

New York State Energy Research and Development Authority

New York Green Residential Building Program

Final Report

August 2014



NYSERDA's Promise to New Yorkers:

NYSERDA provides resources, expertise, and objective information so New Yorkers can make confident, informed energy decisions.

Mission Statement:

Advance innovative energy solutions in ways that improve New York's economy and environment.

Vision Statement:

Serve as a catalyst – advancing energy innovation, technology, and investment; transforming New York's economy; and empowering people to choose clean and efficient energy as part of their everyday lives.

Core Values:

Objectivity, integrity, public service, partnership, and innovation.

Portfolios

NYSERDA programs are organized into five portfolios, each representing a complementary group of offerings with common areas of energy-related focus and objectives.

Energy Efficiency and Renewable Energy Deployment

Helping New York State to achieve its aggressive energy efficiency and renewable energy goals – including programs to motivate increased efficiency in energy consumption by consumers (residential, commercial, municipal, institutional, industrial, and transportation), to increase production by renewable power suppliers, to support market transformation, and to provide financing.

Energy Technology Innovation and Business Development

Helping to stimulate a vibrant innovation ecosystem and a clean energy economy in New York State – including programs to support product research, development, and demonstrations; clean energy business development; and the knowledge-based community at the Saratoga Technology + Energy Park® (STEP®).

Energy Education and Workforce Development

Helping to build a generation of New Yorkers ready to lead and work in a clean energy economy – including consumer behavior, youth education, workforce development, and training programs for existing and emerging technologies.

Energy and the Environment

Helping to assess and mitigate the environmental impacts of energy production and use in New York State – including environmental research and development, regional initiatives to improve environmental sustainability, and West Valley Site Management.

Energy Data, Planning, and Policy

Helping to ensure that New York State policymakers and consumers have objective and reliable information to make informed energy decisions – including State Energy Planning, policy analysis to support the Regional Greenhouse Gas Initiative and other energy initiatives, emergency preparedness, and a range of energy data reporting.

New York Green Residential Building Program

Final Report

Prepared pursuant to Section 1872 of the Public Authorities Law by:

New York State Energy Research and Development Authority

Albany, NY

Daniel Farrell

Project Manager

August 2014

Table of Contents

NYSERDA Record of Revision	ii
List of Figures	iii
List of Tables.....	iii
Executive Summary.....	1
1 Program Incentives.....	1
2 Budget	2
3 Program Activity and Key Milestones	3
4 Buildings	4
5 Quality Assurance	5
6 Certifications.....	6
7 Program Analysis	7
8 Energy Savings and Green Building Measures	9
Appendix A: Program Incentive Levels	A-1

List of Figures

Figure 1. Projects by Green Building Certification Level	6
--	---

List of Tables

Table 1. Program Incentive Applications Received and Incentives Paid.....	1
Table 2. Green Residential Building Program Funding Summary	2

Executive Summary

On September 29, 2008, Public Authorities Law (PAL) 1872 directed the New York State Energy Research and Development Authority (NYSERDA) to establish a green residential building grant program to serve residential buildings with up to 11 dwelling units¹ for buildings receiving a Certificate of Occupancy during the timeframe of January 1, 2010 through October 31, 2013. NYSEDA convened an Advisory Group to provide guidance, and undertook a rulemaking process in accordance with the law to establish program regulations, performance requirements, and application procedures. Final regulations were published in the State Register on September 22, 2010. NYSEDA announced the establishment of the New York Green Residential Building Program (Program) on September 23, 2010. It was the second statewide program in the country² to provide direct incentives to building owners³ for certified green buildings. The Program was closed on October 31, 2013, as specified by PAL 1872.

To receive Program incentives, qualifying residential buildings had to be certified to meet or exceed the second level (Silver) of either Leadership in Energy and Environmental Design (LEED[®]) for Homes or LEED for New Construction, or the National Green Building Standard[™] (NGBS). Additional Program-specific energy efficiency performance and occupant health and safety requirements also had to be met. Green building refers to buildings that are designed and built to deliver improved environmental performance in site preparation, water efficiency, energy efficiency, building materials selection, and indoor environmental quality, relative to buildings using typical construction practices.

NYSERDA is issuing this final report to the Governor, Temporary President of the Senate, and Speaker of the Assembly, pursuant to Section 5 (Reporting) of PAL 1872. This report provides information on all Program activities to date. In summary, 610 applications were received, 579 applications were approved, and \$3,076,041 of incentives were paid.

¹ A dwelling unit is defined in Program Regulations (21 NYCRR, Part 508) as “a single, independent unit for providing living, sleeping, eating, cooking, and sanitation facilities, for one or more persons to perform life activities,” consistent with the definition in the Building Code of New York State.

² Delaware’s “Green for Green Program,” initiated in May 2010, was the first.

³ The “owner” is defined in the Program regulations as the individual or entity that owns the building on the date the Certificate of Occupancy is issued for newly constructed buildings, or the date the Certification of Completion is issued for substantially renovated buildings.

1 Program Incentives

NYSERDA's Green Residential Buildings Program received 610 applications over the duration of the program. Of those received, 95% or 579 were approved, which culminated in total funding of \$3,076,041.

Table 1. Program Incentive Applications Received and Incentives Paid

Cumulative total of incentive applications received, approved, and withdrawn as well as incentives paid represent the duration of the program, which ended October 31, 2013.

Incentive Applications Received	Applications Approved	Applications Pending	Applications Denied or Withdrawn	Incentives Paid
610	579	0	31	\$3,076,041

Of the 579 approved buildings, 565 were newly constructed and 14 were substantial renovations.

2 Budget

NYSERDA expended a total of \$3.349 million to fund the approved applications.⁴ All expenditures are summarized in Table 2.

Table 2. Green Residential Building Program Funding Summary

Budget Item	Expenditures
Incentives	3,076,041
Regulatory Filing Costs	143,450
Marketing	18,323
Database Development	30,091
Quality Assurance Contractor	<u>81,935</u>
Totals	\$3,349,840

⁴ \$2,749,728 in Regional Greenhouse Gas Initiative (RGGI) funds were allocated to the Program. Additionally, \$600,112 in State Energy Program (SEP) grant funds were allocated to the Program incentives.

3 Program Activity and Key Milestones

Over the program's duration, the following milestones were reached:

- **September 2010:** The Final Regulations were published in the State Register on September 22, 2010, and the Program was launched the following day.
- **October 12, 2010:** The first incentive application package was received.
- **November 2011:** NYSERDA implemented an incentive reservation process to ensure that demand for the program did not exceed funds available. This process required that building owners provide an Incentive Reservation Form to NYSERDA, with the owner's best estimate of construction start and completion dates, and anticipated total incentives to be requested after completion. Owners were required to receive written approval of the Incentive Reservation Form from NYSERDA before they could submit Incentive Application Forms. Overall, 78 Incentive Reservation Forms were approved, three were rejected, and six withdrawn. The incentive reservation process allowed NYSERDA to establish a reliable project pipeline to gauge demand and manage the Program budget. Overall, the incentive reservation process was effective in ensuring that the Program did not become over-subscribed.
- **January 2012:** NYSERDA introduced a clearer and more streamlined process to approve participation by Technicians in the Program. Technicians were required to provide a Signature Form, and documentation showing they met strict qualifications per the Program regulations. The Signature Form bound them to a Partnership Agreement, which detailed NYSERDA's requirements for participation. Prior to this agreement, Technicians were approved through a more formal and time-consuming Request for Qualifications (RFQ) process that involved quarterly review committee meetings.
- **August-September 2013:** NYSERDA staff sent several reminder email messages to Technicians to remind them that all application materials had to be submitted by October 30, 2013.
- **October 2013:** A total of 151 incentive application packages were received in October 2013, which was the busiest month in Program's history by a large margin. Review and approval of these packages carried through the month of November. No incentive applications were submitted after the deadline.

4 Buildings

The projects participating in the Program were predominantly detached single-family homes (351) or attached townhouses (201), however 27 small multifamily buildings received incentives through the Program. Because of the building size limitation (11 dwelling units) established in the enabling legislation, the Program did not achieve significant penetration in the multifamily housing market. There was strong participation in the program by affordable housing developers. The Program did not serve any mixed-use buildings.

5 Quality Assurance

NYSERDA's Quality Assurance contractor completed 18 site inspections on buildings that applied for Program incentives during the Program term. These inspections confirmed that participating Technicians accurately documented the measures installed and performed high-quality building diagnostic testing on the inspected buildings. No deficiencies were noted for any of the Quality Assurance inspections.

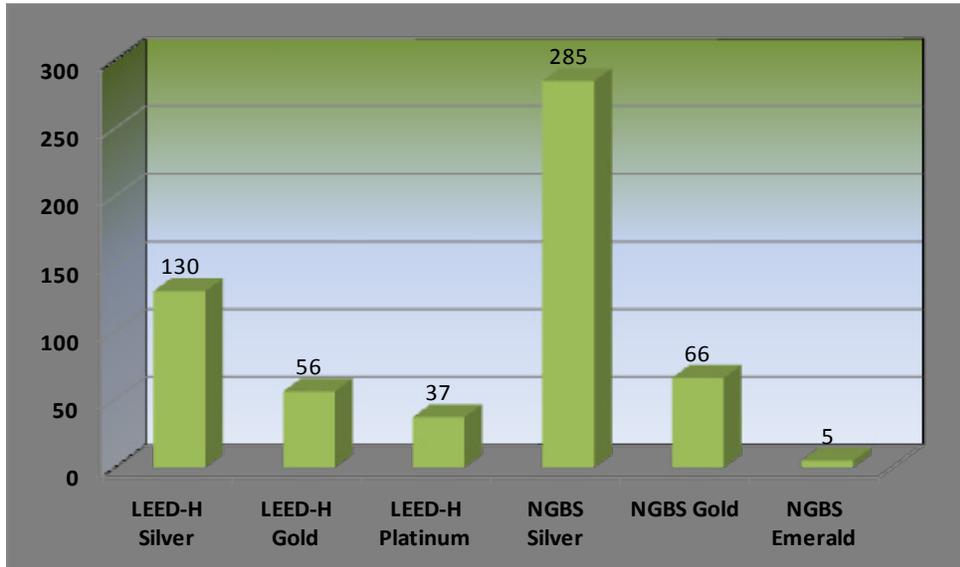
The rate of denied or withdrawn applications was about five percent of the total submitted, which indicates that participants generally understood program requirements.

6 Certifications

For the 579 buildings where applications had been submitted and approved for Program incentives, 223 received LEED for Homes (LEED-H) certification, and 356 were certified to the National Green Building Standard (NGBS). There is a market for both systems in New York State, however NGBS certifications outnumbered LEED-H certifications in this Program. The numbers of projects achieving each specific certification level are provided in Figure 1.

Figure 1. Projects by Green Building Certification Level

Platinum is the highest level achievable under LEED-H and Emerald highest under the NGBS. Silver is the lowest certification level allowed by the Program (both LEED and NGBS offer a Bronze level). The certification level achieved is determined by total points accumulated on the project: more points are obtained by implementing more green building practices, indicating a higher level of green building performance.



7 Program Analysis

As previously noted, the majority of homes in the program that were certified with the NGBS achieved Silver certification. NYSERDA believes the most likely explanation is that production builders, as a cost control measure, did the minimum amount of upgrading needed to achieve Silver certification and access the Program incentive. Based on discussions with Program participants, it is likely that without the incentive from NYSERDA, some of these builders would not have pursued and obtained green building certifications. Builders have told NYSERDA staff that the incentive helped offset the cost of any needed upgrades and the site inspections by the Green Verifier. Some builders intending to pursue LEED certifications may have done so anyway, absent an incentive from NYSERDA, as LEED certifications are better known in the marketplace than the NGBS and have a certain level of demand associated with them. It should be reiterated that these conclusions regarding success of the Program in driving more green construction are not based on a formal survey or evaluation process, but largely from conversations with Program participants.

In addition to the Program incentive, some participating builders cite building green as a good differentiator, which gave them a marketing advantage with respect to their competitors. For example, one active builder in the Program had the best year in the company's 40-year history in 2013. This timing coincided with their commitment as a company to certify all of their homes green and pursue net-zero energy performance. This success story for the Green Residential Building Program demonstrates that this commitment has remained in place even after the Program has concluded.

In the high-performance residential building market, building performance systems or processes aimed at promoting very energy-efficient residential construction substantially above current ENERGY STAR[®] requirements have gained more recognition and traction in recent years. These standards include the U.S. Department of Energy's Zero Energy Ready Home, the Passive House Institute's (U.S.) Passive House certification, and net-zero energy⁵ construction. The organizations developing and promoting LEED for Homes and National Green Building Standard responded slowly to the increasing importance placed on energy-efficiency in the residential building market. Energy codes have become increasingly stringent, and systems seeking to measure "beyond code" energy efficiency performance have increased their visibility in the residential marketplace. However, in the past few years, green building certification systems have become less central to conversations as their energy efficiency performance requirements or pre-requisites are not seen as rigorous enough.

⁵ To qualify as net-zero energy, a home must produce as much electricity as it draws from the electric grid (on a cost basis), resulting in utility bills that net to zero over a year's time. This level of performance is typically accomplished through a very high-performance building shell, coupled with solar photovoltaic (PV) systems installed on the building or building site, where electricity exported to the grid is credited to the building owner by the utility.

Although green builders remain some of the early adopters of the most energy efficient construction techniques, residential green building certification systems have not yet achieved the widespread acceptance in the residential marketplace as they have in the commercial building market. Residential builders are very sensitive to first costs and risk-averse to anything that will increase construction costs and therefore make it challenging to offer their homes at competitive prices. Consumer home buying decisions continue to be most heavily influenced by traditional attributes (price, location, size, school district, perceived quality, features, and interior finishes), and less by energy efficiency and green attributes.

With that said, it is understood in the residential building industry that green building practices provide important benefits in addition to energy efficiency. The NGBS and LEED-H remain the primary, nationally-recognized systems available to measure and establish relative green building performance levels for low-rise residential buildings, however there are many successful regional and local green building rating/certification programs throughout the country, and green building continues to enjoy strong grassroots market acceptance. Consumers in the green market demographic recognize the overall cost savings and quality of life advantages of green construction relative to conventional construction.

8 Energy Savings and Green Building Measures

8.1 Program Energy Savings

Improved energy efficiency performance well beyond energy code minimum requirements should be at the core of any legitimately green building. The overall energy efficiency performance of buildings participating in the Program was outstanding. The average Home Energy Rating System (HERS) Index⁶ achieved by buildings in the Program is 52.4. To put this number in context, a building achieving a HERS Index of 100 would be expected to have about the same energy usage characteristics of building meeting the 2006 International Energy Conservation Code (IECC). The HERS index is obtained by energy modeling, which predicts energy use for heating and cooling, domestic hot water, lighting, and appliances, but actual energy use can vary widely depending on the number of occupants and their behavior. With this said, a building with a lower HERS Index is built to be capable of better energy efficiency performance than one with a higher HERS Index.

The Program has helped to meet New York State's energy use and carbon-emissions reduction goals by saving 37,494 million British thermal units (MMBtu) of gas/propane and 2,138 megawatt-hours (MWh) of electricity through the end of the program.

8.2 Approved Green Building Measures

This section summarized some of the measures and techniques commonly used in green building projects participating in the Program. These advanced measures and techniques contribute to a building's improved energy efficiency and green building performance:

- **High-efficiency furnaces:** Ratings of 92 percent Annual Fuel Utilization Efficiency (AFUE) or above was required in the Program; if a gas furnace was installed, however, a 95 percent AFUE was typical.
- **Energy (or Heat) recovery ventilators (ERVs or HRVs):** ERVs reduce energy usage by preheating incoming cold air using warm air being exhausted (through a heat exchanger, which separates the two air streams), and provide whole-house ventilation to keep adequate fresh air coming into the building.
- **Ground-source heat pumps:** Ground-source heat pumps use the ground (and its relatively constant temperature) as a heat and cold sink for purposes of space conditioning, and can be several times more efficient than the most efficient gas furnaces or electric heat pumps.

⁶ The HERS Index is a numeric comparison of the projected annual energy use of a home being designed and built and a virtual home of exactly the same size and configuration that would meet the minimum requirements of the Residential Energy Services Network's (RESNET) Reference Home. The HERS Index is expressed on a descending scale from 100 to 0. An index of 100 for the as-built home means it equals Reference Home performance in terms of projected annual energy cost. An index of 0 means the home is projected to use no net purchased energy resources. Actual energy efficiency performance may vary, depending on weather, occupant behavior, and other factors.

- **ENERGY STAR-qualified products:** Appliances, lighting, and mechanical equipment (e.g., central air conditioners) meeting ENERGY STAR requirements save energy relative to standard products.
- **High-performance windows:** Windows with low U-values provide better thermal performance, so the lower the U-value, less heat transfers across the window assembly.
- **On-demand (tankless) water heaters:** Heat water when needed only, rather than storing/maintaining hot water constantly, as with conventional tank storage equipment.
- **Advanced framing:** These techniques reduce the amount of framing lumber and increase the amount of insulation in a wall or roof assembly while providing structural integrity as required by code.
- **Spray-foam insulation:** Provides a higher R-value per inch than typical fiberglass insulation (R-value is the measure of resistance to heat transfer by conduction) and far more effectively reduces air leakage into and out of the building.
- **Alternative framing systems:** Several projects in the Program have used Insulated Concrete Forms and Structural Insulated Panels, which provide a building thermal envelope with higher R-values than typical wood-framed construction.
- **Water efficient appliances and fixtures:** Efficient dishwashers, and low-flow shower heads and faucets reduce hot water use, and thereby reduce energy use.

The median size of homes in the Program was approximately 2,333 square feet, which is slightly below the national average new home size of approximately 2,400 square feet, according to the National Association of Home Builders. A reduction in a home's conditioned floor area may help to reduce energy use, material use, waste produced, and the size of the building's physical footprint, which are all important elements of the green building design philosophy and approach.

In terms of indoor environmental and air quality, all buildings in the Program had to meet the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 62.2 requirements for proper mechanical ventilation. ASHRAE 62.2 guides the design of the ventilation system to provide adequate exhaust ventilation to remove stale air and pollutants from the building, and bring in adequate fresh air for occupants based on the number of bedrooms. Selection of materials such as wood products and finishes (paints and varnishes) with low or no levels of volatile organic compounds (VOCs), and use of hard flooring surfaces rather than carpet were other common practices for Program buildings, which further helped to improve indoor air quality and provide benefits to people with respiratory ailments.

Appendix A: Program Incentive Levels

Table A-1. Program Incentive Levels

Incentive levels are based on building units and qualified occupied square footage (QOSF).

Number of Dwelling Units in Building	Calculated Minimum Building Size (in QOSF)	Maximum Program Incentive Award for Building^a
1	1367	\$5,125
2	1633	\$6,125
3	1900	\$7,125
4	2167	\$8,125
5	2367	\$8,875
6	2567	\$9,625
7	2767	\$10,375
8	2967	\$11,125
9	3167	\$11,875
10	3367	\$12,625
11	3567	\$13,375

^a If a building's QOSF is below the Calculated Minimum Building Size shown in Table 1, then the incentive for that building did not exceed \$3.75 per QOSF. No building owner received more than \$120,000 per calendar year in Program incentives.

NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and funding to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA professionals work to protect the environment and create clean-energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York State since 1975.

To learn more about NYSERDA's programs and funding opportunities, visit nyserderda.ny.gov or follow us on Twitter, Facebook, YouTube, or Instagram.

**New York State
Energy Research and
Development Authority**

17 Columbia Circle
Albany, NY 12203-6399

toll free: 866-NYSERDA
local: 518-862-1090
fax: 518-862-1091

info@nyserderda.ny.gov
nyserderda.ny.gov



State of New York
Andrew M. Cuomo, Governor

New York Green Residential Building Program

Final Report
August 2014

New York State Energy Research and Development Authority
Richard L. Kauffman, Chair | John B. Rhodes, President and CEO