



**GREEN BANK NETWORK ISSUE BRIEF**

# HOW GREEN BANKS ASSESS AND REPORT IMPACTS



## About Green Bank Network Issue Briefs

Biannual issue briefs are a new Green Bank Network (GBN) product that will consist of short reports that highlight collective successes and innovations of GBN Members in specific areas. They are an opportunity for the GBN Members to share their experiences and engage in continuous dialogue with the broader green finance community.

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## About the Green Bank Network

The Green Bank Network (GBN) is a membership organization managed by NRDC and the Coalition for Green Capital that was founded in December 2015 to foster collaboration and knowledge exchange among existing Green Banks, enabling them to share best practices and lessons learned. The GBN also aims to serve as a source of knowledge and a network for jurisdictions that seek to establish a Green Bank. The GBN founding members are the Clean Energy Finance Corporation (Australia), Connecticut Green Bank (U.S.), Green Finance Organisation (Japan), GreenTech Malaysia, NY Green Bank (U.S.), and Green Investment Group (UK). Visit us at [greenbanknetwork.org/about-gbn](http://greenbanknetwork.org/about-gbn).

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The Natural Resources Defense Council is an international nonprofit environmental organization with more than 3 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, San Francisco, Chicago, Montana, and Beijing. Visit us at [nrdc.org](http://nrdc.org).

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# Introduction

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Green banks, also referred to as green investment banks, have been created to accelerate private investment in low carbon, climate-resilient (LCR) infrastructure, particularly clean energy projects.

For the purposes of this brief, “green banks” refer to the six members of the Green Bank Network as of February 2018: Australia’s Clean Energy Finance Corporation (CEFC), Connecticut Green Bank (CT Green Bank or CGB), Japan’s Green Finance Organisation (GFO), GreenTech Malaysia (GTM), NY Green Bank (NYGB), and Green Investment Group (GIG).<sup>1</sup>

The Green Bank Network (GBN) was formed in December 2015 to foster collaboration and knowledge exchange among existing green banks, enabling them to share best practices and lessons learned. The GBN also aims to serve as a source of knowledge and a network for jurisdictions that seek to establish a green banks.

Green banks are hybrid institutions: publicly owned but with a mandate to work closely with and influence private sector investors and banks to accelerate the reduction of carbon-emitting assets from their portfolios, thereby contributing to the greening of the larger economy. Due to their public nature, green banks are generally required to establish rigorous and transparent ways to demonstrate to the public that the money invested in green banks cost effectively achieves the carbon reductions necessary to meet public policy goals. At the same time, green banks must also demonstrate to private capital providers that investments are truly green and profitable.

Green banks make their case to public and private stakeholders by tracking financial performance as well as non-financial performance, including reductions in greenhouse gas emissions. We call non-financial performance “impact.”

In this issue brief, we discuss how GBN members approach impact assessment, monitoring, and reporting, as well as related challenges. Our analysis shows that, due to their role in aiming to reduce greenhouse gas emissions, green banks report on carbon emissions that are avoided because of the banks’ investments in low-carbon generation and efficiency. Other commonly reported metrics include capital committed and deployed, closed projects, projects in operation, total project value, capital leverage ratio, and size of their transaction pipeline. Green banks also employ energy-related metrics, including installed renewable energy capacity, clean energy generation, and energy savings.

Since the formation of the Green Bank Network in 2015, the six GBN members spread across five countries have begun to report their aggregate impact and share reporting metrics and processes to document the growing success of the model globally.<sup>2</sup>

Because impact measurement, monitoring, and reporting frameworks developed by green banks were created to achieve the reporting goals of each individual green bank (within the context, policies, and strategies of the states and countries in which each bank is located), these practices differ to some extent from bank to bank. Nevertheless, key issues that green banks must commonly account for in their frameworks include data collection, data analysis, impact attribution, performance monitoring, and data verification.

The broad and deep decarbonization sought by green banks requires overall market transformation—the process by which the activities of green banks facilitate transactions in which the green bank is not directly involved by pushing enduring and widespread market changes. Measuring green banks’ contribution to market transformation is difficult relative to other impact areas.

The precise avenues and mechanisms for market transformation differ from green bank to green bank based on the specific technology markets and customer segments being targeted as well as the technologies and business models involved. Measuring market transformation is challenging because it takes place over a relatively long timeframe, it requires a baseline, and causation cannot be precisely attributed due to multiple participants in the process and multiple macro factors affecting it. Green banks are experimenting with different approaches to market transformation, and continued work on developing new approaches to evaluating market transformation will contribute to a greater understanding of overall green bank impact.

## What Are Green Banks?

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The Organisation for Economic Co-operation and Development (OECD) defines a “green investment bank” as a public or quasi-public entity established to facilitate private investment into domestic LCR infrastructure, which includes renewable energy, energy efficiency, and waste and water management.<sup>3</sup>

While clean energy markets have made tremendous advances in recent years, immature and illiquid markets are still a major barrier to realizing the full potential of the shift in global energy investment. Green banks are uniquely positioned to help “mainstream” LCR investment. Green banks endeavor to animate private investment in LCR by working closely with the private sector and using market-responsive strategies such as credit enhancements and other risk mitigants, project aggregation, contract standardization, and demonstration investments. Each of these approaches can help to build a track record and increase the confidence of private investors. Understanding that public capital is in short supply, green banks use the limited public resources available to effectively connect projects with capital markets and unlock new pools of capital such as institutional investors and the green bond market.

Since 2010, more than a dozen national and sub-national governments have created public green banks and green bank-like entities at the national level (Australia, Japan, Malaysia, Switzerland, United Kingdom), state level (California, Connecticut, Hawaii, New Jersey, New York and Rhode Island in the United States), county level (Montgomery County, Maryland, United States) and city level (London, Toronto, Amsterdam, and New York City).

While green banks differ in name, scope, and approach, they generally share the following core characteristics: a mandate focusing mainly on mobilizing private LCR investment using interventions to mitigate risks and enable transactions; innovative transaction structures and market expertise; independent authority and a degree of latitude to design and implement interventions; and a focus on cost-effectiveness and performance.

### UK GREEN INVESTMENT BANK PRIVATIZATION

UKGIB was created as a publicly capitalized green bank in 2012 and was sold in 2017 to a consortium of private investment banks led by the Australia-based Macquarie Group. The sale was finalized on August 18, 2017, and the UKGIB's name was changed to Green Investment Group (GIG) to enable the expansion into markets outside the UK. A “special share” held by an independent, not-for-profit company run by five trustees was put in place to protect its green mission. The Green Investment Group has reported that the newly appointed Board “has adopted the green policies and principles that guided the GIB business since its inception.” Macquarie has reported that it is “committed to build on the leading methodologies GIB has developed for reporting on the green credentials of both new and existing investments.”<sup>4</sup> While these reports indicate that Green Investment Group under Macquarie will continue to uphold UKGIB's reporting practices, references to the Green Investment Group in this paper refer to the practices of UKGIB prior to privatization.

## What Types of Impacts Do Green Banks Track?

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Because of their focus on increasing LCR investments, green banks track impacts related to LCR infrastructure deployment and market development. These can include direct impacts (such as capital committed to clean energy projects, energy savings, and greenhouse gas emissions reduction) and indirect impacts (the widespread and enduring market changes they are pursuing, or “market transformation”).

Most green banks report direct impacts achieved at both the project and portfolio levels.<sup>5</sup> On a project level, this involves regularly updating their websites with media releases, case studies, and other resources with project-level impact data. On a portfolio level, most banks publish annual reports highlighting aggregated portfolio impact.

As locally-focused, mission-driven institutions, individual green banks often develop impact measurement, monitoring, and reporting frameworks, based on the specific context, policies, and strategies of the jurisdictions where they are located. As a result, individual green banks have different approaches for expressing mission-based goals and articulating key performance indicators. For example, CEFC and NYGB are the only green banks analyzed that systematically track the dissemination of information to industry stakeholders. Information sharing with private sector actors is key to achieving CEFC and NYGB's missions, both of which involve working with private sector partners to transform LCR infrastructure financing markets.

Another example of specific mission-based reporting is in CT Green Bank’s annual financial report, which reports residential clean energy deployment by income level, credit quality of residential borrowers by product, and the amount of lending to small and minority-owned businesses. These reporting categories align with CT Green Bank’s mission of expanding access to clean energy to all Connecticut residents, particularly low- and moderate-income communities that suffer from the state’s high electricity rates.<sup>6</sup> CT Green Bank also reports on direct job-years created as well as indirect and induced job-years supported—a key piece of its mission to “achieve cleaner, cheaper, and more reliable sources of energy while creating jobs and supporting local economic development.”<sup>7</sup>

Finally, GIG’s Articles of Association contains five “green purposes”: the reduction of greenhouse gas emissions, the advancement of efficiency in the use of natural resources, the protection or enhancement of the natural environment, the protection or enhancement of biodiversity, and the promotion of environmental sustainability. Every investment the UKGIB makes must contribute to at least one of these green purposes.<sup>8</sup> The GIG’s Green Investment Handbook outlines its process for determining whether an investment meets this requirement. This green due diligence is undertaken as part of the investment decision making process and overall impact related to the five green purposes is reported on in GIG’s annual reports as part of its “green performance”.<sup>9</sup>

While they may vary based on local considerations, direct-benefits metrics employed by green banks can be organized into the following general categories: investments and pipeline, building industry capacity, energy, and environment (see the “Reporting Category” in Table 1 on page 4).

It should be noted that reporting practices change over time, and that Table 1 only captures metrics that have already been reported in the past. In other words, the table is not comprehensive and does not suggest that any specific reporting approach is optimal; it merely identifies information that has already been made available by green banks.

Green banks’ impact reporting frameworks were each created to achieve the reporting goals of the individual institution within the context, policies, and strategies of the jurisdictions in which they’re located, but they have much in common. All green banks that were analyzed reported some version of the following metrics, as indicated in Table 1:

- Cumulative green bank capital committed to clean energy projects since inception
- Total value of projects supported
- Leverage or mobilization ratio of public funds to total value of investments/projects<sup>10</sup>
- Number of transactions closed/projects completed
- Carbon dioxide equivalent emissions avoided

**TABLE I: SELECT METRICS USED BY GREEN BANKS TO REPORT ON DIRECT IMPACTS**

REPORTING CATEGORY	METRIC	GREEN BANK						RELEVANT METRIC DETAILS	
		CEFC	CGB	GFO	GTM	NYGB	GIG		
Investments and pipeline	Cumulative green bank capital committed to clean energy projects since inception	✓	✓	✓	✓	✓	✓	NYGB's measure is overall investments to date (without netting any repayments). As part of its current portfolio at any time, NYGB tracks both funds that are committed but not deployed, and deployed amounts.  GTM investment is calculated as the amount of private debt it guarantees (which is 60 percent of total private debt).	
	Cumulative green bank capital deployed to clean energy projects since inception	✓						CEFC and NYGB report total capital deployed, in addition to total capital committed (but not necessarily deployed).	
	Total non- green bank investment in green bank - supported projects	✓	✓	✓	✓	✓	✓	Certain green banks do not explicitly report total non-green bank investment, but it can generally be derived from reported green bank investment and total project value figures.	
	Total value of projects supported	✓	✓	✓	✓	✓	✓		
	Leverage or mobilization ratio	✓	✓	✓	✓	✓	✓	CT Green Bank also tracks leverage ratio by sector (C&I, residential, statutory/infrastructure).  See Table 2 for green bank-specific definitions of leverage or mobilization ratio.	
	Value of pipeline (investments in approval process)	✓				✓	✓	✓	
	Number of transactions closed/ projects completed	✓	✓	✓	✓	✓	✓	✓	CT Green Bank tracks number of projects approved, closed, and completed.  Projects "closed" by GTM refers to the number of projects certified to receive funding through the Green Technology Financing Scheme.  NYGB tracks projects closed as well as percentage of portfolio by technology category (renewable energy, energy efficiency, other).  GFO and GIG post summary lists of closed transactions on their websites.
	Percent of total investment by financial product (loans/leases, credit enhancements, subsidies)			✓					
	Self-sufficiency	✓						✓	✓

**TABLE I: SELECT METRICS USED BY GREEN BANKS TO REPORT ON DIRECT IMPACTS**

REPORTING CATEGORY	METRIC	GREEN BANK						RELEVANT METRIC DETAILS
		CEFC	CGB	GFO	GTM	NYGB	GIG	
Building industry capacity	Dissemination of information to industry stakeholders	✓				✓		CEFC reports number of publications produced, external presentations, media releases, factsheets, feature articles, and digital presence. NYGB reports on external affairs outreach efforts in quarterly and annual reports.
	Total number of investment counterparties				✓	✓		NYGB tracks number and type of counterparties. For GTM, counterparties are GTFS participating financial institutions.
Energy	Clean energy capacity installed		✓	✓		✓	✓	CT Green Bank, NYGB, <sup>11</sup> and GIG report total clean energy capacity installed (MW or GW). GFO reports the installed or planned capacity for most projects. CT Green Bank also reports capacity installed by technology and by sector.
	Clean energy production		✓			✓	✓	CT Green Bank, NYGB, and GIG report lifetime production of clean energy generated (MWh or GWh). NYGB and GIG also report annual generation (“first year” and “average annual,” respectively). CT Green Bank reports lifetime production (MWh) by technology and sector.
	Energy savings		✓			✓	✓	CT Green Bank reports expected annual energy savings (MMBtu). NYGB reports expected lifetime energy savings (MWh or MMBtu). GIG reports average annual energy demand reduced (MWh) and energy demand reduced over remaining lifetime (MWh).
Environment	CO <sub>2</sub> eq emissions reduction	✓ <sup>12</sup>	✓	✓	✓	✓	✓	CEFC, CT Green Bank, GTM, and GIG report expected lifetime CO <sub>2</sub> eq emissions reduction of projects supported (in metric tons [Mt] except for GIG, which reports in kt). GFO and GIG report expected annual CO <sub>2</sub> eq emissions avoided (in metric tons/year and kt/year, respectively). NYGB reports expected annual (“first year”) and lifetime GHG emissions reduction (Mt), as well as annual actuals. CT Green Bank reports lifetime CO <sub>2</sub> eq emissions reduction equivalents for cars removed from the road and trees planted.
	NOx emissions reduction		✓					CT Green Bank reports NOx emissions reduction over portfolio lifetime and annually.
	Impacts on the natural environment						✓	GIG reports the percentage of projects in its portfolio that, based on environmental impact assessments, have a positive, neutral, and negative impact.
	Impacts on biodiversity						✓	GIG reports the percentage of projects in its portfolio that, based on environmental impact assessments, have a positive, neutral, and negative impact.
	Waste diverted from landfills						✓	GIG reports waste diverted over portfolio lifetime and annually (t).
	Materials recycled						✓	GIG reports waste recycled over portfolio lifetime and annually (t).

## Key Issues in Impact Measurement and Monitoring

This section describes five key issues related to impact measurement and monitoring: data collection, data analysis, impact attribution, performance monitoring, and data verification. The analysis is focused on examples from NYGB, GIG, and CT Green Bank because they have systematized and published their processes for collecting, calculating, and presenting direct-impact data from closed transactions.

### IMPACT EVALUATION FRAMEWORKS

NYGB, GIG, and CT Green Bank each have impact evaluation frameworks available to the public. NYGB's initial capitalization order required the New York State Energy Research and Development Authority, its parent organization, to develop (with public input) a Metrics, Reporting, and Evaluation Plan ("Metrics Plan") to evaluate NYGB's performance. The first Metrics Plan was published in June 2014, and the third version was published in June 2016.<sup>13</sup> In March 2015, the GIG released its Green Investment Handbook, which outlines its step-by-step process for assessing, monitoring, and reporting the green impact of its investments.<sup>14</sup> Developed as a result of its mandate to invest in projects that are both green and profitable, the Handbook includes practical tools and guidance to help financiers determine which projects are "green." In July 2016, CT Green Bank published an Evaluation Framework laying out its process for the assessment, monitoring, and reporting of program impacts and processes.<sup>15</sup> CT Green Bank is not obligated to evaluate its programs, but has committed to do so to ensure that its programs are effectively working toward the bank's objectives.

### DATA COLLECTION

Green banks work with investee management teams to collect performance data when investing in programs and projects that the green bank does not oversee day to day. This may require including data-access provisions in investment contracts and vetting of investees for their capacity to collect and report performance data.

In addition to direct investment into projects and programs, some green banks invest through funds and other indirect investing arrangements. In these cases, the green bank does not necessarily have as easy access to information on specific investments as it does for direct investments. For example, to accurately attribute its own impact through a fund, a green bank has two options: It can receive detailed information on investments and use its own methodology to calculate and attribute impact. Or, it can receive impact data from the fund manager, which requires a transparent data calculation methodology to ensure reporting consistency.

CEFC has engaged Australia's largest commercial banks in clean energy lending by enabling them to offer a discount on their standard interest rate on a loan for qualified clean energy purchases.<sup>16</sup> Through these on-lending programs, the commercial banks are making loans to retail customers, so CEFC does not have direct access to project information. Nevertheless, under its agreement with its commercial bank partners, CEFC receives information about the clean energy purchase and size of all individual loans offered through the program (e.g., AU\$1 million for a solar project). Based on the average emissions abatement of asset types in their portfolio, CEFC can estimate the impact of those loans (e.g., total greenhouse gas abatement from all solar loans) for its own reporting purposes.

### GIG PROCESS FOR ASSURING DATA ACCESS

GIG assesses the green impact of direct investments based on forecasted or actual energy generation figures provided by investee project management teams. During the due diligence process, GIG interviews the investee management team to assess its capability, capacity, and commitment to providing this data. That team provides forecasted project performance data (e.g., energy generated, energy savings, project economic life). A consultant then uses this data to calculate forecasted green impact. As stated in its Green Investment Handbook, green covenants must be integrated into the formal financing documentation, and "these must have equal legal status and recourse to enforcement measures as with any other financial covenant."<sup>17</sup>

## TRANSPARENCY AND CONFIDENTIALITY

When collecting data, green banks must account for the diverse needs and commercial practices of their private sector partners—including the need for data confidentiality. This might mean that not all information about a transaction can be made public. As a result, green bank reporting practices are designed to provide transparency while also respecting commercial practices. NYGB’s Metrics, Reporting and Evaluation Plan explains that NYGB “requires only disclosures, reporting and other conditions that are usual, customary and commercial in the normal course of similar private market transactions and which do not compromise proprietary or confidential information, subject to the NYS Freedom of Information Law, Public Officers Law, Article 6.”

The Metrics Plan goes on to state, “Striking a reasonable and practical balance between accountability and transparency and the principles outlined above remains a priority in the implementation of this Metrics Plan and is central to NYGB’s success. NYGB’s ability to secure and retain the trust and engagement of its potential counterparties, in addition to all other stakeholders, underpins its ability—as a prudent steward of considerable public funds—to accelerate and grow the deployment of clean energy in the State, transform financing markets and deliver value to ratepayers.”

## DATA ANALYSIS

Green banks analyze the impact of their activities using various methodologies and assumptions for individual metrics. Industry standard approaches include the International Performance Measurement and Verification Protocol (for energy savings of energy efficiency projects) and the Greenhouse Gas Protocol (for project accounting guidelines).<sup>18,19</sup> GIG follows these international approaches, while CT Green Bank uses calculation tools developed by the U.S. government, and NYGB uses the methodology of the New York State Energy Research and Development Authority (NYSERDA), its parent organization.

Green banks use different methodologies to calculate impact. For example, green banks use different conversion factors to estimate carbon abatement from renewable energy generation and energy savings.<sup>20</sup> NYGB uses a single 1,160 lbs./MWh conversion factor, while GIG uses different conversion factors based on the type of project being evaluated.<sup>21</sup> For example, the conversion factor for a centralized renewable energy project is 349 kg (526 lbs.)/MWh (as published by the UK government’s Inter-Departmental Analysts’ Group). CT Green Bank also uses a model with various conversion factors, depending on the technology.

Green banks also define and calculate leverage in various ways.<sup>22</sup> Leverage is often defined as the amount of non-green bank capital attracted to investments for each unit of green bank investment or, in the case of NYGB, the amount of total clean energy/sustainable infrastructure project costs mobilized by each dollar of green bank investment. Another definitional difference across green banks is what is encompassed in a reported “investment” (e.g., funds committed versus funds deployed). Table 2 below shows how each green bank defines leverage.

**TABLE 2: GREEN BANK DEFINITIONS OF LEVERAGE RATIO**

GREEN BANK	DEFINITION OF LEVERAGE RATIO
Clean Energy Finance Corporation (Australia)	Private sector AU\$ catalyzed by every dollar of CEFC funds committed to closed transactions since inception. <sup>23</sup>
Connecticut Green Bank	Private sector US\$ contributed to the gross investment (system costs) of projects for every US\$ of CT Green Bank funds committed or deployed as of the time of calculation. <sup>24</sup>
Green Finance Organization (Japan)	Private sector JP¥ catalyzed by every JP¥ of GFO funds committed or deployed to closed transactions since inception.
GreenTech Malaysia	Private sector MYR catalyzed by every MYR of GTM investment. GTM investment through the Green Technology Financing Scheme is defined as 60 percent of the total value of loans extended by private financial institutions (equal to the amount guaranteed through the scheme).
NY Green Bank	NYGB uses the term “mobilization ratio,” defined as amount of total project costs mobilized for each US\$ committed to investments by NYGB since inception. <sup>25</sup>
Green Investment Group	GIG does not report explicitly on leverage ratio but does report GB£ committed by GIG since inception and total third-party private capital mobilized.

## IMPACT ATTRIBUTION TO MULTIPLE INVESTORS

Green banks almost always invest in transactions alongside other investors. Accordingly, green banks track both total impact of projects and the impact attributable to the green bank. For example, a green bank might report the total megawatt-hours expected to be generated by a project it supported—or it might report only the portion of megawatt-hours proportional to its investment compared with the total project cost.

### GIG APPROACH TO IMPACT ATTRIBUTION

GIG attributes a proportion of a transaction's green impact to its investment. This proportion is derived from the ratio of capital mobilized by GIG's investment to the enterprise value of the investment. In other words, green impact is equal to the total capital mobilized by GIG investment (including GIG and other co-investor capital) divided by total enterprise value of the investment.<sup>26</sup>

When exiting a project, GIG reports the project's green impact up to the point of exit. At this point, GIG estimates future remaining green impact and reports it separately from GIG impact. The future remaining impact of exited transactions will not be reported going forward, since the impacts of projects not directly supported by GIG are more directly attributable to other actors. Projects that are successful after GIG's exit, such as transactions closed by UKGIB's past co-financiers without GIG's involvement, are indicative of the broader market transformation impact GIG has, as opposed to the direct impacts it generates.

The same approach applies to projects in which GIG invests through an intermediary. GIG's Green Impact Reporting Criteria states that “for capital managed by third party funds where [GIG] is a limited partner investor, [GIG] allocates only the green impact attributable to capital committed to or drawn down in respect of identifiable projects and does not attribute green impact to capital committed to funds, but not yet committed or drawn down.”

## PERFORMANCE MONITORING

Since green banks report on impacts realized over the lifetime of projects, impact data is forecasted until actual performance data can be measured. While ex ante data allows green banks to estimate the impact of closed transactions, the actual performance of assets is measured (and impact figures are adjusted) to reflect operating project performance.

For example, GIG's investees provide reports on project performance over the lifetime of project investments, including an annual comprehensive report for audit purposes. This continuous data monitoring allows GIG's Annual Report to indicate both estimated lifetime green impact and estimated annual green impact, as well as actual green impact from previous years. Similarly, NYGB also receives project reports from investees, and the data is reflected in periodic reporting. For their annual installed energy and environmental benefits report, NYGB's Metrics Plan notes that “prior reporting period values will be adjusted, as needed, to incorporate lagged data, corrections, and evaluation results. All adjustments will be identified and described.”

## THIRD PARTY DATA VERIFICATION

To ensure the quality of their performance assessments, green banks often hire independent evaluators for verification of data (both forecasted and actual). For example, CT Green Bank's Evaluation Plan Development and Implementation Process includes data auditing and reporting by an independent consultant as the final step of program evaluation.<sup>27</sup> Similarly, GIG investees provide project performance data, which is regularly reviewed and verified by an external consultant before being aggregated and reported to stakeholders.<sup>28</sup> Finally, NYGB's evaluation activities are largely undertaken by expert third-party contractors, in coordination with NYSERDA, to ensure independent review and verification.

## The Next Frontier: Market Transformation

Market transformation refers to the process through which green bank activities increase the scale of private sector investment in LCR infrastructure markets. The “market” can be broadly defined to include all LCR infrastructure, or it can be more narrowly defined by an institution that focuses on particular market segments.<sup>29</sup> “Transformation” implies widespread and permanent change toward a common envisioned future, and for green banks, that future is one in which LCR infrastructure is financed increasingly with private capital as new asset classes are created and enter the investing mainstream. Global market transformation involves the decarbonization of public and private investment with an emphasis on LCR infrastructure, which is low carbon and resilient to the unavoidable consequences of climate change. The specifics of market transformation and its assessment can vary based on the market, technologies, and business models involved.

Measuring market transformation is a difficult undertaking for several reasons: It takes place over a relatively long timeframe, it requires a baseline, and causation cannot be precisely attributed given multiple participants and multiple macro factors affecting the process.

The most experienced green banks are just beginning to evaluate their contributions to market transformation, while more recently established green banks have not yet reached this benchmark. Nevertheless, institutions can, from the outset, integrate a framework for comparing future markets to those existing at green bank inception across a number of key attributes. In the following case studies, NYGB demonstrates how a green bank can prepare for future evaluation of market changes in its early years, while CT Green Bank provides an example of how a slightly older green bank can assess market transformation as it matures.

### SETTING THE FOUNDATION FOR ASSESSING MARKET TRANSFORMATION AT NY GREEN BANK

NYGB was established in December of 2013 and launched in the summer of 2014. Initial market transformation evaluation at NYGB will take place from 2017 to 2019 and will be informed by the business experience of NYGB from its early years of full operations. The Metrics Plan establishes that “market evaluation will be conducted on sectors that NYGB has supported and will occur approximately three to five years following initial NYGB capital deployments” after a critical mass of financing and investment arrangements have closed. Perhaps most importantly, future markets will be compared to market baselines. Each NYGB transaction profile has a section on “Planned Market Characterization Baseline & Market Transformation Potential” that specifies which baseline data must be collected. This baseline will be used to assess the project and the broader market’s performance over time. Market evaluations are conducted by qualified and independent third parties.<sup>30</sup>

As these market evaluations are conducted, they will help inform NYGB’s evolving product offerings and areas of investment. Targeted studies will focus on measuring (through set indicators) market changes in sectors where NYGB has been and remains active, as well as sectors in which NYGB is no longer participating. Studies will involve long-term data collection via interviews and other sources.

### EVALUATING MARKET TRANSFORMATION AT CT GREEN BANK

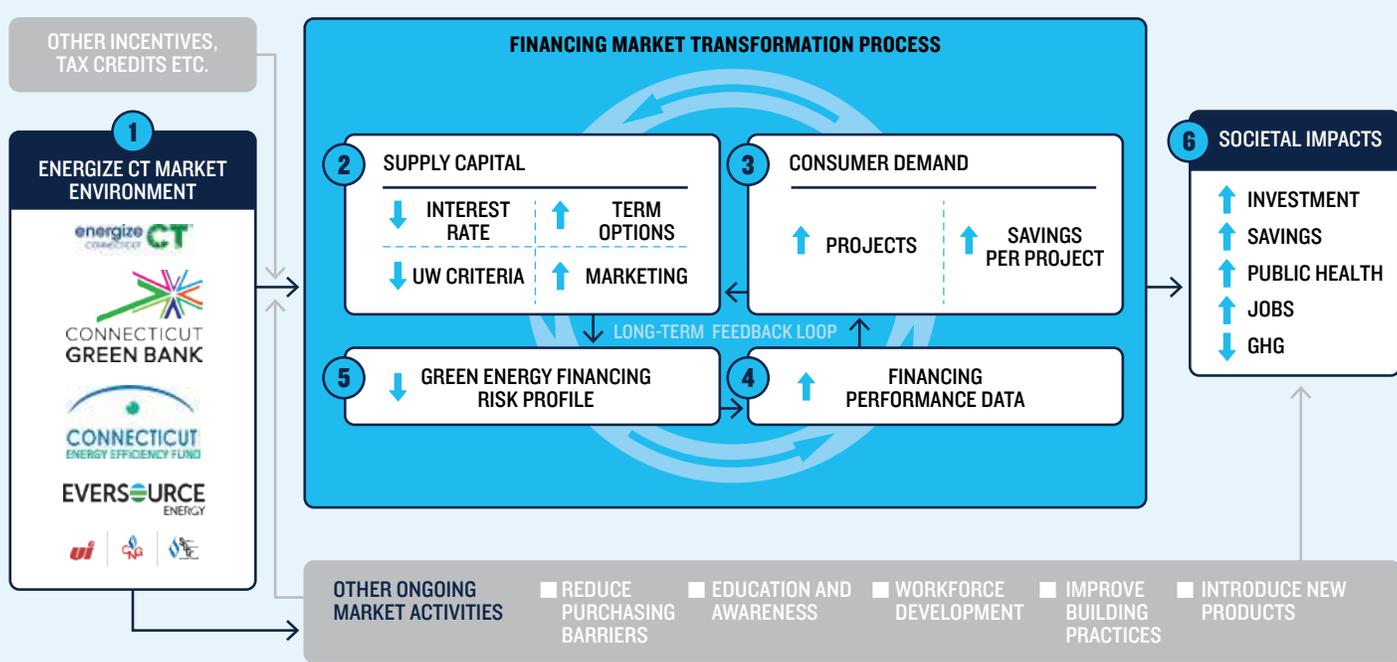
CT Green Bank defines its market transformation objective as “accelerating the deployment of clean energy—more customers and ‘deeper’ more comprehensive measures being undertaken—by securing increasingly affordable and attractive private capital.”<sup>31</sup> It has developed a Program Logic Model (PLM, see Figure 1) to show how its activities contribute to transforming the financing market for clean energy in Connecticut.<sup>32</sup> The PLM includes various other key participants and policies in the sector (e.g., utilities, tax credits). In the long run, efforts by all of these players together will lead to market transformation, and CT Green Bank’s inclusion of other players in the PLM enables coordination for maximum impact.

The PLM clearly shows that this transformation is a process. In conjunction with the listed “other ongoing market activities,” CT Green Bank seeks to facilitate this process through the following: supplying capital, increasing consumer demand by marketing financing products, disseminating information on loan performance to other financiers, and mitigating financing risk of projects (see parts 2-5 of the PLM).

For each of these activity areas, CT Green Bank has a list of program performance indicators that provide quantitative feedback on progress over time toward an established goal. For example, the list of the program performance indicators for financing demand includes total value of loans issued, number of loans issued, number of customer applications, and portion of total addressable market reached, among many others. These figures are calculated using both CT Green Bank program data and lender data. The full list of indicators is in Appendix II of the CT Green Bank Evaluation Framework.<sup>33</sup>

CT Green Bank is in the process of creating evaluation plans for its programs, which will establish how each program will evaluate direct impact and market transformation impact. An important part of creating a program evaluation plan is the selection of program performance indicators relevant to the program.

**FIGURE I. CONNECTICUT GREEN BANK PROGRAM LOGIC MODEL**



Adapted with the permission of CT Green Bank

CT Green Bank has a detailed qualitative approach to assessing the incremental market transformation impacts of its activities, but there are instances when market transformation is unambiguous. For example, the CT Solar Loan program used credit enhancements and subordinated debt to lower the barriers to financing residential solar and reduce reliance on the state’s solar subsidies.<sup>34</sup> CT Green Bank invested US\$6 million through the program to support 279 projects with more than 2 MW total installed capacity. Additionally, CT Green Bank supported the program with marketing and worked through local contractors. After three years, capital providers no longer needed CT Green Bank’s support to finance projects, and the program “graduated” to the private sector. Even without formal analysis, this “graduation” to the private sector suggests that some market transformation did occur.

Market transformation is by definition tied to the market that is being transformed; transformation will take different forms in different market sectors and geographies. As green banks reach maturity, methodologies for assessing their contributions to market transformation will evolve to demonstrate their role in implementing energy and climate policy using public resources. This will help stakeholders, including prospective green bank practitioners, to learn how to effectively design, evaluate, and implement strategies to spur the long-term growth of LCR infrastructure markets.

## Conclusion

As global clean energy markets continue to progress, green banks have a distinct opportunity to accelerate private investment in LCR infrastructure. To demonstrate their impact, green banks are developing and implementing a diversity of approaches to impact assessment, monitoring, and reporting. As they mature, green banks will also contribute to policymakers’ and other stakeholders’ understanding of how to drive broader market transformation, which is required to achieve the larger goals of fully mobilizing private capital into emerging and evolving LCR infrastructure opportunities and decarbonizing energy investment. While there are different approaches and many challenges, this analysis of GBN members reveals the significant advances green banks are already making in evaluating their impact.

## Appendix: Green Bank Snapshots

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Individual green banks' missions are included in the snapshots below, along with other overview information. These missions are generally broken down into annual objectives (in the form of key performance indicators, performance criteria, etc.) in an annual institutional plan approved by a governing body. While this brief focuses on green banks' impact reporting practices, both financial and non-financial objectives are included in the snapshots below, since green banks pursue non-financial objectives alongside financial ones.

### CLEAN ENERGY FINANCE CORPORATION (AUSTRALIA)

Established in 2012, the CEFC's mission is to accelerate Australia's transformation toward a more competitive economy in a carbon-constrained world by acting as a catalyst to increase investment in emissions reduction. CEFC has government funding in the amount of AU\$10 billion (US\$7.47 billion) over five years, comprising annual appropriations of AU\$2 billion (US\$1.49 billion) per year.<sup>35</sup> CEFC invests through project finance, equity finance, corporate loans and aggregation funding. Through June 2017, total capital committed to projects since inception was AU\$4.3 billion (US\$3.4 billion) with a total value of projects (including non-GIB investment) of more than AU\$11 billion (US\$8.7 billion).

CEFC's impact reporting practices are driven by its government directive to "facilitate increased flows of finance into Australia's clean energy sector, applying commercial rigour to investing in renewable energy, low-emissions and energy efficiency technologies, building industry capacity, and disseminating information to industry stakeholders." CEFC's Performance Criteria on which it reported in its latest annual report are:

- Performance against portfolio benchmark return
- Operating expenditure
- Placement of funds into Australia's clean energy sector
- Expected carbon abatement from projects committed to
- Financial leverage in projects committed to
- Building industry capacity (as measured by investment pipeline)
- Dissemination of information to industry stakeholders (as measured by information effectively disseminated through CEFC's website, conferences, industry presentations, media, market reports, and stakeholder communications)<sup>36</sup>

### CONNECTICUT GREEN BANK

CT Green Bank was created in 2011, with the mission to achieve cleaner, cheaper, and more reliable sources of energy while creating jobs and supporting local economic development. Under its authorizing legislation, CT Green Bank is funded by a surcharge on ratepayer bills as well as carbon-trading proceeds, leading to approximately US\$32 million in funding annually. Through June 2017, total capital committed or disbursed since inception was US\$175 million with a total value of projects in excess of US\$1 billion.

In its latest Comprehensive Plan, CT Green Bank lays out performance indicators specific to individual programs for use in measuring the success of those programs.<sup>37</sup> And in the "Non-Financial Statistics" section of its Comprehensive Annual Financial Report, CT Green Bank reports on the following measures of success across the institution:<sup>38</sup>

- Capital attracted and deployed: status of projects from approved to completed, total investment by CT Green Bank, customers and private investors, private-to-public leverage ratio by sector
- Energy saved and generated: clean energy capacity installed, clean energy produced, energy saved
- Focus of financing: as reflected in current versus non-current assets; use of grants and subsidies versus credit enhancements, loans, and leases; credit quality of residential borrowers
- Public benefits: job creation and greenhouse gas emissions reduction

### GREEN FINANCE ORGANISATION (JAPAN GREEN FUND)

The GFO (Japan) was selected by Ministry of the Environment to govern the Japanese Green Fund, which was established in 2013 to solidify the business case for small- to large-scale clean energy projects by making equity and mezzanine investments that attract further capital from private sources. The Green Fund is capitalized by a portion of revenue from the "Carbon Tax as Climate Change Mitigation." Through March 2017, the Green Fund has committed JPY11 billion (US\$110 million) to 27 projects worth JPY90.6 billion (US\$906 million).

For each project the GFO invests in through the Green Fund, it reports:

- Applicant company
- Power generation/technology type
- Investment form (direct or indirect investment)
- Region (where the project is located)
- Total project cost
- Committed investment amount
- Expected annual CO<sub>2</sub> reduction amount (metric tons per year)

## GREENTECH MALAYSIA

The Green Technology Financing Scheme (GTFS), which GreenTech Malaysia (GTM) manages, was introduced by the national government in 2010. The GTFS offers a rebate of 2 percent per annum on interest or profit rates charged by financial institutions as well as a government guarantee of 60 percent for the green cost of the financed amount. Green cost refers to the components directly related to the production of the green product; for clean energy generation projects, for example, costs for civil works, roads, etc. are excluded from green cost. The purpose of the GTFS is to finance investment for the production of green products and to finance investment in the utilization of green technology. The Malaysian government has targeted loans approval of MYR3.5 billion (US\$800 million) from the financial institutions through 2017 and has announced an additional MYR5 billion (US\$1.2 billion) through 2022.

In its latest annual report, GreenTech Malaysia reports on GTFS performance using the following metrics:<sup>39</sup>

- Number of projects certified through the GTFS (previous year and since inception)
- Number of projects receiving funding from participating financial institutions (previous year and since inception)
- Total capital invested by participating financial institutions into certified projects (previous year and since inception)
- Number of financial institutions participating in the scheme
- Green cost of projects financed through the scheme
- Total cost of projects financed through the scheme
- Projects by sector (energy, water and waste, building, transportation)
- Estimated emissions avoided (MtCO<sub>2</sub>eq)
- Number of green jobs created

## NY GREEN BANK

NYGB was established in December 2013 and formally launched in summer 2014 with the mission to accelerate clean energy deployment in New York State by working with the private sector to transform financing markets. Its investments directly contribute to the State's efforts to meet 50 percent of its electricity needs with renewable energy by 2030. It is capitalized by ratepayer funds and carbon-trading proceeds of US\$1 billion over 10 years. As of September 30, 2017, NYGB had invested US\$440.9 million into projects with a total estimated value of between US\$1.3 billion and US\$1.6 billion.

NYGB must report on metrics that correspond to specific 10-year impact objectives for clean energy generated, energy savings, emissions reductions, and mobilization ratio.<sup>40</sup> It publishes a quarterly metrics and evaluation report that provides updated progress toward these objectives.<sup>41</sup> These quarterly reports also include detailed profiles of recent transactions, each of which contain transaction-specific information on estimated energy and environmental benefits, a plan for collecting associated requisite data, and a proposed method of transaction-level impact evaluation by the New York State Energy Research and Development Authority (NYSERDA), its parent organization.

NYGB's 2017 Business Plan lays out its goals and key performance indicators for FY 2017:<sup>42</sup>

- Attract Capital to Clean Energy Capital Markets in NYS: Mobilizing capital; portfolio driving material clean energy investments across NYS; growing portfolio; strong active pipeline; stimulating new clean energy proposals in NYS
- Be Self-Sufficient: Revenue growth to maintain self-sufficiency
- Deliver Energy & Environmental Impact Benefits: Contributing to state-level clean energy objectives by supporting increased deployment of renewable energy, distributed energy, energy efficiency and other qualifying forms of clean energy (e.g., sustainable transportation)

## GREEN INVESTMENT GROUP

The Green Investment Group (GIG), formerly UK Green Investment Bank (UKGIB), has, since its inception in 2012, operated as a commercial bank with a mission to be “green and profitable” while accelerating the UK’s transition to a greener, stronger economy. Upon creation, UKGIB’s sole shareholder was the UK government’s Department of Business Innovation & Skills and it was given a UK government budgetary allocation of GB£3 billion (US\$3.7 billion).

UKGIB was sold in 2017 to a consortium of private investment banks led by the Australia-based Macquarie Group. The sale was finalized on August 18, 2017, and the UKGIB’s name was changed to Green Investment Group to enable the expansion into markets outside the UK. A “special share” held by an independent, not-for-profit company run by five trustees was put in place to protect its green mission. The Green Investment Group has reported that the newly appointed Board “has adopted the green policies and principles that guided the GIB business since its inception.” Macquarie has reported that it is “committed to build on the leading methodologies GIB has developed for reporting on the green credentials of both new and existing investments” While these reports indicate that Green Investment Group under Macquarie will continue to uphold UKGIB’s reporting practices, references to the Green Investment Group in this paper refer to the practices of UKGIB prior to privatization.

GIG has five green purposes in its Articles of Association: the reduction of greenhouse gas emissions, the advancement of efficiency in the use of natural resources, the protection or enhancement of the natural environment, the protection or enhancement of biodiversity, and the promotion of environmental sustainability. Every investment the GIG makes must contribute to at least one of these green purposes, and often investments contribute to more than one.

The Key Performance Indicators (KPIs) used to measure institutional performance are linked to GIG’s corporate strategy and set annually by the Board. KPIs included in GIG’s 2015-16 Annual Report are:<sup>43</sup>

- Capital commitment: Amount of GIG capital committed to green, profitable projects
- Financial performance: Profitability delivered through a combination of revenue growth from investments and strong cost discipline
- Innovation – GIG Offshore Wind Fund: Introduction of additional private capital in GIG Offshore Wind Fund
- Innovation – Products: Innovation in financial products and specific investments to develop the green economy
- Innovation – Green metrics: Demonstration of leadership and innovation in green reporting and policies
- Compliance: All staff compliance training up to date and completed by deadline set by Head of Compliance
- Culture report recommendations: Evidence of implementation of, or targeted progress towards, recommendations of 2014–15 culture audit

When green banks were first established several years ago, no process existed to meaningfully assess and report green impacts of commercial investments, so GIG, like other green banks, had to create its own suite of processes and principles. This effort led to the publishing of the Green Investment Handbook for evaluating and reporting project-level green impact.<sup>44</sup> The handbook has now been published in Mandarin, Spanish, and English; a version applicable to green infrastructure investments in India has been published as well.

GIG’s detailed methodology for forecasting green impact is clearly outlined in its Green Impact Reporting Criteria, which includes appendices that have sector-specific criteria and emissions factors for use in calculations.<sup>45</sup> The result of applying this methodology to a commercial investment is a Green Impact Report, which includes a forecast of green impact metrics as well as Green Impact Forecast Accuracy, which is an assessment of the level of confidence in the accuracy of the green impact forecast.<sup>46</sup>

In pursuit of standardization of green impact measurement, GIG has been working with a group of international development financial institutions (IFIs) to harmonize how they assess the greenhouse gas savings of their climate-smart investments. As a result of this harmonization effort, the group issued proposed approaches to assessing the greenhouse gas mitigation benefits of LCR projects in December 2015. GIG seeks to align its approach with the IFI group’s approach.<sup>47</sup> IFIs that agree to use this common methodology will use the same definitions, assumptions, and calculations for determining the greenhouse gas abatement of their investments.

## ENDNOTES

- 1 See box on the privatization of UKGIB and its renaming as the Green Investment Group.
- 2 For more information about the Green Bank Network, visit [www.greenbanknetwork.org](http://www.greenbanknetwork.org)
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- 6 For more on CT Green Bank’s work on expanding access to low- to moderate-income communities in Connecticut, see NRDC’s Expert Blog: [www.nrdc.org/experts/yerina-mugica/ct-green-bank-strengthens-commitment-low-income-residents](http://www.nrdc.org/experts/yerina-mugica/ct-green-bank-strengthens-commitment-low-income-residents).
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- 11 NYGB reports on energy and environmental impact metrics as follows: (1) When an investment closes, low and high estimates for relevant metrics are given for that transaction; (2) Quarterly, aggregated low and high estimates for all metrics across the portfolio are reported; and (3) Annually, aggregate actual benefits across the portfolio are reported. See: NYGB, “Metrics, Reporting and Evaluation Plan 3.0,” June 2016, [www.greenbank.ny.gov/-/media/greenbanknew/files/Metrics-Reporting-Evaluation-30.pdf](http://www.greenbank.ny.gov/-/media/greenbanknew/files/Metrics-Reporting-Evaluation-30.pdf).
- 12 CEFC does not claim that carbon abatement occurs independently of complementary public policy, such as Australia’s Renewable Energy Target.
- 13 NYGB, “Public Filings,” [www.greenbank.ny.gov/About/Public-Filings](http://www.greenbank.ny.gov/About/Public-Filings), (accessed January 8, 2018).
- 14 Green Investment Group, “Green Investment Handbook,” [www.greeninvestmentbank.com/green-impact/green-investment-handbook](http://www.greeninvestmentbank.com/green-impact/green-investment-handbook), (accessed January 8, 2018).
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- 16 For example, the AU\$100 million Energy Efficient Equipment Finance program, offered through the Commonwealth Bank, provides Australian businesses and not-for-profits lower-cost financing for a wide range of energy-efficient assets. The program offers a 0.70 percent discount on Commonwealth Bank’s standard asset finance rate. See: [www.cefc.com.au/case-studies/finance-for-energy-savings-opportunities.aspx](http://www.cefc.com.au/case-studies/finance-for-energy-savings-opportunities.aspx).
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- 18 International Performance Measurement & Verification Protocol Committee, “International Performance Measurement & Verification Protocol: Concepts and Options for Determining Energy and Water Savings,” Volume I (Revised March 2002).
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- 20 Greenhouse gas conversion factors are used to calculate the amount of greenhouse gas emissions caused by energy use. In order to convert the energy consumed in kWh to the amount of carbon dioxide equivalent, the energy use should be multiplied by a conversion factor (kg or lbs. per unit of energy).
- 21 NYGB, “Providing New Yorkers with Greater Access to Solar Opportunities,” transaction profile, (revised May 2017), see: [www.greenbank.ny.gov/-/media/greenbanknew/files/Transaction-Profile-SolarCity.pdf](http://www.greenbank.ny.gov/-/media/greenbanknew/files/Transaction-Profile-SolarCity.pdf).
- 22 Here “leverage” also includes the use of “mobilization,” though the terms are slightly different, as explained in Table 2.
- 23 CEFC removes from its calculation dollars associated with projects that it did not ultimately participate in unless it can clearly demonstrate that CEFC played a role in helping a project reach financial close with other investors.
- 24 CT Green Bank investment used in calculation is not since inception; e.g., if loans have been sold off, the remaining loans held figure is used. This means that the leverage ratio is sometimes higher than if calculated using gross investment/CT Green Bank investment since inception.
- 25 “Total Project Costs (Cumulative)” captures all capital for the relevant investment irrespective of source (including, without limitation, sponsor equity, tax equity, other equity interests, all categories and types of debt or hybrid interests and incentives), including any assumed rollover of revolving facilities. Note that many NYGB investments involve product types where funds are committed to support NYGB’s contingent obligations to clean energy projects and which, by their nature, are not intended to be drawn upon other than in specifically identified circumstances. Thus, not every dollar of Committed Funds will be Deployed. See [www.greenbank.ny.gov/-/media/greenbanknew/files/2017-06-30-NYGB-Annual-Financial-Metrics.pdf](http://www.greenbank.ny.gov/-/media/greenbanknew/files/2017-06-30-NYGB-Annual-Financial-Metrics.pdf).
- 26 Green Investment Bank, “Green Impact Reporting Criteria,” June 2015, [www.greeninvestmentgroup.com/media/44790/green-impact-reporting-criteria\\_june-2015.pdf](http://www.greeninvestmentgroup.com/media/44790/green-impact-reporting-criteria_june-2015.pdf).
- 27 Connecticut Green Bank, “Evaluation Framework,” July 2016, [www.ctgreenbank.com/wp-content/uploads/2017/02/CTGreenBank-Evaluation-Framework-July-2016.pdf](http://www.ctgreenbank.com/wp-content/uploads/2017/02/CTGreenBank-Evaluation-Framework-July-2016.pdf).
- 28 GIG is an Equator Principles financial institution, so use of external consultants for expert review of any social and environmental documentation is required.
- 29 GIG has five primary investment sectors. See: <http://greeninvestmentgroup.com/investment-sectors>.
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- 33 Opinion Dynamics and Dunskey Energy Consulting, “Evaluation Framework: Assessing, Monitoring, and Reporting of Program Impacts and Processes,” Connecticut Green Bank, July 2016, [www.ctgreenbank.com/wp-content/uploads/2017/02/CTGreenBank-Evaluation-Framework-July-2016.pdf](http://www.ctgreenbank.com/wp-content/uploads/2017/02/CTGreenBank-Evaluation-Framework-July-2016.pdf).
- 34 Connecticut Green Bank, “Comprehensive Annual Financial Report,” for fiscal year ended June 2016.
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- 36 Clean Energy Finance Corporation, “Annual Report, 2015-16: Transforming Australia’s Clean Energy Investment,” 47-48.

- 37 Connecticut Green Bank, “Comprehensive Plan, Fiscal Years 2017 and 2018” (revised July 2017), [www.ctgreenbank.com/wp-content/uploads/2017/08/Comp\\_Plan\\_FY17-FY18\\_Revised-072117.pdf](http://www.ctgreenbank.com/wp-content/uploads/2017/08/Comp_Plan_FY17-FY18_Revised-072117.pdf).
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- 39 Malaysia Green Technology Corporation, “Annual Report 2015: Promising Partnerships for Powerful Results,” 32-33.
- 40 NYGB, “Annual Review 2016 – 17 and Annual Business Plan 2017 – 18,” 10.
- 41 For example, see: NYGB, “Quarterly Report Through September 30, 2017. <https://greenbank.ny.gov/-/media/greenbanknew/files/2017-NYGB-Quarterly-Report-Sept.pdf>.
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