geographies; Philanthropic loan guarantees or other credit enhancement	Gifts, donations, grants, cash transfers, or other transactions in which no repayment is expected or possible; Issue areas where there is no repayment stream

Adapted from Bridge Ventures (2015), Allocating for Impact. Social Impact Investment Taskforce. GB and Bridge Ventures

Market return investors

Market return investors are primarily focused on generating a financial return on their investments and often participate in state or local bond issuances as part of their portfolio's debt allocation. Investments in municipal bonds (issued by states or municipalities) can also have tax advantages for investors who reside in that given geography, as the interest from those issuances is not taxed. As a result, these investors may not be primarily focused on the energy impact of the use of proceeds for the bond issuances, but are still interested in investing in bond issuances and other vehicles that generate a market-rate financial return.

Impact investors

Impact investors can characterize any investor, including a range of institutional types: family offices, foundation endowments, and pensions. These investors are seeking to put their capital to support projects that will generate a financial return as well as environmental, social, and governance (ESG) returns. In some cases, these impact investors are willing to accept a concessionary (below-market) return in exchange for those ESG outcomes. Impact investors can be broken out two ways:

- Negative screen investors: those seeking to "screen out" investments commonly-viewed as having negative social impact (e.g., tobacco and firearms)
- Positive screen investors: those actively seeking to invest in companies, equities, and debt that has positive ESG outcomes

Positive screen investors are most relevant to the purposes of this analysis. These investors are likely to be drawn to public and private equities with a clear environmental benefit, such as green bonds that support renewable energy investments in New Jersey or risk-adjusted investments in innovative project finance approaches for energy and energy efficiency.

Philanthropic investors

Philanthropic investors are foundations whose primary purpose is to achieve social impact, and who are granted tax-exempt status for their activities. Philanthropic capital is valuable to launching new and innovative investments, as it can be used to fund preliminary program development or to provide credit enhancement and guarantees on investment structures viewed as risky by traditional investors, such as Environmental Impact Bonds (described above). Many foundations are "place-based," meaning they have a geographic focus and are seeking to support social and environmental programs in a particular geography. These investors might be interested in supporting New Jersey investments based on their programmatic or geographic priorities. Philanthropies have three approaches to engaging in impact investing: Grants, Program-Related Investments, and Mission-Related Investments.

- Grants: Philanthropies have traditionally deployed capital through grantmaking that does not expect or require any financial return.
- Program-Related Investments (PRIs): More recently, philanthropies have started to exercise their ability to invest through Program Related Investments, which allows the organization to make investments for a return when the investments are related to their mission, do not support lobbying, and are not aimed primarily at generating a return. Typically revenue-generating but concessionary and not return-seeking, PRIs count toward the 5% annual distribution requirement of tax-exempt philanthropies along with their traditional grantmaking operations.
- Mission-Related Investments (MRIs): Some philanthropies are also evaluating or pursuing mission-related investing, where they seek to make investments with the foundation's endowment itself that still align with the mission of the organization overall and support their grantmaking priorities. Unlike PRIs, MRIs do not count toward the 5% annual distribution requirement and do seek returns to replenish and grow endowments, but do so through ESG, Socially Responsible Investing (SRI), or other impact funds instead of through more traditional portfolios that may not be mission-aligned.

These investors comprise the expanding set of private capital that New Jersey can leverage in support of its renewable energy and energy efficiency goals.

Appendix: Green Bank Case Studies

Connecticut Green Bank

Rather than create a new purpose-built entity, Connecticut repurposed an existing clean energy-focused entity to become the Green Bank. The Green Bank is and continues to be capitalized by two sources of funds. The largest source is a ratepayer-funded system benefit charge that the state had long collected for energy efficiency rebate funds, and redirected to the Green Bank. The other source of funding is a portion of the revenue the state earns from the sale of carbon emission allowances as part of the Regional Greenhouse Gas Initiative (RGGI). These two sources together provide the Green Bank roughly $30 million per year in new capital, and the flow from both sources is currently indefinite.

The Connecticut Green Bank employs a hybrid approach, acting as both a wholesale and retail lender. In some markets, like residential solar, the Green Bank acts as a direct lender to end-users for individual projects. But in other cases, the Green Bank is more of a wholesale lender, offering financing to other lenders who then directly underwrite projects. The Green Bank primarily focuses on distributed solar and building efficiency, taking a programmatic approach to both areas. For instance, it offers residential and commercial solar leases, provides credit enhancements to local banks to encourage residential efficiency upgrade lending, and operates a commercial building upgrade finance program that relies on property tax collections (PACE). In some cases, though, it uses more of a market-responsive approach, offering bespoke capital to finance one-off grid-tied projects like fuel cells, innovative hydropower, and anaerobic digesters.

New York Green Bank

The New York Green Bank (NYGB) was announced in January 2013 as a new $1 billion state lending entity. The state's energy office, the New York State Energy Research & Development Authority (NYSERDA), had all the legal authorities a Green Bank would need to provide financing. Therefore, the NYGB was formed as a division of the state energy office.

Separately, it was determined that the best source of funding for NYGB would be similar to those sources chosen in Connecticut. The NYGB was capitalized by redirecting a portion of the ratepayer surcharge funds collected annually to support grant programs, and also received a one-time infusion of the state's RGGI proceeds. Redirecting the ratepayer funds to NYGB required approval by the Public Service Commission (PSC). NYSERDA produced a detailed business plan and explanation of the importance of financing to support its petition to the PSC.[110] This led to PSC approval of NYGB funding in December 2013, initially allocating $165.6 million in ratepayer dollars.[111] More recent PSC decisions have laid out the pathway through which, over the next 8 years, the NYGB will receive further infusions of ratepayer funds until the total capitalization reaches $1 billion. At that point, no more funding will go to the NYGB.

The NYGB operates exclusively as a wholesale clean energy finance lender. Rather than design specific financing products and programs, it looks to the market to learn what financing is needed. In February 2014, the NYGB issued an open-ended RFP seeking applicants for funding that could demonstrate that they could not find private funding elsewhere, and that NYGB deal participation would produce "market transformation." The NYGB was designed to earn a return and operate at a scale such that it could be operationally self-sustaining. In this way, it operates much like an institutional infrastructure investment fund.

The majority of NYGB investments support portfolios of smaller underlying projects that are originated by private partners. This includes investments in commercial and residential efficiency programs, distributed wind projects, residential solar, and fuel cells. As of the end of FY2017, the NYGB is officially break-even, having generated more cumulative revenue than operating expenses since it was founded. This makes the NYGB the first Green Bank to achieve profitability to date in the U.S.[112]

Rhode Island Infrastructure Bank

The Rhode Island Infrastructure Bank was created through legislation in the summer of 2015. The governor and treasurer both campaigned on the promise of creating a Green Bank to support clean energy investment in the state. Rather than create a new entity, the state leveraged their existing expertise and institutions by tapping the state's Clean Water Finance Agency (CWFA) to become the Green Bank. The CWFA was a quasi-public entity tasked with financing water projects using state and federal funds. The legislation expanded the CWFA scope to include clean energy deployment financing, and renamed the whole entity the Rhode Island Infrastructure Bank (RIIB).

RIIB was initially funded with only $7 million in public capital. Rather than rely on a large infusion of new capital to effectively operate as a large revolving loan fund, RIIB will take advantage of the legacy balance sheet of CWFA and finance projects by issuing bonds against its own existing credit rating. RIIB was assigned responsibility for two specific financing programs in the legislation. The first is a PACE program, which is similar to that used by the Connecticut Green Bank. RIIB was also tasked with designing and implementing an Efficient Buildings Fund (EBF), which will finance energy upgrades for municipal

buildings in the state. In 2016 RIIB completed the first round of EBF funding, which used an innovative structure and partnership with the state energy office to finance 17 municipal projects across 6 towns with $17.2 million of capital.[113] The projects are cash flow-positive and will save $20 million in energy costs for citizens.

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