

# IBACOS®

| Home Quality + Performance |



## **NYSERDA Deep Energy Retrofits: House 3 Report**

### **Exterior Rigid Foam Retrofit Strategy**

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February 15, 2013



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## Background of the NYSERDA Deep Energy Retrofit Project

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The purpose of this project for the New York State Energy Research and Development Authority (NYSERDA) is to find new or improved strategies for exterior building solutions in regard to insulation that will provide extensive energy-savings benefits for homeowners. Deep energy retrofits (DER) is one of the solutions. In the past, DERs have been expensive and hard for the average homeowner to budget. The DER solutions proposed by IBACOS and GreenHomes America (GHA) are intended to be market friendly, affordable, and easily repeatable. The insulation strategies that will be used on nine test homes include the following:

- **Rigid foam insulation** – Four homes will have approximate center-of-wall R-values of R-28, including furring strips for siding, with additional systems approach work to supply the complete integrated DER solution.
- **Spray foam insulation** – Four homes will have approximate center-of-wall R-values of R-30, with additional systems approach work to supply the complete integrated DER solution.
- **HPwES upgrade** – One home will include criteria from the Home Performance with ENERGY STAR<sup>®</sup> (HPwES) program, including dense pack walls and window upgrades for this retrofit strategy.

In addition to the insulation, the strategies will include treatment where needed in the attic, mechanical systems, ventilation and basement band joist, walls, and floors.

This report focuses on the third test home, House 3, for the NYSERDA DER project. The report walks through a timeline of preconstruction efforts, the construction process, and post-construction activities for House 3, highlighting key areas.

## Overview

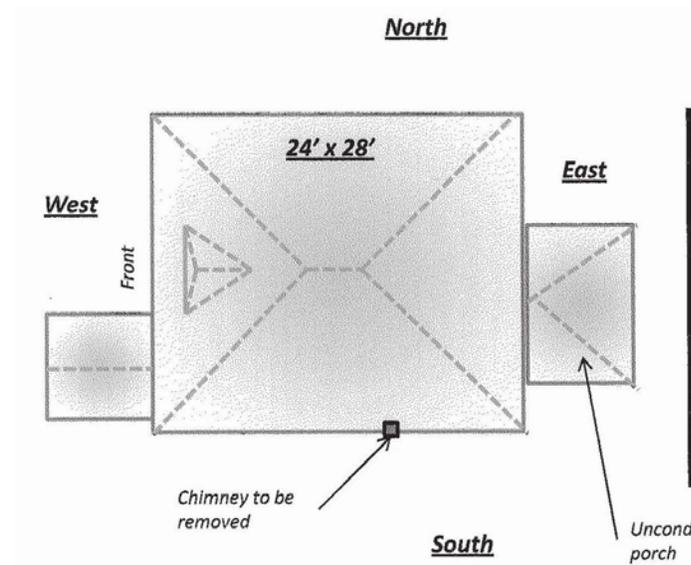
### House 3 Existing Conditions

House 3 is the third of nine test homes participating in the DER project for NYSERDA. The home is in a residential neighborhood in Jordan, New York, located at 21 Valley Drive. Two occupants currently reside in this two-story, foursquare-style home, which was built in 1920 and has a finished floor area of approximately 2,000 ft<sup>2</sup>. Figure 1 shows the site plan for House 3.

Prior to construction, GHA assessed the existing conditions of House 3. The existing home had 2 window units for air conditioning and a natural gas-fired boiler with no duct system and appeared to have no leaks in the roof. The interior of the home included 18 double-hung wooden windows with aluminum storms. The attic was a walk-up, semi-conditioned space with about 6 in. of insulation in the rafters that was in poor condition. The dry, unfinished basement was constructed with walls made of block and included the following systems: a gas boiler from 2000 with a 76% efficiency and a natural gas domestic hot water (DHW) heater from 2012 with an 80% efficiency. Existing exterior conditions of the home included aluminum siding, one chimney, one enclosed sunroom on the back of the home, one open porch with two exterior lights. Some of these conditions are shown in the photos on the right.



Figure 1. Preliminary sketch of the House 3 site plan.



## Planned Approach

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### Strategies for House 3

Once the existing conditions of House 3 were assessed, a workscope was created. This workscope described all of the renovations and updates that were to be done at this residence. Demolition of the following items occurred:

- Removal of existing aluminum siding by GHA
- Removal of the existing chimney
- Removal of the overhang at the front of the home

House 3 was to receive the rigid foam strategy, and the construction included the following:

- Installation of Mastic Quest<sup>®</sup> vinyl siding in the Deep Granite color, dutchlap profile, on all elevations.
- Installation of CertainTeed vinyl soffit material for overhangs.
- Application of white trim to the fascia, 27 OKNA windows, and three doors. GHA will also apply three pairs of shutters to the exterior of the home in locations to be determined.
- Addition of a new 4-in. dryer vent in white. Gutters will be removed and replaced by the roofer.
- Installation of a new 92% AFUE Natural Gas CH-240 Boiler.
- Installation of 6-in. of R-36 closed cell foam to the roof with the approximate area of 806 ft<sup>2</sup>.
- Installation of 3-5/8 in. of Johns Manville JM Spider<sup>®</sup> fiberglass insulation for a total of R-15 in the first- and second-floor walls, with the approximate area of 1,824 ft<sup>2</sup>. Also, installation of 3 in. of DOW extruded polystyrene (XPS) rigid insulation for an additional R-15.
- Basement rim joists with 2 in. of closed cell foam around approximately 104 ft of the perimeter. GHA will then install 2 in. of Dow Thermax<sup>™</sup> foam board on foundation walls 4 ft from the top.

See Appendix A for the workscope that explains the DER strategies for House 3.

## Preconstruction Process

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### Homeowner Approval

After discussing the workscope as previously described, the homeowners agreed on the DER construction strategy, timeline, and process. The agreement states that the homeowners will pay \$84,188. This includes a \$2,000 HEMI (High Efficiency Measure Incentive), which is a cash rebate from NYSEERDA that was paid directly to GHA; \$2,500 from a Green Jobs Green New York (GJGNY) loan program with a 3.49% 15-year fixed rate; and \$8,188 Home Head Quarters 3.99% 10-year fixed secured loan. In addition to that amount, NYSEERDA will contribute \$49,000 from the DER program toward the DER installation.

In addition, a short addendum to the agreement states that GHA will install a thermal barrier (1/2-in. sheet rock, taped and skim coat applied) over the rafters containing closed cell foam on the third floor (attic).

See Appendix B for the Homeowner Construction Agreement for House 3.

### Permitting

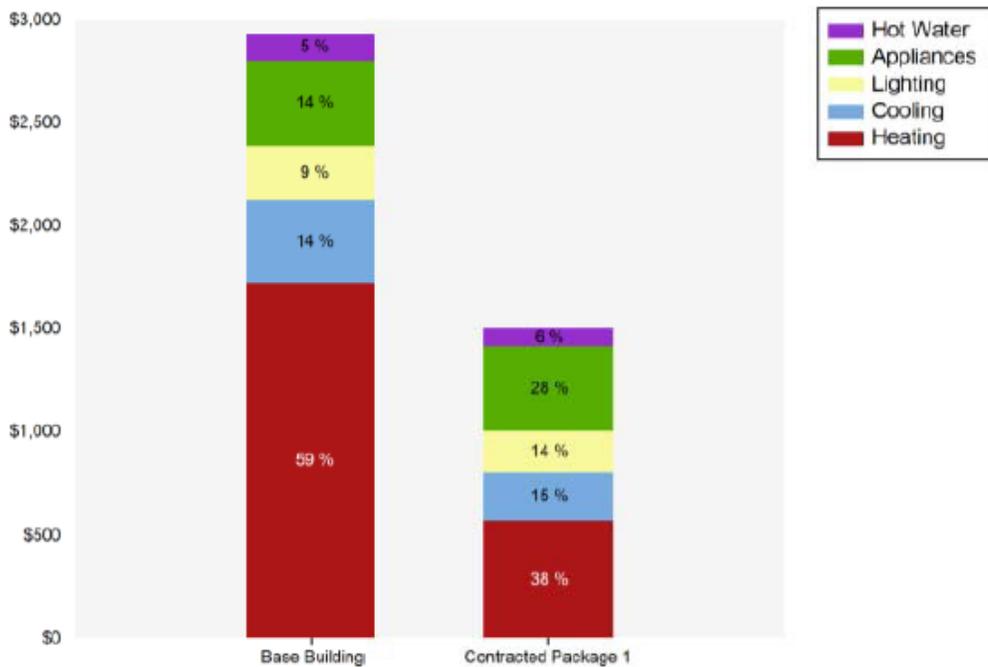
There were no permitting problems or issues with this house. Construction was able to start immediately with verbal approval from the local governing offices.

## Modeling

GHA performed Targeted Retrofit Energy Analysis Tool (TREAT) modeling for House 3. TREAT modeling involves entering and analyzing utility bill information, weather data, and building modeling information. The output report shows calculated energy savings for improvements made to the home through the DER. Figure 2 shows the source energy use for the existing House 3 prior to the DER.

See Appendix C for the TREAT modeling outputs for House 3.

Figure 2. TREAT modeling output for House 3.



## Construction Process

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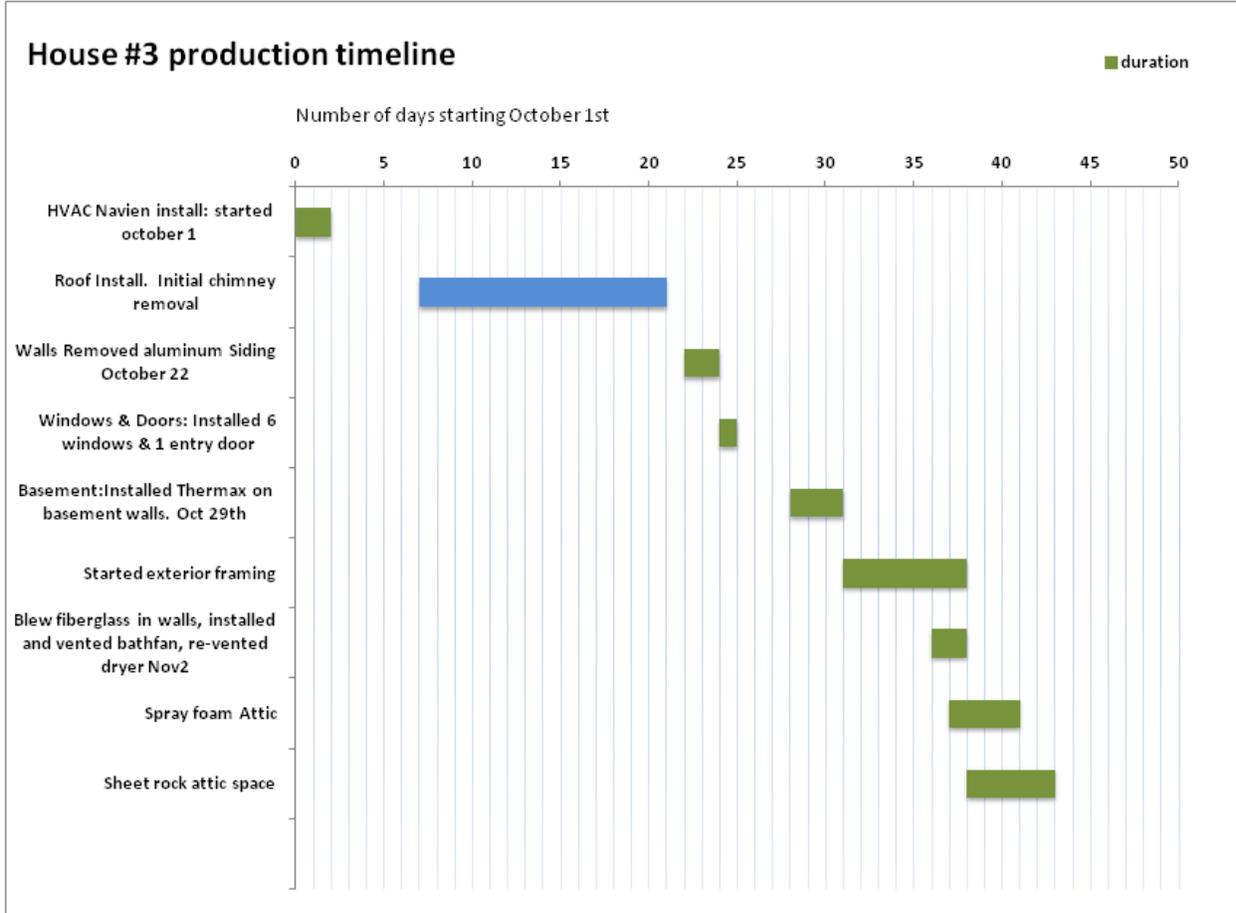
### Construction Schedule

GHA created the project schedule based on its prior knowledge of energy upgrades to homes. Heating, ventilation, and air conditioning (HVAC) equipment was the first to be installed, a few weeks before any other work was done. The installation of the HVAC equipment was scheduled earlier than the rest of the project because the customers had hired a roofer as well. GHA's contractors needed to install the HVAC in advance of other work because the chimney was eventually being removed. This was done so the roofers did not have to come back and finish the roof work after the chimney was removed for wall installation.

That HVAC equipment included a Navien Boiler/Combi Unit and an energy recovery ventilator (ERV). Construction on the house started during the last week of October with the removal of the existing aluminum siding. The contractors then removed the existing plumbing and electric and started work on the bottom ledger board, for attachment of the exterior insulation, the following week. Also completed during that week were the installation of six windows and one entry door and the installation of the Thermax on the basement walls. During the first week of November, the fiberglass insulation was blown into the walls, bath fan vents were installed, and the dryer was revented. Finally, the spray foam was applied in the attic, the sheet rock was placed, and the attic was sealed.

Figure 3 shows the production timeline.

Figure 3. House 3 Production Timeline.



## Construction Process Photos

This photo shows the front of House 3 before any DER work was done. The overhang, which runs through the middle of the home, was later demolished.



This view shows the side of the home before any DER work was done. Notice the chimney, which was later demolished.



This view shows the existing boiler and water heater.



This picture shows the existing unfinished basement.



This view shows the existing attic with minimal and patchy batt insulation.



The electrical service on the house had to be removed when the existing siding was removed. There were some difficulties with this, and the removal and reinstallation had to be scheduled in advance.



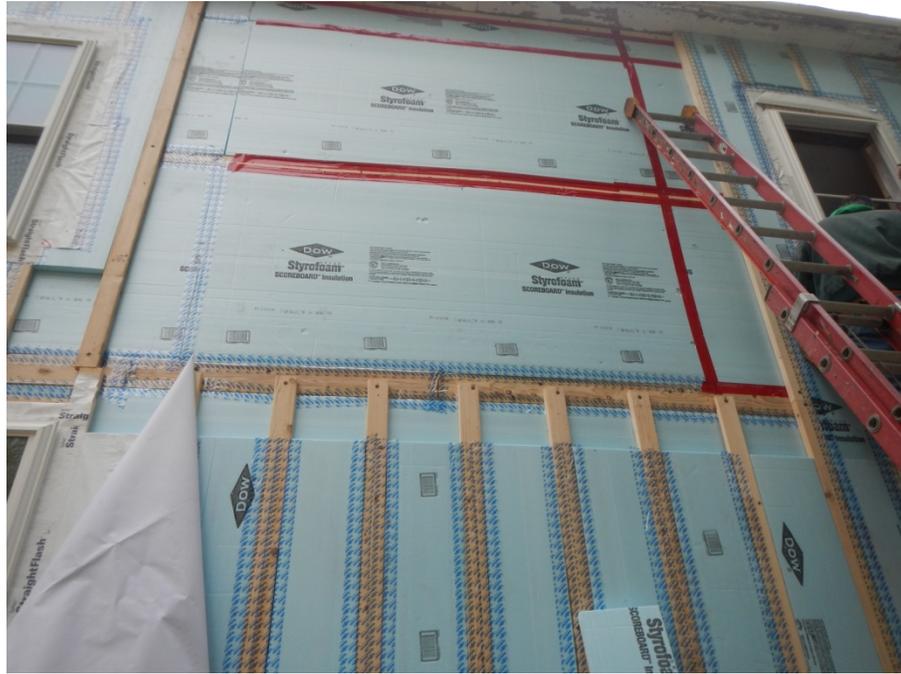
The existing chimney was removed, as shown in this picture. Also shown are the “drill and fill” dense pack locations. The JM Spider insulation was installed here.



The existing overhang was removed. After removal, it was determined that the overhang was not original to the construction of the home.



This picture shows rigid foam in the first and second layer. The first layer is horizontal, and the second layer is vertical with the 2x4s on flat.



This is a close-up view of the edge of the DER.



Here is an example of the preparation for the window flashing on House Number 3. DuPont™ Straight Flash™ was used at the jambs and head of each window.



This is a picture of the DuPont™ FlexWrap™ sill flashing after the new windows were installed but before the jamb and head flashing.



The house originally had weights and pulleys at the interior of the windows. These were removed and filled in, resulting in a larger window opening than the original window.



This picture shows the finished appearance of the interior of the windows.



Here is a view of the cap nails used to attach the Thermax on the basement walls.



This view shows the newly installed ERV system.



This view shows is the installation of new ductwork for the ERV system. Because the home had no ductwork, one supply register and one return register were placed at opposite ends of the home.



This photo shows the foil-faced Thermax and the spray foam insulation that covered the band joist.



This view from the attic shows how the walls were dense packed with JM Spider insulation.



This is the corner of the attic. The wall cavities where the blown-in insulation was installed were draftstopped and sealed.



This view shows Bayer closed cell spray foam covering the attic to give a R-36 insulation value.



Here is another view of the spray foam with the window in the attic. The window was later replaced after drywall was stocked in the space.



This picture shows the attic after the drywall had been installed.



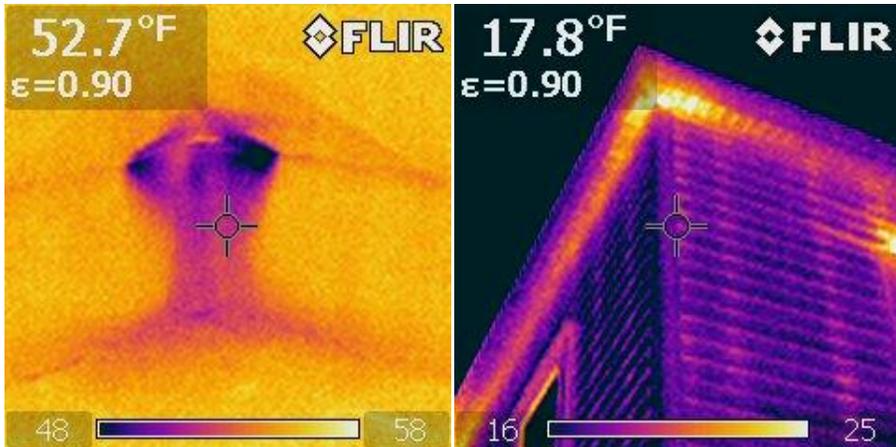
This is a view from the attic looking down the stairs to the second level.



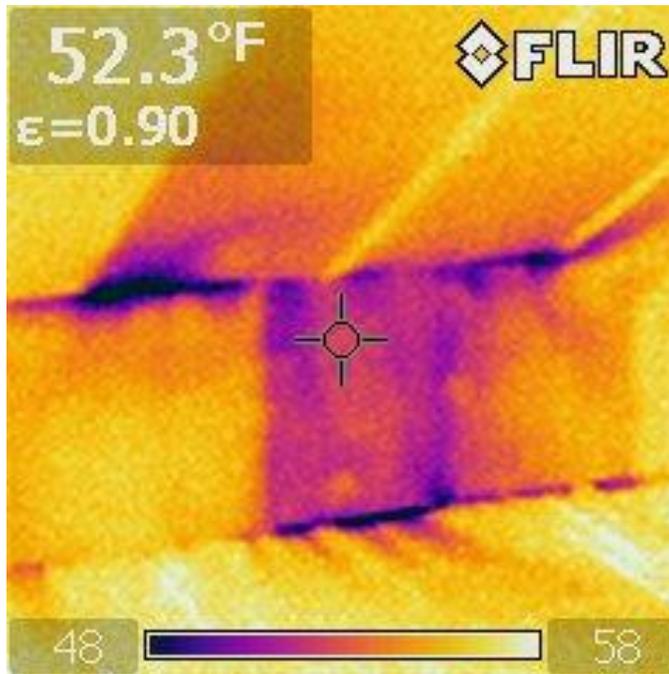
Following the homeowners' complaint about irregular snow melt on the roof line, GHA visited the home to diagnose the problem. This photo shows the corner of the attic where the drywall was not properly installed. A thermal bridge past the insulation and this unsealed drywall appeared to be resulting in a cold spot.



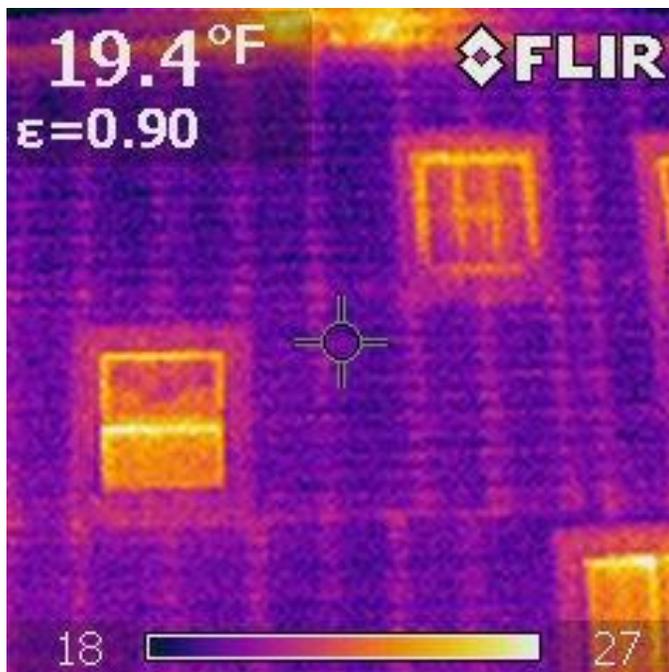
These infrared camera images show the air leakage coming from that area in the interior of the space and the exterior.



This infrared camera image shows the interior of the attic where the chimney had been located. It was determined that excessive wood was used at this location to patch the hole left by removing the chimney, resulting in poor thermal performance.



This infrared camera image shows the exterior of the home where the chimney had been located. It shows only leakage toward the roof line.



Here is a final exterior photo of the home, following the installation of the siding.



## Lessons Learned

Since this was the first two-story home in this project, the exterior framing and foam board were expected to take longer to install. This was, in fact, the case, given the need for ladders. Some consideration was given to using scaffolding; however, with the necessary staging of the work and sequencing, it seemed best to work from ladders. Another factor for the longer install was the cold weather in January in the Syracuse area. Moving forward, these implications will need to be addressed in the final pricing for the contract. Overall, the construction of the exterior wall went according to plan.

The installation of Thermax insulation in the basement went well, although again the construction team's pace was slowed by unavailability of product. The preferred finish in these projects has been the white-faced Thermax board, which was not available at that time. The construction team instead installed the foil-faced material in the basement of this home. The homeowners are not particularly pleased with the look of the foil over white finish, but the performance is comparable for these materials.

All windows were replaced. Given the somewhat unique trim detail of this home, time was spent to duplicate trim detail where necessary.

Converting the attic to a properly treated conditioned space entailed the use of spray foam and drywall, replacing the poorly installed batt insulation. Filling the empty cavity with foam met the R-value needs for the assembly; however, in an old framed home such as this, a great deal of full-dimension lumber was used in framing, including a hipped roof.

Finishing the attic came with some difficulties independent of energy concerns. The attic was a difficult space in which to move drywall material. Once the drywall material was lifted into the attic through a window, the team spent more time in labor than they would have spent on a normal renovation to finish the space with drywall as needed to meet code.

Shortly after construction was completed, the homeowners noticed ice forming at each corner of the roof and saw melt patterns lining up with the prior location of the chimney. At the start of the project, the roofers had arrived before the construction team and had removed the chimney to below the roof line. The construction team then pulled the rest of the brick off the side of the home to fully remove the chimney. The remaining chimney cavity was covered with plywood and then dense packed. From the inside, the prior chimney area was covered by the spray foam by the subcontractor as well.

The team concluded that, when covering the cavity where the chimney had been, the roofers added wooden framing that was not covered with spray foam. This wood material nailed onto the existing framing held the new deck well but left a weak point for airflow. The cavities were filled, but the wood-to-wood connection was never sealed. To address this issue, GHA went back to the home and removed drywall, removed the excess wood on the interior of the home, and covered the area in spray foam.

The airflow issue can be seen in the corners of the home. The cavities between the rafters were filled with spray foam, but the rafters resting on the corner of the kneewall over the years have likely twisted and warped, leaving small gaps. It was discovered that the drywall was not completed in each corner. For an unknown reason, the line following down each hip section of the roof was terminated short of the kneewall, and a small return was installed. This was not taped shut, and airflow resulted, as shown in the infrared images.

Infrared images reveal some of the weaknesses discovered, in addition to the ice that has formed at the corners of the roof. GHA plans to use spray foam and will finish these areas. Some drywall may need to be removed to access some areas to stop these leaks.

## **Material List**

The materials that were used on site included both donated and purchased materials. The donated materials were from some of the partnering companies for this DER project, including the following: Simpson Strong-Tie<sup>®</sup>, Johns Manville, Dow, Bayer, and Carrier. In addition to donated materials, other materials were purchased to complete the project.

See Appendix D for a complete list of the material breakdown for this project.



## **Cost per Shell Square Foot**

One of the main research questions in this DER project is to find a way to make these types of retrofits common and affordable for midstream homeowners. Because this home is the team's first two-story DER, it was estimated that the cost would rise slightly.

After construction of House 3, the material list was completed and included both donated and bought materials. Then the true costs of the project were calculated. The costing for the new wall system included the following: removal of siding, new framing, and foam board installation. That cost totaled \$13.85 per shell square foot (ssf). If the cost of the siding is added to that cost per shell square foot, the total is \$20.82 ssf.

See Appendix E for actual costing information for this House 3 project.

## Testing and Monitoring

### Testing Results

Blower door testing was conducted prior to construction, after JM Spider insulation and basement walls were applied with Thermax, after the XPS rigid insulation and windows were installed, and finally after drywall was applied to the attic.

Table 1 describes these test results. The details used for House 3 include the following:

- Volume: 17,472 ft<sup>3</sup>
- Square feet of conditioned space: 2,688 ft<sup>2</sup>
- Perimeter of house: 104 ft
- Wall height: 26 ft
- Shell square footage (ssf): 3,376 ssf

Table 1. DER House 3 Airflow Reductions by Stage.

| Improvement Stage   | CFM50 | CFM50 Reduction from Start | % Reduction from Start | ACH50 | CFM50/SSF |
|---|-------|----------------------------|------------------------|-------|-----------|
| Start   | 4802  | 0                          | 0%                     | 16.5  | 1.42      |
| Wall work:<br>(Spider insulation and basement walls with Thermax) | 2466  | 2336                       | 49%                    | 8.5   | 0.73      |
| Wall DER work:<br>(Foam board build out and windows)              | 1945  | 2857                       | 59%                    | 6.7   | 0.58      |
| Drywall installed in attic  | 1092  | 3710                       | 77%                    | 3.8   | 0.32      |

All blower door testing was done with the basement door open. The basement in House 3 was considered part of the enclosure from the beginning.

## Future Monitoring

Further monitoring and testing for House 3 will include one full heating season of data collection after completion of the DER and will consist of the following:

- Indoor temperature and relative humidity in the main living space at the main thermostat, in one bedroom, and in conditioned basement area
- Run time of the space heating system
- Outdoor temperature and relative humidity for the Syracuse area in which House 3 is located
- Blower door tests designed to evaluate the impact of the exterior wall insulation strategy with respect to the other DER improvements
- Collection of homeowner utility bills for three months of the heating season prior to DER activity and one year following the DER

## Location of House 3

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House 3 is located at 21 Valley Drive, Jordan, New York 13080.





## Summary

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Construction of House 3 was a success for the DER project and for the homeowners. The team learned valuable lessons during construction that it can apply on the next few homes that are to receive the same rigid foam application. Testing and monitoring will be telling on the success of the energy aspect of the project. After construction was completed, the material and cost analysis was beneficial to learning where there may be aspects of the project on which the team could improve. That includes the learning process for the contractors to build the wall system in a smooth and timely manner. The construction process was slower with this home because it was the team's first two-story home. In the future, the construction timeline will shorten.



NYSEERDA Deep Energy Retrofits:  
House 3 Report  
Exterior Rigid Foam Retrofit Strategy  
February 15, 2013

## Appendix A – Workscope

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Client EARLY

Acct# \_\_\_\_\_

**FURNACES**

1.  New Furnace - \_\_\_\_\_ % AFUE, \_\_\_\_\_ BTU(s) \_\_\_\_\_ Fuel \_\_\_\_\_ Furnace  
 Replacement  2-Stage  ECM Variable Speed

2.  Thermostat - Electric programmable thermostat \_\_\_\_\_

3.  Duct Work - Modify/Repair Ductwork \_\_\_\_\_

4.  Clean & Tune - \_\_\_\_\_ Filter Size: \_\_\_\_\_

5.  Other - \_\_\_\_\_

6.  Warranty - \_\_\_\_\_ Yr Parts Warranty \_\_\_\_\_ Yr Heat Exchanger Warranty \_\_\_\_\_ Yr Labor Warranty

**BOILERS**

20K -> 199K

7.  New Boiler - 92 % AFUE, \_\_\_\_\_ BTU(s) NGAS Fuel CH-240: NAVIEN Boiler

8.  Thermostats - Install ONE electric programmable thermostat \_\_\_\_\_

9.  Clean & Tune - \_\_\_\_\_ Filter Size: \_\_\_\_\_

10.  Fill/PRV - Install a New Automatic Fill / Pressure Reducing Valve

11.  Zone Valves - Install \_\_\_\_\_ New Zone Valves

12.  Circulator Pump- Install 1 New Circ. Pumps

13.  Exp. Tank - Install a New Expansion Tank

14.  Backflow Prev. - Install a New Backflow Preventer

15.  Zone Valves - Install \_\_\_\_\_ New Zone Valves

16.  Air Eliminator - Install Automatic Air Eliminator

17.  Other - PRIMARY & SECONDARY PIPING. / ARGO CONTROL

18.  Warranty - 5 Yr Parts Warranty 10 Yr Heat Exchanger Warranty 2 Yr Labor Warranty

**AIR CONDITIONING**

19.  New AC - \_\_\_\_\_ SEER, \_\_\_\_\_ BTU(s):  Replacement  Add-on \_\_\_\_\_  
CAC

20.  Thermostat - Electric programmable thermostat \_\_\_\_\_

21.  Heat Pump - \_\_\_\_\_ SEER, \_\_\_\_\_ BTU(s):  Replacement  Add-on \_\_\_\_\_ HP

22.  Duct Work - Modify/Repair Ductwork \_\_\_\_\_

23.  Refrigerant - Refrigerant Recovery & Disposal Per Clean Air Act

24.  Line Set - Install Insulated Refrigerant Lines

25.  Condenser Pad - Install New Condenser Pad

26.  Disconnect - Install a Weather-proof Disconnect

27.  Evaporator Coil - Install a New Evaporator Coil

28.  Other - \_\_\_\_\_

29.  Warranty - \_\_\_\_\_ Yr Parts Warranty \_\_\_\_\_ Yr Compressor Warranty \_\_\_\_\_ Yr Labor Warranty

**DISTRIBUTION SYSTEMS**

30.  New Ducts - Install Duct System w/ \_\_\_\_\_ Zones

31.  Duct Sealing - Seal Accessible Ductwork

32.  Balance Sys - Balance Air Flow for Even Temp's

33.  Duct Insulation - Seal Accessible Ductwork

34.  Inst Dampers - Install Balancing Dampers: Qty: \_\_\_\_\_

35.  Pipe Insulation - Insulate Accessible HW Pipes

36.  Other - \_\_\_\_\_

37.  Other - \_\_\_\_\_

Client Acceptance:  
Kathleen Early  
Date: 6/28/12

Client Acceptance:  
Robert ...  
Date: 6/28/12

GreenHomes America:  
[Signature]  
Date: 6/28/12

Client \_\_\_\_\_ Acct# \_\_\_\_\_

### ATTIC INSULATION

House Type:  Ranch  Cape  Raised Ranch  Split Level  Bungalow  Colonial  2 - Family  Other: \_\_\_\_\_  
Siding type:  Vinyl  Alum:  "Cedar Shakes  "Boards  \_\_\_\_\_; Brkr. Avail?  Yes  No; To Brkr. \_\_\_\_\_ ft. Gen. Needed?  Yes  No

Insulate the following attic areas:

|   | Attic Area Description<br>(Flat / Closed or Open Slants) | Area<br>Ft <sup>2</sup> | Existing<br>Effective<br>R-Value | CELLULOSE              | FOAMS                | Inches<br>Added | Final<br>Approx.<br>R-Value |
|---|--|-------------------------|----------------------------------|------------------------|----------------------|-----------------|-----------------------------|
| 30. <input checked="" type="checkbox"/> | F/C <u>ROOF DECK</u>                                     | <u>806</u>              | <u>-0-</u>                       | Dense Pack / Open Blow | <u>Closed</u> / Open | <u>6</u>        | <u>R-36</u>                 |
| 31. <input type="checkbox"/>            | F/C/O  |                         |                                  | Dense Pack / Open Blow | Closed / Open        |                 |                             |
| 32. <input type="checkbox"/>            | F/C/O  |                         |                                  | Dense Pack / Open Blow | Closed / Open        |                 |                             |
| 33. <input type="checkbox"/>            | F/C/O  |                         |                                  | Dense Pack / Open Blow | Closed / Open        |                 |                             |
| 34. <input type="checkbox"/>            | F/C/O  |                         |                                  | Dense Pack / Open Blow | Closed / Open        |                 |                             |

- 35.  **Stairway Entries** -  Dense Pack Cellulose  Spray with Foam :  Stairs to Attic  Stairway Walls
- 36.  **Attic Entries** - Create D/H; Repair D/H; Insulate D/H; Weather Strip D/H; \_\_\_ Hatch(s) / \_\_\_ Door(s); Loc.(s) \_\_\_\_\_
- 37.  **Retaining Walls** - Build a retaining barrier around :  Hatch  Air Handler  Chimney  Storage Area: \_\_\_\_\_
- 38.  **Kneewalls / Verticals**- Insulate open studs  kneewalls  verticals with  tyvar cover & dense pack cellulose  foam \_\_\_ ft<sup>2</sup>
- 39.  **Skylight Walls** - Attach tyvar to open stud walls and dense pack with cellulose or spray foam for \_\_\_\_\_ ft<sup>2</sup>.
- 40.  **Access Closed Cavities** -  Ceiling  Wall : To attic  flat  slope cavities. GHA (is /is not) responsible for painting.
- 41.  **Remove** :  \_\_\_" F/G Batts  \_\_\_\_\_ : Attic: \_\_\_ ft<sup>2</sup>  Open Slants: \_\_\_ ft<sup>2</sup>  Closed Slants: \_\_\_ ft<sup>2</sup>  Kneewalls: \_\_\_ ft<sup>2</sup>
- 42.  **Preparation for insulation work**:  Move / Shift storage items  Cover items with plastic  Homeowner will prep. work area.

### WALL INSULATION

Insulate the following wall areas:

|   | Wall Area Description      | Area<br>Ft <sup>2</sup> | Existing<br>Effective<br>R-Value | CELLULOSE         | FOAMS                | Inches<br>Added | Final<br>Approx.<br>R-Value |
|---|----------------------------|-------------------------|----------------------------------|-------------------|----------------------|-----------------|-----------------------------|
| 13. <input checked="" type="checkbox"/> | <u>1st &amp; 2nd FLOOR</u> | <u>1824</u>             | <u>-0-</u>                       | <u>Dense Pack</u> | Closed / Open        | <u>3 7/8</u>    | <u>R-15</u>                 |
| 14. <input checked="" type="checkbox"/> | <u>1st &amp; 2nd FLOOR</u> | <u>1824</u>             | <u>-0-</u>                       | <u>Dense Pack</u> | <u>Closed</u> / Open | <u>3</u>        | <u>R-18</u>                 |
| 15. <input checked="" type="checkbox"/> | <u>REAR MUD ROOM</u>       | <u>128</u>              | <u>-0-</u>                       | <u>Dense Pack</u> | Closed / Open        | <u>3 7/8</u>    | <u>R-15</u>                 |

- 6.  **Cantilever** -  Dense Pack with Cellulose or  Spray Foam; into overhang(s).  front  rear  side. \_\_\_ lf.
- 7.  **Drill & Patch Walls** -  Interior  Exterior to access wall cavities. GHA (is / is not) responsible for painting.
- 8.  **Enclosed Band Joists**: Fill band joists between floors \_\_\_ inches deep with cellulose for approx. \_\_\_ linear feet.
- 9.  **Lead Safe Practice**  YES  NO ; Notes: \_\_\_\_\_
- 0.  **Exclusions**: \_\_\_\_\_

### BASEMENT, CRAWL SPACE AND GARAGE CEILING INSULATION

- 1.  **Rim Joists** - Insulate with 2 inches of closed cell foam around the basement perimeter for approx. 104 lf.
- 2.  **Basement / Crawl** - Spray \_\_\_ inch(es) of closed cell foam to interior foundation walls of crawlspace for approx. \_\_\_ sf.
- 3.  **Vapor Barrier** - Install vapor barrier on crawl space ground with (6 /12 /16 / \_\_\_ mil) barrier for approx. \_\_\_ sf.
- 4.  **Floor Joists** -  Dense pack underside of floor with \_\_\_ in. of cellulose  Spray \_\_\_ in. of closed cell foam approx. \_\_\_ sf.
- 5.  **Garage Ceiling** - Dense pack ceiling with cellulose for approx. \_\_\_ square feet, resulting in approximately R-\_\_\_.
- 6.  INSTALL 2" OF DOW THERMAX FOAM BOARD ON FOUNDATION WALLS 4' FROM TOP.

Client Acceptance: Kathleen May 6/28/12

Client Acceptance: [Signature] 6/28/12

GreenHomes America: [Signature]



**Green Homes<sup>®</sup>**  
A M E R I C A

# Siding Work Scope

801 Hiawatha Blvd. E., Syracuse, NY 13208 315-474-6549

New York State's Most Awarded Contractor

|  |  |
|--|--|
| Homeowner: <u>ROBERT &amp; KATHLEEN EARLEY</u> | Date: <u>6/28/12</u>                       |
| Street: <u>21 VALLEY DR.</u>                   | City: <u>JORDON</u> N.Y. Zip: <u>13080</u> |
| Home Phone: <u>315-751-5772</u>                | Cell Phone: _____ Work Phone: _____        |
| Advisor: <u>JOHN SCIPIONE / JOE REVERE</u>     |  |

Building Type: RANCH CAPE SPLIT BUNGALOW COLONIAL CONTEMPORARY TWO-FAMILY OTHER

Proposal to furnish and install the following:

|                              |   |
|------------------------------|---|
| Complete Siding Preparations | <input checked="" type="checkbox"/> Home exterior, shrubs, landscaping, trees to be protected from damage.  |
|                              | <input checked="" type="checkbox"/> Customer to take down pictures, mirrors, and/or delicate items from interior of wall.   |
|                              | <input checked="" type="checkbox"/> Site to be left in basic good order each day, debris removed at project completion.   |
|                              | <input checked="" type="checkbox"/> Remove existing siding ( <input checked="" type="checkbox"/> alum <input type="checkbox"/> cedar shake, <input type="checkbox"/> other _____) and haul away.<br>( <input checked="" type="checkbox"/> 1 <input type="checkbox"/> 2) Layers  |
|                              | <input type="checkbox"/> Existing eave soffit to be either opened completely or cut open as wide as possible to allow maximum ventilation.  |
|                              | <input checked="" type="checkbox"/> Remove <u>(frame in)</u> and side over following areas: <u>ALL EXCEPT REAR HUD ROOM.</u>  |
|                              | <input type="checkbox"/> Apply 3/8" fanfold foam underlayment over area to be sided. <u>(N/A)</u><br>Style: ( <input type="checkbox"/> Standard <input type="checkbox"/> High-R solid core) Brand _____   |
|                              | <input checked="" type="checkbox"/> If sheathing is needed, it shall be added at \$45 per sheet.  |
| Siding                       | <input checked="" type="checkbox"/> Apply house wrap over area to be sided. ( <del>Limited Applicability</del> )  |
|                              | <input checked="" type="checkbox"/> For disposal purposes, a dumpster may need to be set in driveway.   |
| Siding                       | <input type="checkbox"/> Vinyl Siding to be applied over specified areas:<br>( <input checked="" type="checkbox"/> House <input type="checkbox"/> Attached Garage <input type="checkbox"/> Detached Garge <input type="checkbox"/> Other _____) <input type="checkbox"/> Exclusions _____<br>Brand <u>MASTIC</u> Line <u>QUEST</u> Color <u>DEEP GRANITE</u> Size _____ Profile: <u>DUTCH LAP</u>   |
|                              | <input type="checkbox"/> SPECIALTY Siding to be applied over specified areas:<br>Brand _____ Line _____ Color _____ Size _____ Profile: _____   |
| Soffit & Trim                | <input checked="" type="checkbox"/> Apply vinyl soffit material to: <u>CERTAINTEED BEADED TRIPLE 2" - FRONT</u> → <u>SOLID TRIPLE 4" OVERHANGS</u><br>( <input type="checkbox"/> Overhangs <input checked="" type="checkbox"/> Porch Ceiling(s) <input type="checkbox"/> Inner skirting <input checked="" type="checkbox"/> Other <u>OVERHANGS</u> ) <input type="checkbox"/> Exclusions <u>(NON VENTED)</u><br>Brand: ( <input type="checkbox"/> Universal <input type="checkbox"/> Other _____) Color _____<br>Rakes, ceilings & skirting to be solid. Eaves to be: ( <input type="checkbox"/> Solid <input type="checkbox"/> Center-vent <input type="checkbox"/> Full-vent) |
|                              | <input type="checkbox"/> Trim to be applied to the following areas: <u>VINYL LINIALS (5") - CERTAINTEED</u><br>( <input checked="" type="checkbox"/> Fascia <input type="checkbox"/> Crown <input type="checkbox"/> Freeze <input checked="" type="checkbox"/> # <u>27</u> Windows <input type="checkbox"/> # <u>3</u> Doors <input checked="" type="checkbox"/> # <u>X</u> Garage Doors <input type="checkbox"/> # _____ Posts <input type="checkbox"/> # _____ Beams)<br>Brand _____ Color <u>WHITE</u> Profile: ( <input type="checkbox"/> Brick mold <input type="checkbox"/> Other _____) ( <input type="checkbox"/> Smooth <input type="checkbox"/> PVC)                  |
|                              | <input checked="" type="checkbox"/> Apply Shutters: Brand: <u>Mid-America</u> Quantity: # <u>3</u> pairs Style Code: <u>TBD</u> Color# <u>TBD</u><br>Locations: (As listed on measure sheet)  |
| Accessories                  | <input type="checkbox"/> Gable end vents: ( <input type="checkbox"/> Trim around existing <input type="checkbox"/> Replace with new <input type="checkbox"/> Eliminate and side over)<br>If new, then: Quantity: # _____ Shape: _____ Color: _____ Size: (H) _____ (W) _____  |
|                              | <input checked="" type="checkbox"/> Utility Blocks: Color: <u>DEEP GRANITE</u> ( <input type="checkbox"/> # <u>2</u> Electrical <input type="checkbox"/> # <u>1</u> Split spigot <input type="checkbox"/> # _____ Other _____)  |
|                              | <input checked="" type="checkbox"/> Dryer vent: ( <input type="checkbox"/> Trim around existing <input checked="" type="checkbox"/> Replace with new)<br>If new, then: Quantity: # <u>1</u> Color: <u>WHITE</u> Color: _____ Size: ( <input checked="" type="checkbox"/> 4" <input type="checkbox"/> 6")  |
|                              | <input checked="" type="checkbox"/> Gutters: If new, then: Color: _____ Location(s): _____<br>( <input type="checkbox"/> Remove and dispose of <input type="checkbox"/> Remove and reset if salvageable <input type="checkbox"/> Leave in place and trim up to <input type="checkbox"/> Replace with new)   |

Comments: 3/8" SHEATHING TO BE INSTALLED OVER DER. RETROFIT FRAMING.  
HOUSE WRAP TO COVER SHEATHING UNDER SIDING.

\* GUTTERS TO BE REMOVED & REPLACED BY ROOFER

5 of 7

Robert M. Earley 6/28/12  
Kathleen M. Earley 6/28/12

Client EARLY.

Acct# \_\_\_\_\_

|  | R C I<br>123 A. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>  | R C I<br>123 B. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>  | R C I<br>123 C. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>  | R C I<br>123 D. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>   |
|--|---|---|---|--|
| LOCATION   | FRONT   | SIDE REAR   | SIDE  |  |
| MFG  | PROVIA 206A   | PROVIA 206A   | PROVIA 206A   |  |
| MODEL #  | # 206   | 430-IGT <sup>DC</sup>   | 430-IGT <sup>DC</sup>   |  |
| TYPE   | <input checked="" type="checkbox"/> NC <input type="checkbox"/> RD <input type="checkbox"/> SD<br><input type="checkbox"/> SPD <input type="checkbox"/> HPD | <input checked="" type="checkbox"/> NC <input type="checkbox"/> RD <input type="checkbox"/> SD<br><input type="checkbox"/> SPD <input type="checkbox"/> HPD | <input checked="" type="checkbox"/> NC <input type="checkbox"/> RD <input type="checkbox"/> SD<br><input type="checkbox"/> SPD <input type="checkbox"/> HPD | <input type="checkbox"/> NC <input type="checkbox"/> RD <input type="checkbox"/> SD<br><input type="checkbox"/> SPD <input type="checkbox"/> HPD |
| SIZE   | W 36" H 84"   | W 32" H 80"   | W 32" H 80"   | W _____" H _____"  |
| COLOR  | Ext. MOUNTAIN BERRY<br>Int. II  | Ext. MOUNTAIN BERRY<br>Int. II  | Ext. MOUNTAIN BERRY<br>Int. II  | Ext. _____<br>Int. _____   |
| Choose One Swing   | Outswing<br><input type="checkbox"/> Left Hand <input type="checkbox"/> Right Hand<br>"Inside of house"   | Outswing<br><input type="checkbox"/> Left Hand <input type="checkbox"/> Right Hand<br>"Inside of house"   | Outswing<br><input type="checkbox"/> Left Hand <input type="checkbox"/> Right Hand<br>"Inside of house"   | Outswing<br><input type="checkbox"/> Left Hand <input type="checkbox"/> Right Hand<br>"Inside of house"  |
|  | Inswing<br><input type="checkbox"/> Left Hand <input checked="" type="checkbox"/> Right Hand<br>"Inside of house"   | Inswing<br><input type="checkbox"/> Left Hand <input checked="" type="checkbox"/> Right Hand<br>"Inside of house"   | Inswing<br><input type="checkbox"/> Left Hand <input checked="" type="checkbox"/> Right Hand<br>"Inside of house"   | Inswing<br><input type="checkbox"/> Left Hand <input type="checkbox"/> Right Hand<br>"Inside of house"   |
| SLIDE (X/O)  | _____ "Outside of house"  | _____ "Outside of house"  | _____ "Outside of house"  | _____ "Outside of house"   |
| LOCK STYLE   | (GEORGIAN / THUMB BEAD BOOT ON ALL)   |   |   |  |
| LOCK FINISH  | ANTIQUE BRASS ON ALL  |   |   |  |
| JAMB DEPTH   |   |   |   | (CERTIFIED<br>TIMERS)  |
| TRIM: EXT/INT  | Ext. WHITE<br>Int. _____  | Ext. WHITE<br>Int. _____  | Ext. WHITE<br>Int. _____  | Ext. _____<br>Int. _____   |
| Accessories  | BRICKMOLD (FACTORY WHITE-VINYL COAT)  |   |   |  |
| Glass  | LOW E   | LOW E   | LOW E.  |  |
| Special Instructions:  | *KEY ALL DOORS THE SAME.  |   |   |  |
| RD = Replacement Door    SD = Storm Door    NC = New Construction    SPD = Sliding Patio Door    HPD = Hinged Patio Door    BM = Brick Mold    Fixed = O    Operator = X<br>Code: R = Recommended    C = Contracted    I = Installed |   |   |   |  |





NYSEERDA Deep Energy Retrofits:  
House 3 Report  
Exterior Rigid Foam Retrofit Strategy  
February 15, 2013

## Appendix B – Homeowner Construction Agreement

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This Agreement is made the 28<sup>th</sup> day of JUNE, 2012 between GreenHomes America, LLC (the "Contractor") and the Client:

|  |                                       |                |
|--|---------------------------------------|----------------|
| CLIENT NAME<br><u>ROBERT &amp; KATHLEEN EARLY</u>                | HOME TELEPHONE<br><u>315-751-5772</u> | WORK TELEPHONE |
| ADDRESS<br><u>21 VALLEY DR.</u>                                  | WORK SITE LOCATION IF DIFFERENT       |                |
| CITY<br><u>JORDON</u> , STATE<br><u>NY</u> , ZIP<br><u>13080</u> | Site Phone: _____                     |                |

Client is the:  Homeowner  Authorized Agent of Property Owner  Cooperative Shareholder Owner

Starting Date APPROX. 3-4 WEEKS Substantial Completion Date \_\_\_\_\_ Completion Date \_\_\_\_\_

Work Description (attach additional sheets if needed): DEEP ENERGY RETROFIT PROJECT  
COMPREHENSIVE ALL PER WORK SCOPES ATTACHED PG. 1-7.

Guarantee: The work described above shall be covered by the following guarantee(s) as indicated below (for any guarantee to apply, the associated box must be checked and both parties must initial in the spaces provided):

- 25% Energy Savings Guarantee  Total Comfort Guarantee  Property Protection Guarantee  
 HVAC Temperature Guarantee  No Guesswork Guarantee  Ultimate Assurance Guarantee.

Payment: Client agrees to pay Contractor \$ 84,188 EIGHTY FOUR THOUSAND ONE HUNDRED & EIGHTY EIGHT (Agreement price) for the materials, labor and services to be provided as described above.

Down Payment: \$ \_\_\_\_\_ upon approval of this agreement. \*NOTE: Down-Payments Deposited at: Wachovia Bank, Charlotte, NC.

Full Payments: \$ 49,000 upon substantial completion of performance by Contractor. FROM NYSEDA: DER

Progress Payments: The Contractor shall be entitled to receive payment from client for the reasonable value of materials and labor to be provided and expenses incurred upon the Agreement in accordance with the following schedule:  \$2000<sup>00</sup> HEMI PAID DIRECT TO GHA.

25000 as payment for the following materials, labor and services (identify the state of completion of the work to be performed):  
GSJ6NY 3.49% - 15 year FIXED RATE LOAN PENDING APPROVAL.

\$ 8,188 as payment for the following materials, labor and services (identify the state of completion of the work to be performed):  
HOME HEADQUARTERS 3.99% FIXED SECURED LOAN PENDING APPROVAL.

Notices:  
1. CLIENT MAY CANCEL THIS TRANSACTION ANY TIME PRIOR TO MIDNIGHT ON THE THIRD BUSINESS DAY AFTER THE DATE OF THIS AGREEMENT. SEE THE ATTACHED "NOTICE OF RIGHT TO CANCEL" FORM FOR AN EXPLANATION OF THIS RIGHT.

2. Client and Contractor expressly agree that the contents of this Agreement, subject to the terms and conditions stated on the face, the back and any attachments to this document, comprise the complete, exclusive and mutual understanding of the corresponding obligations of the parties. No oral assertions, representations or descriptions of work to be performed shall be binding on either party. **THIS AGREEMENT SHALL NOT BECOME BINDING UPON THE CONTRACTOR UNTIL IT IS ACCEPTED BY AN AUTHORIZED MANAGER OF THE CONTRACTOR.** By executing this Agreement, Client acknowledges that Client has read its terms and conditions, and further understands and agrees to perform Client's obligations hereunder; and acknowledges that Client has received a true copy of this Agreement. In the event this transaction is financed, all financing documents shall be considered a part of this Agreement.

3. Failure to tender payment to a performing Contractor or Subcontractor may subject Client's property to applicable liens by the Contractor or Subcontractor in order to enforce payments.

|  |  |   |  |
|--|--|---|--|
| <b>Client Acceptance</b>                           |  | <b>GreenHomes America, LLC Acceptance</b>                 |  |
| Client <u>Kathleen M Early</u> Date <u>6/28/12</u> |  | Advisor <u>[Signature]</u> Date <u>6/28/12</u>            |  |
| Client <u>Robert M Early</u> Date <u>6/28/12</u>   |  | Authorized Manager <u>[Signature]</u> Date <u>6/28/12</u> |  |



**ADDENDUM TO  
AGREEMENT**

CLIENT NAME: EARLY

Work Description (continued): \_\_\_\_\_

① INSTALL THERMAL BARRIER (1/2 sheet rock) TAPE  
& SKIM COAT - OVER RAFTERS CONTAINING CLOSED  
CELL FOAM ON 3<sup>rd</sup> FLOOR.

② REMOVE BLOCK CHIMNEY ON SIDE OF HOME & DISPOSE.

| Client Acceptance          |                     | GreenHomes America, LLC Acceptance |                     |
|----------------------------|---------------------|------------------------------------|---------------------|
| Client <u>Kathleen Fay</u> | Date <u>6/28/12</u> | Advisor <u>[Signature]</u>         | Date <u>6/28/12</u> |
| Client <u>[Signature]</u>  | Date <u>6/28/12</u> | Authorized Manager _____           | Date _____          |



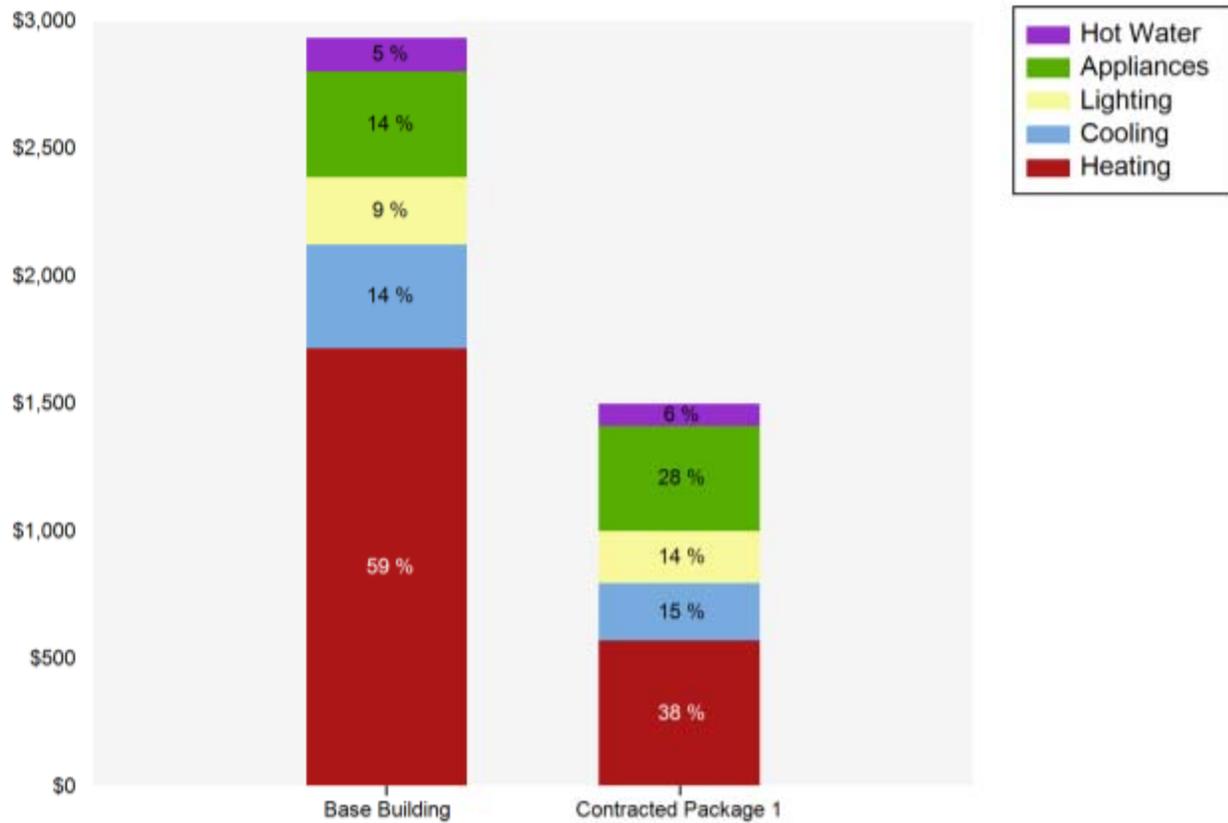
NYSEERDA Deep Energy Retrofits:  
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## Appendix C – TREAT Model

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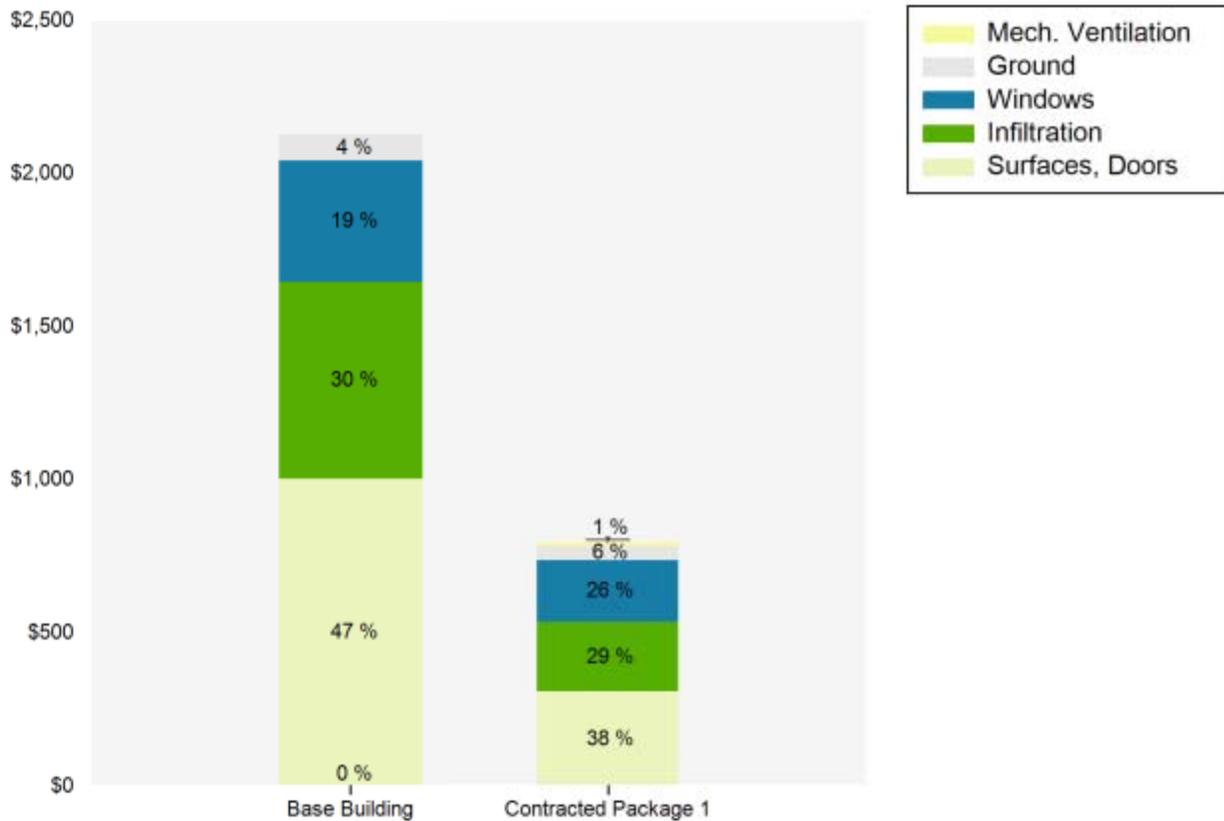
## Model Energy Comparison

**Total Annual Energy Bill by Category**



|              | Base Building  | Contracted Package 1 | Savings        |
|--------------|----------------|----------------------|----------------|
| Heating      | \$1,719        | \$572                | \$1,148        |
| Cooling      | \$405          | \$223                | \$182          |
| Lighting     | \$264          | \$207                | \$57           |
| Appliances   | \$413          | \$413                | \$0            |
| Hot Water    | \$135          | \$84                 | \$51           |
| <b>Total</b> | <b>\$2,936</b> | <b>\$1,499</b>       | <b>\$1,438</b> |

### Annual Heating/Cooling Bill by Category



|                        | Base Building  | Contracted Package 1 | Savings        |
|------------------------|----------------|----------------------|----------------|
| Surfaces, Doors        | \$1,005        | \$305                | \$699          |
| Infiltration           | \$642          | \$231                | \$411          |
| Windows                | \$396          | \$203                | \$192          |
| Ground                 | \$82           | \$45                 | \$37           |
| Mechanical Ventilation | \$0            | \$10                 | (\$10)         |
| <b>Total</b>           | <b>\$2,124</b> | <b>\$795</b>         | <b>\$1,330</b> |

Notes:

1. Costs for annual heating/cooling bills are calculated by taking the combined heating and cooling loads and multiplying by the average cost per BTU of heating and cooling fuel use. Differences in load profile or HVAC system efficiencies are not accurately reflected in this report.



NYSEERDA Deep Energy Retrofits:  
House 3 Report  
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## Appendix D – Material Counts

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# Early Project Material Quantities & Costs

## Project Summary

| <b>Purchased Materials</b>      |                    |
|---------------------------------|--------------------|
| WALL Construction Materials     | \$2,524.37         |
| WINDOW Construction Materials   | \$10,343.08        |
| ATTIC Construction Materials    | \$22.00            |
| BASEMENT Construction Materials | \$1,313.98         |
| HVAC Construction Materials     | \$4,213.57         |
| <b>TOTALS</b>                   | <b>\$18,417.00</b> |

| <b>Donated Materials</b>        |                   |
|---------------------------------|-------------------|
| WALL Construction Materials     | \$5,725.20        |
| WINDOW Construction Materials   | \$0.00            |
| ATTIC Construction Materials    | \$1,050.00        |
| BASEMENT Construction Materials | \$313.95          |
| HVAC Construction Materials     | \$0.00            |
| ERV Construction Materials      | \$0.00            |
| <b>TOTALS</b>                   | <b>\$7,089.15</b> |

| <b>Purchased &amp; Donated Materials</b> |                    |
|--|--------------------|
| <b>TOTAL Purchased Materials</b>         | <b>\$18,417.00</b> |
| <b>TOTAL Donated Materials</b>           | <b>\$7,089.15</b>  |
| <b>TOTAL MATERIALS</b>                   | <b>\$25,506.15</b> |

## WALL Construction Material Counts

| Donated Materials              | Donated By:    | Units | Unit Cost | Quantities | Total Costs       |
|--------------------------------|----------------|-------|-----------|------------|-------------------|
| 1 1/2" DOW Brd 4' x 8' Sheets  | DOW            | EA    | \$28.00   | 85         | \$2,380.00        |
| 1 1/2" Thermax                 | DOW            | EA    | \$35.00   | 12         | \$420.00          |
| 4" Dow Clear Construction Tape | DOW            | EA    | \$65.00   | 21         | \$1,365.00        |
| 4" Screws                      | Simpson        | EA    | \$0.60    | 1,125      | \$675.00          |
| 5" Screws                      | Simpson        | EA    | \$0.70    | 36         | \$25.20           |
| Climate-Pro Fiberglass         | Johns-Manville | BAG   | \$20.00   | 43         | \$860.00          |
| <b>TOTALS</b>                  |                |       |           |            | <b>\$5,725.20</b> |

| Purchased Materials     | Donated By: | Units | Unit Cost  | Quantities | Total Costs       |
|-------------------------|-------------|-------|------------|------------|-------------------|
| 4 Mill Poly             |             | FT    | \$0.02     | 0          | \$0.00            |
| Aluminum Vented Soffit  |             | EA    | \$23.22    | 0          | \$0.00            |
| CDX 1/2" 4Ply           |             | PC    | \$19.65    | 3          | \$58.95           |
| Fiberglass R-19         |             | PC    | \$4.62     | 0          | \$0.00            |
| Framing 2'x4'x10'       |             | EA    | \$4.37     | 213        | \$930.81          |
| Framing 2'x4'x12'       |             | EA    | \$5.83     | 23         | \$134.09          |
| Framing 2'x4'x8'        |             | EA    | \$3.55     | 0          | \$0.00            |
| Framing 2'x6'x10'       |             | EA    | \$6.96     | 47         | \$327.12          |
| 1" Foamboard            |             | EA    | \$0.38     | 0          | \$0.00            |
| Misc Materials          |             | EA    | \$34.89    | 1          | \$34.89           |
| Fan Fold                |             | SF    | \$0.31     | 24         | \$7.44            |
| Foam - 2 Prt            |             | LB    | \$13.40    | 0          | \$0.00            |
| Spray Foam              |             | EA    | \$7.78     | 2          | \$15.56           |
| Nailing Lath            |             | PC    | \$0.22     | 0          | \$0.00            |
| OSB Board 7/16"         |             | PC    | \$11.00    | 0          | \$0.00            |
| Painters Masking Tape   |             | EA    | \$6.07     | 0          | \$0.00            |
| Pine 1"x3"x10' Furring  |             | FT    | \$0.17     | 0          | \$0.00            |
| Pine 1"x3"x12' Furring  |             | FT    | \$0.18     | 0          | \$0.00            |
| Panasonic Fan           |             | EA    | \$131.61   | 1          | \$131.61          |
| 2 9/16 Plug             |             | EA    | \$0.30     | 60         | \$18.00           |
| 1" Plugs                |             | EA    | \$0.13     | 20         | \$2.60            |
| 2 1/2" Red Venture Tape |             | EA    | \$19.12    | 0          | \$0.00            |
| 4" Dupont Flashing Tape |             | LF    | \$0.78     | 0          | \$0.00            |
| 6" Dupont Flex Tape     |             | LF    | \$1.99     | 0          | \$0.00            |
| 9" Dupont Flex Tape     |             | LF    | \$2.55     | 0          | \$0.00            |
| Plastic Drop Cloths     |             | EA    | \$0.83     | 0          | \$0.00            |
| Select Pine 1x10x8      |             | EA    | \$2.12     | 0          | \$0.00            |
| Select Pine 1x12x14     |             | EA    | \$2.12     | 0          | \$0.00            |
| Sheetrock 1/2"          |             | PC    | \$17.98    | 0          | \$0.00            |
| Sheetrock 5/8" - 4'x10' |             | PC    | \$13.48    | 0          | \$0.00            |
| Siding Materials        |             | EA    | \$4,048.48 | 0          | \$0.00            |
| Staples                 |             | BOX   | \$48.00    | 0          | \$0.00            |
| Straight Flash Tape     |             | FT    | \$0.77     | 310        | \$238.70          |
| Thermax Tape            |             | EA    | \$22.63    | 0          | \$0.00            |
| Tite Bond Adhesive      |             | EA    | \$6.58     | 0          | \$0.00            |
| Dupont Flex Wrap        |             | EA    | \$2.55     | 212        | \$540.60          |
| TYVEK                   |             | EA    | \$0.42     | 200        | \$84.00           |
| T-Ply Sheathing         |             | EA    | \$13.55    | 0          | \$0.00            |
| <b>TOTALS</b>           |             |       |            |            | <b>\$2,524.37</b> |

**WINDOW Construction Material Counts**

| <b>Purchased Materials</b>  | <b>Donated By:</b> | <b>Units</b> | <b>Unit Cost</b> | <b>Quantities</b> | <b>Total Costs</b> |
|-----------------------------|--------------------|--------------|------------------|-------------------|--------------------|
| 1/2" CDX 4-ply              |                    | EA           | \$19.65          | 3                 | \$58.95            |
| Caulking - Boss White       |                    | EA           | \$1.38           | 0                 | \$0.00             |
| Colonial Casing             |                    | LF           | \$0.71           | 0                 | \$0.00             |
| Colonial Base               |                    | LF           | \$0.87           | 0                 | \$0.00             |
| Colonial Stop               |                    | LF           | \$0.46           | 0                 | \$0.00             |
| Coil Alcoa White            |                    | LF           | \$1.85           | 0                 | \$0.00             |
| Coil Grey                   |                    | LF           | \$1.96           | 0                 | \$0.00             |
| Quad White Caulking         |                    | EA           | \$5.67           | 0                 | \$0.00             |
| Boss Clear Caulking         |                    | EA           | \$1.38           | 10                | \$13.80            |
| Silicone Caulking           |                    | EA           | \$3.38           | 0                 | \$0.00             |
| DOOR - Okna                 |                    | EA           | \$762.82         | 3                 | \$2,288.47         |
| DOOR - Okna                 |                    | EA           | \$0.00           | 0                 | \$0.00             |
| DOOR - Precision            |                    | EA           | \$902.79         | 0                 | \$0.00             |
| DOOR - Precision            |                    | EA           | \$0.00           | 0                 | \$0.00             |
| Framing 2'x4'x8'            |                    | EA           | \$3.55           | 0                 | \$0.00             |
| Framing 2'x4'x10'           |                    | EA           | \$4.15           | 0                 | \$0.00             |
| Framing 2'x6'x10'           |                    | EA           | \$6.71           | 0                 | \$0.00             |
| Framing 2'x8'x8'            |                    | EA           | \$6.42           | 0                 | \$0.00             |
| Furring                     |                    | EA           | \$0.18           | 24                | \$4.32             |
| Gable Vents                 |                    | EA           | \$26.94          | 0                 | \$0.00             |
| Gutter Fillet               |                    | LF           | \$0.53           | 214               | \$113.42           |
| Housewrap                   |                    | EA           | \$1.17           | 0                 | \$0.00             |
| Misc                        |                    | MISC         | \$757.56         | 1                 | \$757.56           |
| Parting Stop                |                    | LF           | \$0.35           | 0                 | \$0.00             |
| Pine Common 1"x4"           |                    | FT           | \$0.48           | 54                | \$25.92            |
| Pine Common 1"x6"           |                    | FT           | \$0.75           | 0                 | \$0.00             |
| Pine Common 5/4"x4"         |                    | FT           | \$0.71           | 28                | \$19.88            |
| Pine Common 5/4"x6"         |                    | FT           | \$1.05           | 6                 | \$6.30             |
| Pine Common 5/4"x8"         |                    | FT           | \$1.75           | 0                 | \$0.00             |
| Pine Select 1" x 4"         |                    | LF           | \$0.94           | 0                 | \$0.00             |
| Pine Select 1" x 6"         |                    | LF           | \$1.47           | 352               | \$517.44           |
| Pine Select 1" x 8"         |                    | LF           | \$1.49           | 398               | \$593.02           |
| Pine Select 1" x10"         |                    | LF           | \$2.12           | 0                 | \$0.00             |
| Pine Select 1/2" x 8" x 12" |                    | LF           | \$1.48           | 0                 | \$0.00             |
| PT 1"x6"x8'                 |                    | EA           | \$5.99           | 0                 | \$0.00             |
| Ranch Base                  |                    | LF           | \$0.82           | 0                 | \$0.00             |
| Ranch Casing                |                    | LF           | \$0.49           | 0                 | \$0.00             |
| Roofing Nails               |                    | EA           | \$10.77          | 0                 | \$0.00             |
| Tyvek Tape                  |                    | EA           | \$13.98          | 0                 | \$0.00             |
| WINDOWS - Okna              |                    | EA           | \$220.15         | 27                | \$5,944.00         |
| WINDOWS - Okna              |                    | EA           | \$0.00           | 0                 | \$0.00             |
| Wood Shims                  |                    | EA           | \$2.66           | 0                 | \$0.00             |
| <b>TOTALS</b>               |                    |              |                  |                   | <b>\$10,343.08</b> |

## Basement Construction Material Counts

| Donated Materials | Donated By: | Units | Unit Cost | Quantities | Total Costs |
|-------------------|-------------|-------|-----------|------------|-------------|
| Bayer 2-Part Foam | Bayer       | BF    | \$0.35    | 897        | \$313.95    |
|                   |             |       |           |            |             |

|               |  |  |  |  |                 |
|---------------|--|--|--|--|-----------------|
| <b>TOTALS</b> |  |  |  |  | <b>\$313.95</b> |
|---------------|--|--|--|--|-----------------|

| Purchased Materials | Donated By: | Units | Unit Cost | Quantities | Total Costs    |
|---------------------|-------------|-------|-----------|------------|----------------|
| 4 Mill Poly         |             | EA    | \$100.00  | 0          | \$22.00        |
| Tapcons & Washers   |             | MISC  | \$58.50   | 0          | \$0.00         |
| <b>TOTALS</b>       |             |       |           |            | <b>\$22.00</b> |

## Attic Construction Material Counts

| Donated Materials      | Donated By:    | Units | Unit Cost | Quantities | Total Costs |
|------------------------|----------------|-------|-----------|------------|-------------|
| Climate-Pro Fiberglass | Johns-Manville | BAG   | \$20.00   | 0          | \$0.00      |
| Bayer 2-Part Foam      | Bayer          | BF    | \$0.35    | 3,000      | \$1,050.00  |

|               |  |  |  |  |                   |
|---------------|--|--|--|--|-------------------|
| <b>TOTALS</b> |  |  |  |  | <b>\$1,050.00</b> |
|---------------|--|--|--|--|-------------------|

| Purchased Materials       | Donated By: | Units | Unit Cost | Quantities | Total Costs       |
|---------------------------|-------------|-------|-----------|------------|-------------------|
| House Wrap - Typar        |             | SF    | \$0.13    | 0          | \$0.00            |
| Foam Board 1"x2'x8'       |             | EA    | \$6.12    | 0          | \$0.00            |
| Foam Board 2"x2'x8'       |             | EA    | \$13.09   | 0          | \$0.00            |
| Fanfold 3/8"              |             | SF    | \$0.31    | 0          | \$0.00            |
| Baffles 24"               |             | EA    | \$0.64    | 0          | \$0.00            |
| Insul Shield 14"x24'      |             | FT    | \$1.23    | 0          | \$0.00            |
| Cellulose - Fiber America |             | BG    | \$6.99    | 0          | \$0.00            |
| Spray Foam - 2 Part       |             | LB    | \$13.40   | 0          | \$0.00            |
| CDX 1/2" 4Ply             |             | PC    | \$20.50   | 0          | \$0.00            |
| Plastic Drop Cloths       |             | EA    | \$0.83    | 0          | \$0.00            |
| Recessed Light Boxes      |             | EA    | \$6.99    | 0          | \$0.00            |
| Lumber/Sheetrock          |             | EA    | \$970.00  | 1          | \$970.00          |
| Pine Select 1" x 6"       |             | LF    | \$1.47    | 34         | \$49.98           |
| Misc                      |             | LF    | \$294.00  | 1          | \$294.00          |
| <b>TOTALS</b>             |             |       |           |            | <b>\$1,313.98</b> |

## HVAC Construction Material Counts

| Purchased Materials   | Donated By: | Units | Unit Cost  | Quantities | Total Costs       |
|-----------------------|-------------|-------|------------|------------|-------------------|
| Renue-Air 130 ERV     |             | EA    | \$810.00   | 0          | \$0.00            |
| Renue-Air 150/200 ERV |             | EA    | \$1,131.53 | 1          | \$1,131.53        |
| Navien Combi Unit     |             | EA    | \$2,719.07 | 1          | \$2,719.07        |
| ERV Timer             |             | EA    | \$68.04    | 0          | \$0.00            |
| 1 1/8" OD Mini        |             | EA    | \$12.36    | 0          | \$0.00            |
| 12/2 Elec Wire        |             | FT    | \$0.24     | 0          | \$0.00            |
| 2x4 Utility Box       |             | EA    | \$1.93     | 0          | \$0.00            |
| Switch Plug Combo     |             | EA    | \$10.75    | 0          | \$0.00            |
| Receptical Cover      |             | EA    | \$0.86     | 0          | \$0.00            |
| 3/8" Set screw conn   |             | EA    | \$0.18     | 0          | \$0.00            |
| 18-2 Thermostat wire  |             | FT    | \$0.13     | 0          | \$0.00            |
| 18-5 Thermostat wire  |             | FT    | \$0.21     | 0          | \$0.00            |
| Wire Ties             |             | EA    | \$0.05     | 0          | \$0.00            |
| Duct - 6" GA          |             | FT    | \$8.13     | 0          | \$0.00            |
| Condensate Pump       |             | FT    | \$34.00    | 0          | \$0.00            |
| Misc Materials        |             | FT    | \$362.97   | 1          | \$362.97          |
| Misc Materials        |             | FT    | \$0.00     | 0          | \$0.00            |
| Misc Materials        |             | FT    | \$0.00     | 0          | \$0.00            |
| Misc Materials        |             | FT    | \$0.00     | 0          | \$0.00            |
| Misc Materials        |             | FT    | \$0.00     | 0          | \$0.00            |
| <b>TOTALS</b>         |             |       |            |            | <b>\$4,213.57</b> |



NYSEERDA Deep Energy Retrofits:  
House 3 Report  
Exterior Rigid Foam Retrofit Strategy  
February 15, 2013

## Appendix E – Wall Costing

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# Early Project Wall Cost Estimates vs Actuals

| Wall Work                  | Contract Amount | Contract Amount per SF | Estimate of Donated Material | Net Contract Amount | Total Actual    | Donated Material | Total Actual w/ Donated Material | Actual % vs Projected | Actual Cost/sf |
|----------------------------|-----------------|------------------------|------------------------------|---------------------|-----------------|------------------|----------------------------------|-----------------------|----------------|
| Remove Siding              | \$2,928         | \$1.36                 | \$0                          | \$2,928             | \$3,129         | \$0              | \$3,129                          | 106.9%                | \$1.45         |
| New Framing                | \$8,451         | \$3.93                 | \$3,435                      | \$5,816             | \$6,376         | \$3,435          | \$9,811                          | 116.1%                | \$4.56         |
| Remove Windows             | \$1,100         | \$0.51                 | \$0                          | \$1,100             | \$970           | \$0              | \$970                            | 88.2%                 | \$0.45         |
| Window Trim                | \$4,500         | \$2.09                 | \$0                          | \$4,500             | \$4,830         | \$0              | \$4,830                          | 107.3%                | \$2.24         |
| Foamboard                  | \$9,804         | \$4.56                 | \$2,290                      | \$12,834            | \$8,384         | \$2,290          | \$10,674                         | 108.9%                | \$4.96         |
| Install T-ply              | \$0             | \$0.00                 | \$0                          | \$0                 | \$0             | \$0              | \$0                              | 0.0%                  | \$0.00         |
| Box Bottom                 | \$520           | \$0.24                 | \$0                          | \$520               | \$400           | \$0              | \$400                            | 76.9%                 | \$0.19         |
| <b>TOTALS (W/O Siding)</b> | <b>\$27,303</b> | <b>\$12.69</b>         | <b>\$5,725</b>               | <b>\$27,698</b>     | <b>\$24,090</b> | <b>\$5,725</b>   | <b>\$29,815</b>                  | <b>109.2%</b>         | <b>\$13.85</b> |
| <b>Install siding</b>      | <b>\$13,870</b> | <b>\$8.71</b>          | <b>\$0</b>                   | <b>\$13,870</b>     | <b>\$14,987</b> | <b>\$0</b>       | <b>\$14,987</b>                  | <b>108.1%</b>         | <b>\$6.96</b>  |
| <b>TOTALS (W/ Siding)</b>  | <b>\$41,173</b> | <b>\$19.13</b>         | <b>\$5,725</b>               | <b>\$41,568</b>     | <b>\$39,077</b> | <b>\$5,725</b>   | <b>\$44,802</b>                  | <b>108.8%</b>         | <b>\$20.82</b> |