

NORA Board Meeting

May 25, 2021

12.30 pm

NORA is inviting you to a scheduled Zoom meeting.

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*Please Mute Phone or Computer When not Talking*

- I. Introduction – Chairman Rick Bologna and President John Huber
- II. Approval of Minutes
- III. Financial Information – Treasurer Eric Degesero
  - a. 2020 Year End Financials
  - b. Audit Status
  - c. Projection for 2021
  - d. State Spending and Executive Committee Recommendations – Motion 1
  - e. Increase in Spending for States Under Research and Development – Motion 2
  - f. 2022 and 2023 Budget
- IV. Research and Development – Director of Laboratory Dr. Thomas Butcher
- V. Energy Efficiency – Rebates and Evaluation of Effectiveness
- VI. Education and Training – Bob O’Brien
- VII. Electrification – John Huber for Richard Sweetser
- VIII. Executive Committee and Officers
- IX. Old Business -
- X. New Business -
- XI. Adjournment

NORA Board Meeting

September 22, 2020

12.30 pm

<https://zoom.us/j/173665392?pwd=NDhDb013OUo2eBYMEhUaGkzaDliZz09>

Meeting ID: 173 665 392

Password: 205762

- I. Introduction – Chairman Rick Bologna and President John Huber called the meeting to order at 12.30. The following members of the Board and guests were in attendance.

|                |                    |
|----------------|--------------------|
| Rick Bologna   | Steve Oehlert      |
| Scott Vadino   | Gary Sippin        |
| Mario Bouchard | Randy Groft        |
| Mark Caspers   | George McQueeney   |
| Michael Devine | Charlie Uglietto   |
| Matt Cota      | Deanna Shermann    |
| Will Berry     | Roger Marran       |
| Scott Hacker   | Ralph Carlo        |
| Peter Bourne   | Jim Townsend       |
| Matt Meehan    | Leanne Pannebianco |
| Mike Estes     | Kate Duffey        |
| Jeff Lykins    |                    |

At the conclusion of the roll call, a quorum was declared.

- II. Approval of Minutes The minutes were described and highlighted. On motion made for approval, and seconded, the motion carried.

- III. Financial Information –

The Treasurer, Eric Degesero presented the reports in the package.

At the previous meeting, we went through the audited financials and year end wrap up, so I will not be revisiting them. However, since then we have received our management letter dated July 7<sup>th</sup>.

The first item concerns the designated net asset, the escrow account. The auditor noted that there was no proper coding for this account. Setting up the escrow account took an extended amount of time as the escrow was not a normal escrow, and thus all documentation and laws had to be reviewed extensively by Bank of America. As a result of this, the funds were not transferred until late in 2019, and the accounting firm did not fully understand the nature of the transfer.

As indicated in the management response, the exact amount to be transferred cannot be established until the audit is partially complete and the actual revenue net of refunds occurs. NORA

does not use those funds that are put to the side in the budget, and the transaction occurs at year end.

The second item is focused on the allocation of expenses associated with our legal retainer. In developing the budget and preparing monthly financials, NORA has allocated those expenses to the various program areas. There was a change in GAAP which requires an adjustment at the end of the year to the financials for audited presentation that did not occur. However, the financials were presented in accordance with the budget.

The final item involves an entry error. This was corrected. These errors generally involve state rebate requests. Often the rebate request may arrive in the next year event though it involves the previous year. The accountant will more closely monitor transactions to ensure they are properly allocated.

Now turning to our statement of activities. Currently looking at the two yellow highlighted cells, you will see our net revenue for the year at this point is \$4,867,595. Our budget goal is \$8,127,763. There are two ways of looking at this. Q1 and Q2 which are included in this financial represent approximately 59 percent of the budget year. The similar number for July was \$4,774,951 by .59, the result is \$8,093,137, which is very close to budget. However, I would note that the original budget was downgraded due to the poor performance of January. According to NOAA, Quarter 1 ended 10 percent below normal in New England and 13 percent below normal in mid-Atlantic. So, if we revert to estimates based on normal, our expectation for net revenue from Q3 and Q4, would be \$3,653,920. So, if you add that to already received income, there is hope that we will finish the year ahead of schedule with \$8,428,81 of income. I think based on these two estimates, we should not take any steps to amend the budget at this time.

Turning to the next item is the grants, which are in blue. At this time, we have not received any funds, however, we did just sign a contract with NBB for \$32,615, which will make up some of this shortage. I would note that most of the grants have originated with NBB or NYSERDA, and our budgets are very much an estimate of what program activities those two organizations may wish to fund in a given year. It is also well off 2019 where we had a number of major projects that we completed with NYSERDA and NBB.

In the program expense area, (light green) NORA's grants to the states are booked on January 1<sup>st</sup> for the full amount. The program expenses for the NORA lab, consumer education and training are a little ahead of budget (less than budget), and energy efficiency is over budget for the year. This is due to the fact that a substantial amount of accounting time is booked to this program in writing and reconciling the rebate checks. However, this is not cause for concern as this has been under budget most years, and we have a reserve built into energy efficiency.

In the unallocated expenses, there are three items I want to bring to your attention. The first two are in red and reflect accounting fees. These fees include the audit and part of our overall accounting bill. You will note the first fee is over budget, and second under budget. The fees are also frontloaded due to the audit.

The next item is in purple and is the legal fees. As described in the management letter, this will be adjusted to year end and will be slightly over budget.

Now, I will turn to the Statement of Financial Position

Starting off you will see that we have over 12 million in cash, and another 1.78 in escrow. So, in fact we are really not working down all of our balances. At year end we will need to add a little over \$2 million to the escrow account. The majority of the accounts receivable, in yellow, is the allocation for a heat pump project with NYSERDA that should be completed this year. Neehad is working on that now, and then it will need to be published.

In liabilities, the state rebate obligations are self explanatory. There was an adjustment made this year to correct an error which is why 2014 is higher now than in 2019. As you can see, most of the years are being worked down. 2020 has seen approximately \$1.3 million of expenditures. However, Covid has certainly slowed down some of the state programming and education they have been doing.

In the green at the bottom are some of the unspent balances at the national level that have accrued. The largest is the research and development. NORA is very interested in finding some partners for these funds to advance our technology.

That is my report. Motion was made to accept report, seconded, and approved as submitted.

#### IV. Research and Development –

John Huber reviewed the Eurofuel NORA Technology Conference. He then gave a brief on the outdoor freezer test program that is underway.

Dr. Butcher indicated they would highlight three areas. Neehad Islam gave a brief on the legacy pump testing program. He then gave a brief on the outdoor freezer test program that is underway.

#### V. Energy Efficiency –

Dr. Butcher then described NORA's research review of the boiler and furnace program rebate programs and the type and amount of energy being saved.

#### VI. Education and Training Activities –

John Levey then briefed the group on the new books underway. The tank book is completed. The Silver book is well underway.

#### VII. Executive Committee and Officers

|                            |                    |
|----------------------------|--------------------|
| Immediate Past Chairperson | – Charlie Uglietto |
| Chairman                   | - Rick Bologna     |



National Oilheat Research Alliance  
Statement of Financial Position  
December 31, 2020

|   | 2020                   | 2019                   |
|---|------------------------|------------------------|
| <b>ASSETS</b>   |                        |                        |
| <b>CURRENT ASSETS:</b>  |                        |                        |
| Cash and Cash Equivalents   | \$10,742,467.49        | \$9,172,751.78         |
| Bank of America - Escrow account                                    | 1,780,972.99           | 1,741,894.70           |
| Accounts Receivable   | 42,608.57              | 42,608.57              |
| Assessments and Other Receivables                                   | 22,389.64              | 2,966,129.01           |
| Security Deposit  | 24,514.18              | 24,514.18              |
| Prepaid Assets  | 42,310.14              | 24,775.54              |
| Total Current Assets  | 12,655,263.01          | 13,972,673.78          |
| <b>PROPERTY AND EQUIPMENT</b>                                       |                        |                        |
| Office Furniture and Equipment                                      | 78,836.98              | 78,836.98              |
| Website   | 45,450.00              | 45,450.00              |
| Computer Equipment  | 3,819.34               | 3,819.34               |
| Less: Accumulated Depreciation                                      | (78,798.78)            | (71,442.24)            |
| Less: Accumulative Amortization (Web Site)                          | (45,449.99)            | (45,449.99)            |
| Total Property and Equipment  | 3,857.55               | 11,214.09              |
| <b>TOTAL ASSETS</b>   | <b>\$12,659,120.56</b> | <b>\$13,983,887.87</b> |
| <b>LIABILITIES AND NET ASSETS</b>                                   |                        |                        |
| <b>CURRENT LIABILITIES:</b>   |                        |                        |
| State Rebate Obligations 2014                                       | 23,315.94              | 35,340.42              |
| State Rebate Obligations 2015                                       | 187,727.73             | 199,304.94             |
| State Rebate Obligations 2016                                       | 227,364.20             | 322,676.69             |
| State Rebate Obligations 2017                                       | 291,804.70             | 436,975.86             |
| State Rebate Obligations 2018                                       | 571,578.07             | 1,041,745.51           |
| State Rebate Obligations 2019                                       | 852,827.87             | 2,252,667.31           |
| State Rebate Obligations 2020                                       | 2,377,701.88           | (80,408.00)            |
| State Rebate Obligations 2021                                       | (175.22)               | 0.00                   |
| Total Grants Payable  | 4,532,145.17           | 4,208,302.73           |
| Accrued Salaries & Benefits   | 84,395.00              | 50,834.85              |
| Reserve for BIO Diesel Testing                                      | 764.35                 | 764.35                 |
| Refunds Reserve   | 0.00                   | 114,242.97             |
| Accounts Payable  | 109,766.63             | 928,549.33             |
| Accrued Expenses  | (0.00)                 | 24,094.52              |
| Total Current Liabilities   | \$4,727,071.15         | \$5,326,788.75         |
| <b>NET ASSETS:</b>  |                        |                        |
| Unrestricted Net Assets   | 446,494.16             | 1,043,449.51           |
| Pre-2014 Reauthorization Net Assets                                 | 55,933.05              | 55,933.05              |
| Unavailable for Obligation until 10/01/2028                         | 1,780,972.99           | 1,780,972.99           |
| National Spending Not Yet Incurred                                  |                        |                        |
| Research, Development, and Demonstration - net yet obligated        | 5,201,153.87           | 5,309,398.87           |
| Research, Development, and Demonstration - obligated under contract | 242,884.00             | 242,884.00             |
| Heating Oil Efficiency and Upgrade - net yet obligated              | 113,993.88             | 151,237.42             |
| Consumer Education, Safety, and Training - net yet obligated        | 90,617.46              | 73,223.28              |
| Total Net Assets  | 7,932,049.41           | 8,657,099.12           |
| <b>TOTAL LIABILITIES AND NET ASSETS</b>                             | <b>\$12,659,120.56</b> | <b>\$13,983,887.87</b> |

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National Oilheat Research Alliance  
Statement of Activities  
For the Twelve Months Ending December 31, 2020

|  | December<br>2020    | YTD<br>2020         | 2020 Budget         | Remaining             | YTD<br>2019         |
|--|---------------------|---------------------|---------------------|-----------------------|---------------------|
| <b>INCOME</b>  |                     |                     |                     |                       |                     |
| <b>Collections and Assessments</b>                       |                     |                     |                     |                       |                     |
| Collections  | \$2,615,144.98      | \$9,367,185.27      | \$8,127,762.70      | (\$1,239,422.57)      | \$10,377,402.51     |
| Remittance Accrual                                       | 0.00                | 0.00                | (2,031,940.68)      | (2,031,940.68)        | 0.00                |
| Refunds  | (330,008.24)        | (1,196,237.85)      | 0.00                | 1,196,237.85          | (1,271,785.96)      |
| Collection Costs   | (13,434.37)         | (122,269.13)        | (90,000.00)         | 32,269.13             | (23,476.00)         |
| <b>Net Collections</b>                                   | <b>2,271,702.37</b> | <b>8,048,678.29</b> | <b>6,005,822.02</b> | <b>(2,042,856.27)</b> | <b>0.00</b>         |
| <b>In Kind Contributions</b>                             |                     |                     |                     |                       |                     |
| Sales Revenue  | 937.67              | 8,281.20            | 0.00                | (8,281.20)            | 5,250.72            |
| Other Revenue (Grants, etc)                              | 0.00                | 32,615.00           | 100,000.00          | 67,385.00             | 253,680.04          |
| <b>Total Income</b>                                      | <b>2,272,640.04</b> | <b>8,089,574.49</b> | <b>6,105,822.02</b> | <b>(1,983,752.47)</b> | <b>0.00</b>         |
| <b>PROGRAM EXPENSES</b>                                  |                     |                     |                     |                       |                     |
| <b>Consumer Education and Training (Max. 30%)</b>        |                     |                     |                     |                       |                     |
| Education and Training (Central)                         | 30,969.78           | 1,811,268.84        | 1,824,635.61        | 13,366.77             | 0.00                |
| Education and Training (States)                          | 0.00                | 256,633.23          | 270,000.00          | 13,366.77             | 36,897.11           |
|  | (0.00)              | 1,554,635.61        | 1,554,635.61        | 0.00                  | 1,837,333.56        |
| <b>Research Development and Demonstration (Min. 30%)</b> |                     |                     |                     |                       |                     |
| Research Development and Demonstration (Central)         | 143,829.68          | 2,338,225.30        | 2,278,203.99        | (60,021.31)           | 0.00                |
| Research Development and Demonstration (States)          | 143,829.68          | 1,330,021.31        | 1,270,000.00        | (60,021.31)           | 510,376.57          |
|  | 0.00                | 1,008,203.99        | 1,008,203.99        | 0.00                  | 554,025.67          |
| <b>Home Energy Efficiency Program (Min. 15%)</b>         |                     |                     |                     |                       |                     |
| Home Energy Efficiency Program (Central)                 | 10,235.68           | 949,091.38          | 918,873.24          | (30,218.14)           | 0.00                |
| Home Energy Efficiency Program (States)                  | 10,235.68           | 90,968.14           | 60,750.00           | (30,218.14)           | 60,122.39           |
|  | 0.00                | 858,123.24          | 858,123.24          | 0.00                  | 1,027,010.92        |
| <b>Total Central</b>                                     | <b>185,035.14</b>   | <b>1,677,622.68</b> | <b>1,600,750.00</b> | <b>(76,872.68)</b>    | <b>0.00</b>         |
| <b>Total States</b>                                      | <b>(0.00)</b>       | <b>3,420,962.84</b> | <b>3,420,962.84</b> | <b>0.00</b>           | <b>0.00</b>         |
| <b>State Rebates</b>                                     | <b>(45,999.92)</b>  | <b>1,176,349.75</b> | <b>1,176,349.76</b> | <b>0.01</b>           | <b>1,618,085.09</b> |
| <b>Old Grant Advertising</b>                             | <b>0.00</b>         | <b>0.00</b>         | <b>0.00</b>         | <b>0.00</b>           | <b>0.00</b>         |
| <b>Office Unallocated Expenses</b>                       |                     |                     |                     |                       |                     |
| Salaries and Consulting (Admin)                          | 14,043.92           | 120,927.57          | 154,994.40          | 34,066.83             | 86,499.73           |
| Accounting (Admin)                                       | 4,509.34            | 65,264.57           | 32,877.60           | (32,386.97)           | 64,612.66           |
| Insurance (Admin)  | 11,416.97           | 27,968.78           | 14,090.40           | (13,878.38)           | 38,954.00           |
| Taxes  | 39.19               | 353.85              | 2,818.08            | 2,464.23              | 1,879.30            |
| Postage  | 0.00                | 0.00                | 1,409.04            | 1,409.04              | 582.44              |
| Web Pages  | 1,788.93            | 9,868.94            | 14,090.40           | 4,221.46              | 30,655.90           |
| Annual Report  | 3,643.55            | 15,906.34           | 42,271.20           | 26,364.86             | 45,773.22           |
| Rent and Telephone                                       | 1,243.00            | 17,711.05           | 18,787.20           | 1,076.15              | 62,647.25           |
| Travel   | 0.00                | 0.00                | 939.36              | 939.36                | 627.44              |
| Meeting Expenses   | 0.00                | 0.00                | 2,818.08            | 2,818.08              | 0.00                |
| Office Supplies  | 141.76              | 2,127.94            | 939.36              | (1,188.58)            | 1,786.53            |
| Dues & Memberships                                       | 221.46              | 852.55              | 939.36              | 86.81                 | 204.37              |
| Bank Fees  | 281.56              | 2,207.04            | 5,636.16            | 3,429.12              | 6,433.40            |
| Legal Expense  | 3,200.00            | 36,638.52           | 70,452.00           | 33,813.48             | 19,896.10           |
| Professional Fees  | 165.00              | 2,502.50            | 0.00                | (2,502.50)            | 982,978.19          |
| Misc Expense   | 0.00                | (3,157.36)          | 0.00                | 3,157.36              | 1,045.92            |
| Advertising Expense                                      | 0.00                | 0.00                | 0.00                | 0.00                  | 0.00                |
| Fixed Assets <\$1,000                                    | 0.00                | 0.00                | 0.00                | 0.00                  | 0.00                |
| Equipment Maintenance                                    | 0.00                | 1,150.00            | 4,696.80            | 3,546.80              | 0.00                |
| Bad Debts  | 0.00                | 11,213.66           | 0.00                | (11,213.66)           | 0.00                |
| <b>Total Unallocated Expenses</b>                        | <b>40,694.68</b>    | <b>311,535.95</b>   | <b>367,759.44</b>   | <b>56,223.49</b>      | <b>1,344,576.45</b> |
| <b>Other Expenses/(Income)</b>                           |                     |                     |                     |                       |                     |
| Cost of Goods Sold                                       | 101.55              | 5,918.07            | 0.00                | (5,918.07)            | 5,595.44            |
| Interest Expense   | 0.00                | 0.00                | 0.00                | 0.00                  | 0.00                |
| Interest   | (33.08)             | (2,787.40)          | (60,000.00)         | (57,212.60)           | (68,717.32)         |
| <b>Total Other Expenses/(Income)</b>                     | <b>68.47</b>        | <b>3,130.67</b>     | <b>(60,000.00)</b>  | <b>(63,130.67)</b>    | <b>0.00</b>         |
| <b>Net Revenue/(Expense)</b>                             | <b>2,092,841.67</b> | <b>1,499,972.60</b> | <b>(400,000.02)</b> | <b>(1,899,972.62)</b> | <b>0.00</b>         |

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## Resolution 1

Whereas a number of states have not developed programs to use the funds made available to NORA for previous years, and that those funds would be utilized in other markets.

Whereas it is important to provide benefits to consumers of Oilheat,

Whereas, a state has withdrawn from NORA, has unspent funds, and has not utilized those funds for multiple years, and that in the years they have been a member of the Alliance, they spent at least 15 percent of all funds generated in the state.

Whereas the NORA statute indicates that at least 15 percent of funds in a state be made available to the state for use in the state,

Whereas NORA has allocated and made substantially more than 15 percent allocations to NORA states,

Now Therefore Be it Resolved: In 2021, if any state or local group has spent less than 50 percent of the funds allocated in the years shown on the attached spreadsheet labeled "state reports ye 2020", in any category on December 31, 2021 other than rebates, then that state will only be provided a grant equal to the minimum allowed by the NORA statute in that category (15 percent)

Be it Further Resolved: In 2022, if any state or local group has spent less than 75 percent of the funds allocated in the previous years, 2021 and earlier, in any category on December 31, 2022, then that state will only be provided a grant equal to the minimum allowed by the NORA statute in that category (15 percent).

Be it Further Resolved: That in all years henceforth, this 75 percent formula will be applied.

Be it Further Resolved: That any state or local group that has not spent at least 50 percent of its funds in the previous years, as decided on December 31, 2021, that the funds in 2014, 2015, and 2016 will be reduced to the statutory minimum of 15 percent.

Be it further Resolved: That the funds allocated to Idaho shall be recovered and allocated to other uses.

Be it Further Resolved: That all funds that are recovered will be redistributed and used for state activities.

## Proposed Amendment to Resolution 2

Immediately after the final Whereas, strike the remaining text and insert.

Whereas it is of utmost importance that the benefits of fees paid in a state accrue to the dealers and customers in a state, which has been the hallmark of NORA's activities



Be it Resolved: In 2022, if any state or local group has spent less than 50 percent of the funds allocated in the previous years, 2021 and earlier, in any category on December 31, 2022, then that state will only be provided a grant equal to the minimum allowed by the NORA statute in that category (15 percent). The remaining funds which would otherwise be spent will be used in accordance with this resolution.

Be it Further Resolved: In 2023, if any state or local group has spent less than 75 percent of the funds allocated in the previous years, 2022 and earlier, in any category on December 31, 2022, then that state will only be provided a grant equal to the minimum allowed by the NORA statute in that category (15 percent). The remaining funds which would otherwise be spent will be used in accordance with this resolution

Be it Further Resolved: That in all years henceforth, this 75 percent formula will be applied.

Be it Further Resolved: That the President of NORA will form a subcommittee to develop spending for the funds that are now available per this resolution. That subcommittee will include the President and the Chairman of NORA, and the state association executive for the state in question and the Chairman of that organization will be requested to participate and recommend such persons as they think will aid in the selection of projects.

Be it Further Resolved: That the President will report on the Activities and Recommendations of that Committee at the Spring Board meeting for NORA in 2022. That the Committee should work to develop a plan that brings the outstanding balances to less than 25 percent in three years or less.

Be it Further Resolved: The President may enter into such contracts or activities as the President deems proper and within the scope of the presentation to the Board, and shall do so in a timely manner.

Be it further Resolved: That the funds allocated to Idaho shall be recovered and allocated to other uses.

Be it Further Resolved: That all funds that are recovered will be redistributed and used for state activities.

## Resolution 2

Whereas it is beneficial to have new high efficient equipment in residences as it saves energy, provides better operations, and improves customer satisfaction.

Whereas, the industry has a significant balance in the central research and development account, and these funds could be allocated to encourage the transition to new energy equipment.

Therefore be it resolved that NORA allocate \$1 million from its central research and development fund for states that are actively using their rebate funds.

Be it further resolved: That the President sets up an allocation table of this \$1 million for the states based on their allocations in 2021, and that the states be notified of its availability.

Be it further resolved: That the fund transfers to states shall only occur when their R and D account goes to 0.

Be it further resolved: That any allocations not obligated by December 31, 2021 shall be added to the \$1 million provided for this program in 2022, under the same rules.

Be it further resolved: That the extra \$1 million being added to the 2022 budget shall operate under the rules described above.

National Oilheat Research Alliance  
For the Twelve Months Ending December 31, 2020

|                    | Total Budget | Actual<br>2014 | Actual<br>2015 | Actual<br>2016 | Actual<br>2017 | Actual<br>2018 | Actual<br>2019 | Actual<br>2020 | Total Actual | Remaining  | percent of earlier budgets remaining |    |
|--------------------|--------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------|------------|--------------------------------------|----|
|                    |              |                |                |                |                |                |                |                |              |            |                                      |    |
| TOTAL CT R&D       | 468,918.24   |                |                | 26,496.37      | 28,883.18      | 3,346.33       | 37,231.89      | 69,495.26      | 165,453.03   | 303,465.21 | 65%                                  |    |
| TOTAL CT EE        | 817,296.90   |                | 46,620.38      | 107,491.06     | 162,446.56     | 140,331.97     | 269,102.61     | 91,154.32      | 817,146.90   | 150.00     | 0%                                   |    |
| TOTAL CT REBATE    | 1,200,070.28 |                |                | 195,392.99     | 129,814.51     | 233,282.50     | 180,546.72     | 409,671.03     | 1,148,707.75 | 51,362.53  | 4%                                   |    |
| TOTAL DC E&T       | 8,756.04     |                |                |                |                |                |                |                |              | 8,756.04   | 100%                                 |    |
| DC 20 R&D          | 1,012.20     |                |                |                |                |                |                |                |              | 1,012.20   |                                      |    |
| TOTAL DC R&D       | 2,885.96     |                |                |                |                | 483.92         |                |                | 483.92       | 2,402.04   | 83%                                  |    |
| TOTAL DC EE        | 4,674.89     |                |                |                |                |                |                |                |              | 4,674.89   | 100%                                 |    |
| TOTAL DC REBATE    | 6,740.56     |                |                |                |                | 716.08         |                |                | 716.08       | 6,024.48   | 89%                                  |    |
| TOTAL DE E&T       | 92,154.37    |                | 12,752.48      | 18,635.54      | 15,839.72      | 19,830.00      |                |                | 67,057.74    | 25,096.63  | 27%                                  |    |
| TOTAL DE R&D       | 26,920.75    |                |                |                |                | 2,100.00       | 500.00         | 200.00         | 2,800.00     | 24,120.75  | 90%                                  |    |
| TOTAL DE EE        | 49,101.03    |                | 2,510.44       | 8,396.94       | 13,449.01      | 400.00         | 1,000.00       | 3,800.26       | 29,556.65    | 19,544.38  | 40%                                  |    |
| TOTAL DE REBATE    | 71,691.08    |                |                | 7,472.84       | 18,448.94      | 1,400.00       |                | 23,400.00      | 50,721.78    | 20,969.30  | 29%                                  |    |
| TOTAL ID E&T       | 6,349.95     |                |                |                |                | 4,749.48       |                |                | 4,749.48     | 1,600.47   | 25%                                  |    |
| TOTAL ID R&D       | 1,667.48     |                |                |                |                |                |                |                |              | 1,667.48   | 100%                                 |    |
| TOTAL ID EE        | 3,253.67     |                |                |                |                |                |                |                |              | 3,253.67   | 100%                                 |    |
| TOTAL ID REBATE    | 4,809.00     |                |                |                |                |                |                |                |              | 4,809.00   | 100%                                 |    |
| TOTAL IN E&T       | 23,590.73    |                | 1,925.58       | 610.00         |                |                |                |                | 2,535.58     | 21,055.15  | 89%                                  |    |
| TOTAL IN R&D       | 6,999.22     |                |                |                |                |                |                |                |              | 6,999.22   | 100%                                 |    |
| TOTAL IN EE        | 12,567.92    |                | 1,507.97       | 1,221.53       |                |                |                |                | 2,729.50     | 9,838.42   | 78%                                  |    |
| TOTAL IN REBATE    | 18,349.10    |                | 417.62         | 1,507.97       |                |                |                |                | 1,925.59     | 16,423.51  | 90%                                  |    |
| TOTAL KY E&T       | 185,130.54   | 4,226.56       | 32,549.41      | 20,659.64      | 35,463.78      | 24,710.92      | 34,317.31      | 14,564.78      | 166,492.40   | 18,638.14  | 10%                                  |    |
| TOTAL KY EE        | 98,636.80    | 8,865.93       | 18,945.12      | 11,531.71      | 23,565.84      | 15,718.58      | 12,631.96      |                | 91,259.14    | 7,377.66   | 7%                                   |    |
| TOTAL KY REBATE    | 143,683.99   |                | 14,968.76      | 51,247.99      | 23,926.50      | 816.84         | 10,891.34      | 1,490.00       | 103,341.43   | 40,342.56  | 28%                                  |    |
| TOTAL MA E&T       | 1,695,433.81 |                | 198,057.59     | 201,516.92     | 427,985.41     | 456,075.08     | 224,357.72     | 169,012.49     | 1,677,005.21 | 18,428.60  | 1%                                   |    |
| TOTAL MA R&D       | 516,799.96   |                | 25,769.72      | 83,499.95      | 31,553.04      | 100,527.55     | 118,127.73     | 38,393.76      | 397,871.75   | 118,928.21 | 23%                                  |    |
| TOTAL MA EE        | 906,078.49   |                | 69,076.57      | 73,857.28      | 302,195.08     | 246,798.01     | 116,668.74     | 97,482.80      | 906,078.48   | 0.01       | 0%                                   |    |
| TOTAL MA REBATE    | 1,330,351.73 |                |                | 201,468.45     | 344,833.88     | 303,967.75     | 216,181.26     | 131,239.56     | 1,197,690.90 | 132,660.83 | 10%                                  |    |
| TOTAL MD E&T       | 458,687.89   | 41,165.68      | 63,137.26      | 90,106.61      | 70,000.56      | 42,335.89      | 82,043.00      | 64,730.00      | 453,519.00   | 5,168.89   | 1%                                   |    |
| TOTAL MD R&D       | 140,163.88   | 1,700.00       |                | 6,310.00       | 277.78         | 32,600.00      | 45,500.00      | 47,100.00      | 133,487.78   | 6,676.10   | 5%                                   |    |
| TOTAL MD EE        | 245,317.82   | 15,400.00      | 5,708.60       | 81,225.36      | 27,257.98      | 53,606.28      | 35,431.97      | 26,687.64      | 245,317.83   | (0.01)     | 0%                                   |    |
| TOTAL MD REBATE    | 360,827.17   |                | 26,941.92      | 122,717.43     | 56,743.97      | 54,143.72      | 61,568.03      | 38,712.10      | 360,827.17   |            | 0%                                   |    |
| TOTAL ME E&T       | 933,651.50   |                |                | 38,206.01      | 220,512.39     | 236,768.48     | 207,805.75     | 140,980.13     | 83,088.67    | 927,361.43 | 6,290.07                             | 1% |
| TOTAL ME R&D       | 287,768.55   |                |                | 14,055.92      | 24,644.38      | 25,914.85      | 117,916.94     | 39,261.67      | 62,768.05    | 284,561.81 | 3,206.74                             | 1% |
| TOTAL ME EE        | 499,256.12   |                |                | 26,410.67      | 12,505.48      | 127,812.28     | 176,169.73     | 107,533.13     | 40,694.91    | 491,126.20 | 8,129.92                             | 1% |
| TOTAL ME REBATE    | 733,145.00   |                | 18,498.23      | 37,263.52      | 95,400.79      | 291,135.35     | 210,855.33     | 5,150.26       | 658,303.48   | 74,841.52  | 20%                                  |    |
| TOTAL MI E&T       | 375,436.98   |                | 25,865.00      | 51,566.00      | 85,458.00      | 52,430.00      | 82,000.00      | 70,274.00      | 367,593.00   | 7,843.98   | 2%                                   |    |
| TOTAL MI R&D       | 115,492.46   |                |                | 18,949.60      | 22,773.90      | 1,238.00       | 1,880.00       | 31,436.00      | 76,277.50    | 39,214.96  | 34%                                  |    |
| TOTAL MI EE        | 290,414.41   |                |                | 15,000.00      | 44,282.89      | 65,030.86      | 51,129.75      | 11,200.00      | 186,643.50   | 13,770.91  | 7%                                   |    |
| TOTAL MI REBATE    | 291,821.83   |                |                | 27,664.64      | 54,443.21      | 59,753.65      | 6,035.25       | 54,800.00      | 202,696.75   | 89,125.08  | 31%                                  |    |
| TOTAL NC E&T       | 457,881.15   | 20,209.84      | 79,864.12      | 90,039.57      | 80,629.98      | 89,547.18      | 42,550.90      | 43,500.00      | 446,341.59   | 11,539.56  | 3%                                   |    |
| TOTAL NC R&D       | 139,226.28   | 3,962.48       | 7,960.71       | 30,270.17      | 38,982.46      | 10,837.13      | 5,486.16       | 32,000.00      | 129,499.11   | 9,727.17   | 7%                                   |    |
| TOTAL NC EE        | 244,782.40   | 21,920.00      | 38,400.97      | 39,962.25      | 128,790.01     | (13,629.23)    | 3,937.95       | 500.00         | 219,881.95   | 24,900.45  | 10%                                  |    |
| TOTAL NC REBATE    | 359,095.18   |                | 28,664.66      | 90,809.04      | 82,324.59      | 65,403.61      | 21,000.00      |                | 288,201.90   | 70,893.28  | 20%                                  |    |
| TOTAL NH E&T       | 648,238.27   |                | 162,895.00     | 96,251.54      | 28,458.86      | 150,912.93     | 53,969.41      | 52,204.92      | 544,692.66   | 103,545.61 | 16%                                  |    |
| TOTAL NH R&D       | 197,595.49   |                |                |                |                | 13,378.35      | 127,445.80     | 55,300.00      | 196,124.15   | 1,471.34   | 1%                                   |    |
| TOTAL NH EE        | 346,383.62   |                |                |                | 204,816.33     | 77,933.23      | 15,248.95      | 37,945.50      | 335,944.01   | 10,439.61  | 3%                                   |    |
| TOTAL NH REBATE    | 507,041.51   |                |                |                | 237,389.50     | 147,593.60     | 71,357.74      | 19,200.00      | 475,540.84   | 31,500.67  | 6%                                   |    |
| TOTAL NJ E&T       | 1,058,617.02 | 76,697.13      | 209,926.55     | 221,840.40     | 92,288.81      | 131,112.71     | 122,818.00     | 79,522.10      | 934,205.70   | 124,411.32 | 12%                                  |    |
| TOTAL NJ R&D       | 330,962.73   |                | 21,139.47      | 54,885.41      | 51,400.00      | 25,000.00      | 58,160.67      | 52,300.00      | 262,885.55   | 68,077.18  | 21%                                  |    |
| TOTAL NJ EE        | 566,544.94   |                |                | 47,808.67      | 130,462.02     | 108,914.53     | 97,726.25      | 38,349.37      | 566,544.94   |            | 0%                                   |    |
| TOTAL NJ REBATE    | 828,787.88   |                | 77,312.48      | 144,129.18     | 158,043.82     | 218,143.72     | 133,168.75     | 69,731.50      | 800,529.45   | 28,258.43  | 3%                                   |    |
| TOTAL NV E&T       | 4,254.35     |                |                |                |                |                |                |                |              | 4,254.35   | 100%                                 |    |
| TOTAL NV R&D       | 1,513.58     |                |                |                |                |                |                |                |              | 1,513.58   | 100%                                 |    |
| TOTAL NV EE        | 2,669.57     |                |                |                |                |                |                |                |              | 2,669.57   | 100%                                 |    |
| TOTAL NV REBATE    | 3,880.35     |                |                |                |                |                | 562.05         |                | 562.05       | 3,318.30   | 86%                                  |    |
| TOTAL NYOHA E&T    | 859,663.28   | 22,767.05      | 123,650.14     | 252,366.92     | 128,388.20     | 130,724.92     | 90,313.31      | 110,886.26     | 859,096.80   | 566.48     | 0%                                   |    |
| TOTAL NYOHA R&D    | 274,472.51   |                | 6,390.96       | 24,355.11      | 71,495.96      | 18,689.14      | 555.67         | 49,035.36      | 170,522.20   | 103,950.31 | 38%                                  |    |
| TOTAL NYOHA EE     | 480,826.38   | 13,357.50      | 31,161.05      | 35,194.43      | 144,831.84     | 89,427.49      | 111,676.76     | 47,131.42      | 472,780.49   | 8,045.89   | 2%                                   |    |
| TOTAL NYOHA REBATE | 701,299.98   |                | 25,301.38      | 85,314.29      | 92,175.02      | 213,338.04     | 150,535.97     | 121,052.25     | 687,716.95   | 13,583.03  | 1%                                   |    |
| TOTAL UNYEA E&T    | 668,432.10   | (26,154.05)    | 161,429.56     | 146,958.11     | 116,065.05     | 84,437.36      | 83,266.24      | 17,971.79      | 583,974.06   | 84,458.04  | 23%                                  |    |
| TOTAL UNYEA R&D    | 214,094.33   | (5,197.28)     | 5,197.28       | 21,892.64      | 82,825.88      | 45,132.99      | 13,429.34      | 28,820.86      | 192,101.71   | 21,992.62  | 10%                                  |    |
| TOTAL UNYEA EE     | 374,003.72   | (14,124.87)    | 14,124.87      | 37,530.95      | 184,511.68     | 80,162.27      | 29,359.42      | 39,380.00      | 371,202.32   | 2,801.40   | 1%                                   |    |
| TOTAL UNYEA REBATE | 545,993.63   |                |                | 109,273.05     | 241,290.35     | 60,723.82      | 48,021.61      | 27,279.14      | 486,587.97   | 59,405.66  | 11%                                  |    |
| TOTAL UNVHC E&T    | 385,239.86   |                | 61,255.74      | 72,394.02      | 103,235.47     | 50,661.16      | 19,679.35      | 33,392.54      | 340,618.28   | 44,621.58  | 12%                                  |    |
| TOTAL UNVHC R&D    | 124,292.72   |                |                | 3,261.50       | 41,670.86      | 27,085.05      | 16,138.09      | 20,500.00      | 108,575.50   | 15,717.22  | 13%                                  |    |
| TOTAL UNVHC EE     | 215,687.53   |                | 14,192.35      | 35,543.65      | 43,277.64      | 69,204.97      | 27,259.47      | 4,310.00       | 193,788.08   | 21,899.45  | 21%                                  |    |
| TOTAL UNVHC REBATE | 153,261.80   |                | 1,593.05       | 40,502.35      | 82,617.71      | 98,348.53      | 9,442.44       | 19,864.80      | 252,368.88   | 62,892.92  | 20%                                  |    |
| TOTAL OHILI E&T    | 741,110.81   | 36,719.05      | 148,190.54     | 136,483.22     | 131,483.07     | 129,618.80     | 66,200.90      | 91,108.01      | 739,803.59   | 1,307.22   | 0%                                   |    |
| TOTAL OHILI R&D    | 237,407.27   | 7,714.78       | 13,369.32      | 67,667.52      | 32,716.07      | 10,137.79      | 50,497.42      | 41,575.06      | 223,677.96   | 13,729.31  | 6%                                   |    |
| TOTAL OHILI EE     | 414,632.70   | 30,427.37      | 16,893.95      | 141,068.04     | 57,914.89      | 83,019.97      | 51,342.86      | 33,125.76      | 413,792.84   | 839.86     | 0%                                   |    |
| TOTAL OHILI REBATE | 605,133.82   |                | 47,349.77      | 192,149.10     | 117,760.43     | 68,622.24      | 109,217.06     | 63,483.41      | 598,582.01   | 6,551.81   | 1%                                   |    |
| NYSEC 20 EE        |              |                |                |                |                |                | (0.02)         | (0.02)         |              | 0.02       |                                      |    |
| TOTAL OH E&T       | 387,669.69   |                | 66,345.37      | 86,674.78      | 40,108.38      | 5,351.66       | 13,421.80      | 211,901.99     | 175,767.70   |            | 45%                                  |    |
| TOTAL OH R&D       | 118,987.15   |                | 7,017.09       |                | 570.00         |                | 1,440.00       | 9,027.09       | 109,960.06   |            | 92%                                  |    |
| TOTAL OH EE        | 207,006.99   |                |                | 19,070.64      |                |                |                |                | 19,070.64    | 187,936.35 | 91%                                  |    |
| TOTAL OH REBATE    | 302,963.31   |                | 8,416.47       | 2,079.36       | 13,147.70      |                |                |                | 23,643.53    | 279,319.78 | 92%                                  |    |
| TOTAL PA E&T       | 1,984,829.34 |                | 177,797.58     | 327,281.78     | 318,550.61     | 308,328.22     | 280,896.89     | 193,926.80     | 1,606,781.88 | 378,047.46 | 8%                                   |    |
| TOTAL PA R&D       | 605,943.80   |                |                | 21,864.92      | 100,809.62     | 93,817.65      | 51,044.94      | 48,308.39      | 315,845.52   | 290,098.28 | 48%                                  |    |
| TOTAL PA EE        | 1,061,336.96 |                |                | 87,943.79      | 196,192.20     | 331,389.96     | 330,650.86     | 112,765.15     | 1,058,941.96 | 2,395.00   | 0%                                   |    |
| TOTAL PA REBATE    | 1,558,329.86 |                |                | 75,110.06      | 247,908.29     | 455,379.36     | 342,075.96     | 293,633.03     | 1,414,106.70 | 144,223.16 | 9%                                   |    |
| TOTAL RI E&T       | 422,522.98   | 31,620.00      | 78,808.55      | 50,260.00      | 49,710.26      | 72,819.13      | 62,699.65      | 63,003.50      | 408,921.09   | 13,601.89  | 3%                                   |    |
| TOTAL RI R&D       | 131,897.35   |                | 49,764.90      | 2,164.81       | (5,523.56)     | 30,065.08      | 22,449.85      | (3,851.46)     | 95,069.62    | 36,827.73  | 28%                                  |    |
| TOTAL RI EE        | 226,192.59   |                | 34,473.94      | 31,668.91      | 47,802.65      | 50,089.61      | 34,096.85      | 27,767.17      | 225,899.13   | 293.46     | 0%                                   |    |
| TOTAL RI REBATE    | 330,967.98   |                | 28,337.77      | 24,585.73      | 64,456.00      | 83,585.69      | 91,261.59      | 38,741.20      | 330,967.98   |            | 0%                                   |    |
| TOTAL SC E&T       | 150,536.33   |                |                |                | 12,913.65      | 44,375.00      | 50,400.00      | 24,000.00      | 131,688.65   | 18,847.68  | 13%                                  |    |
| TOTAL SC R&D       | 45,904.51    |                |                |                |                |                | 28,479.75      | 15,049.54      | 43,529.29    | 2,375.22   | 5%                                   |    |
| TOTAL SC EE        | 80,661.22    |                |                | 8,118.19       | 11,393.23      | 20,637.57      | 13,500.00      |                | 53,648.99    | 27,012.23  | 33%                                  |    |
| TOTAL SC REBATE    | 119,859.59   |                |                | 4,406.81       | 19,464.75      | 18,382.68      | 21,050.46      |                | 63,304.70    | 56,554.89  | 47%                                  |    |
| TOTAL VA E&T       | 439,145.18   |                | 20,378.87      | 58,359.24      | 93,493.50      | 67,013.12      | 101,595.75     | 17,640.63      | 358,481.11   | 80,664.07  | 18%                                  |    |
| TOTAL VA R&D       | 170,209.76   |                |                |                |                |                |                |                |              |            |                                      |    |



|  | 2021             | 2020 revised     | 2022             | 2023             |
|--|------------------|------------------|------------------|------------------|
| <b>INCOME</b>  |                  |                  |                  |                  |
| <b>Collections and Assessments</b>                       |                  |                  |                  |                  |
| Collections  | \$ 8,644,659.89  | \$ 8,127,762.70  | \$ 8,385,320.09  | \$ 8,133,760.49  |
| Remittance Accrual                                       |                  | \$ -             |                  |                  |
| Refunds  |                  | \$ -             |                  |                  |
| Escrow   | \$ 2,161,164.97  | \$ 2,001,940.67  | \$ 2,096,330.02  | \$ 2,033,440.12  |
| Collection Costs   | \$ ( 90,000.00 ) | \$ ( 90,000.00 ) | \$ ( 90,000.00 ) | \$ ( 90,000.00 ) |
| <b>Net Collections</b>                                   | \$ 6,393,494.91  | \$ 6,035,822.02  | \$ 6,198,990.07  | \$ 6,010,320.36  |
| <b>In Kind Contributions</b>                             |                  |                  |                  |                  |
| Sales Revenue  |                  | \$ -             |                  |                  |
| Other Revenue (Grants, etc)                              | \$ 100,000.00    | \$ 100,000.00    |                  |                  |
| <b>Total Income</b>                                      | \$ 6,493,494.91  | \$ 6,135,822.02  | \$ 6,198,990.07  | \$ 6,010,320.36  |
| <b>PROGRAM EXPENSES</b>                                  |                  |                  |                  |                  |
| <b>Consumer Education and Training (Max. 30%)</b>        |                  |                  |                  |                  |
| Education and Training (Central)                         | \$ 1,918,048.47  | \$ 1,837,746.61  | \$ 1,859,697.02  | \$ 1,803,096.11  |
| Education and Training (States)                          | \$ 280,000.00    | \$ 270,000.00    | \$ 280,000.00    | \$ 280,000.00    |
|  | \$ 1,638,048.47  | \$ 1,567,746.61  | \$ 1,579,697.02  | \$ 1,523,096.11  |
| <b>Research Development and Demonstration (Min. 30%)</b> |                  |                  |                  |                  |
| Research Development and Demonstration (Central)         | \$ 2,018,048.47  | \$ 2,278,204.00  | \$ 1,859,697.02  | \$ 1,803,096.11  |
| Research Development and Demonstration (States)          | \$ 1,270,000.00  | \$ 1,270,000.00  | \$ 1,270,000.00  | \$ 1,270,000.00  |
|  | \$ 748,048.47    | \$ 1,008,204.00  | \$ 589,697.02    | \$ 533,096.11    |
| <b>Home Energy Efficiency Program (Min. 15%)</b>         |                  |                  |                  |                  |
| Home Energy Efficiency Program (Central)                 | \$ 959,024.24    | \$ 918,873.30    | \$ 929,848.51    | \$ 901,548.05    |
| Home Energy Efficiency Program (States)                  | \$ 60,000.00     | \$ 54,720.00     | \$ 60,000.00     | \$ 60,000.00     |
|  | \$ 899,024.24    | \$ 864,153.30    | \$ 869,848.51    | \$ 841,548.05    |
| <b>Total Program Expenses</b>                            | \$ 4,895,121.19  | \$ 5,034,823.91  | \$ 4,649,242.55  | \$ 4,507,740.27  |
| <b>Total States</b>                                      |                  | \$ -             |                  |                  |
| <b>State Rebates</b>                                     | \$ 1,255,128.73  | \$ 1,187,958.67  | \$ 1,153,747.52  | \$ 1,106,580.09  |
| <b>Old Grant Advertising</b>                             | \$ -             | \$ -             |                  |                  |
| <b>Office Unallocated Expenses</b>                       |                  |                  |                  |                  |
| Salaries and Consulting (Admin)                          | \$ 169,950.00    | \$ 154,994.40    | \$ 165,000.00    | \$ 165,000.00    |
| Accounting (Admin)                                       | \$ 36,050.00     | \$ 32,877.60     | \$ 35,000.00     | \$ 35,000.00     |
| Insurance (Admin)  | \$ 15,450.00     | \$ 14,090.40     | \$ 28,000.00     | \$ 28,000.00     |
| Taxes  | \$ 3,090.00      | \$ 2,818.08      | \$ 3,000.00      | \$ 3,000.00      |
| Postage  | \$ 1,545.00      | \$ 1,409.04      | \$ 1,500.00      | \$ 1,500.00      |
| Web Pages  | \$ 15,450.00     | \$ 14,090.40     | \$ 5,000.00      | \$ 5,000.00      |
| Annual Report  | \$ 46,350.00     | \$ 42,271.20     | \$ 40,000.00     | \$ 40,000.00     |
| Rent and Telephone                                       | \$ 20,600.00     | \$ 18,787.20     | \$ 20,000.00     | \$ 20,000.00     |
| Travel   | \$ 1,030.00      | \$ 939.36        | \$ 1,000.00      | \$ 1,000.00      |
| Meeting Expenses   | \$ 3,090.00      | \$ 2,818.08      | \$ 3,000.00      | \$ 3,000.00      |
| Office Supplies  | \$ 1,030.00      | \$ 939.36        | \$ 1,000.00      | \$ 1,000.00      |
| Dues & Memberships                                       | \$ 1,030.00      | \$ 939.36        | \$ 2,500.00      | \$ 2,500.00      |
| Bank Fees  | \$ 6,180.00      | \$ 5,636.16      | \$ 6,000.00      | \$ 6,000.00      |
| Legal Expense  | \$ 77,250.00     | \$ 70,452.00     | \$ 80,000.00     | \$ 80,000.00     |
| Equipment Consulting                                     | \$ 5,150.00      | \$ 4,696.80      | \$ 5,000.00      | \$ 5,000.00      |
| Misc Expense/bill payment                                |                  | \$ -             | \$ 5,000.00      | \$ 5,000.00      |
| Advertising Expense                                      |                  | \$ -             | \$ -             | \$ -             |
| Fixed Assets <\$1,000                                    |                  | \$ -             | \$ -             | \$ -             |
| Equipment Maintenance                                    |                  | \$ -             | \$ -             | \$ -             |
| Bad Debts  |                  | \$ -             | \$ -             | \$ -             |
| <b>Total Unallocated Expenses (7 Percent Cap)</b>        | \$ 403,245.00    | \$ 367,759.44    | \$ 401,000.00    | \$ 401,000.00    |
| <b>Other Expenses/(Income)</b>                           |                  |                  |                  |                  |
| Cost of Goods Sold                                       |                  | \$ -             |                  |                  |
| Interest Expense   |                  | \$ -             |                  |                  |
| Interest   | \$ 60,000.00     | \$ 54,720.00     | \$ ( 5,000.00 )  | \$ ( 5,000.00 )  |
| <b>Total Other Expenses/(Income)</b>                     |                  | \$ 54,720.00     | \$ ( 5,000.00 )  | \$ ( 5,000.00 )  |
| Net Revenue/(Expense)                                    | \$ -             | \$ (400,000.00)  | \$ -             | \$ -             |
| <b>Net Revenue/(Expense)</b>                             |                  |                  |                  |                  |

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| Table 1                                   |                                    | 2019                               | 2020                               | 2021                               |
|---|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| <b>Section 1: General Information</b>     |                                    |                                    |                                    |                                    |
| <b>1.1. Identification of the Project</b> |                                    |                                    |                                    |                                    |
| Project Name                              | Project Alpha                      | Project Alpha                      | Project Alpha                      | Project Alpha                      |
| Project Number                            | 101                                | 101                                | 101                                | 101                                |
| Project Manager                           | John Doe                           | John Doe                           | John Doe                           | John Doe                           |
| Project Sponsor                           | ABC Corp                           | ABC Corp                           | ABC Corp                           | ABC Corp                           |
| Project Start Date                        | 2019-01-01                         | 2019-01-01                         | 2019-01-01                         | 2019-01-01                         |
| Project End Date                          | 2021-12-31                         | 2021-12-31                         | 2021-12-31                         | 2021-12-31                         |
| Project Status                            | Completed                          | Completed                          | Completed                          | Completed                          |
| <b>1.2. Project Objectives</b>            |                                    |                                    |                                    |                                    |
| Objective 1                               | Develop a new software application | Develop a new software application | Develop a new software application | Develop a new software application |
| Objective 2                               | Improve system performance         | Improve system performance         | Improve system performance         | Improve system performance         |
| Objective 3                               | Reduce operational costs           | Reduce operational costs           | Reduce operational costs           | Reduce operational costs           |
| Objective 4                               | Enhance user experience            | Enhance user experience            | Enhance user experience            | Enhance user experience            |
| Objective 5                               | Ensure data security               | Ensure data security               | Ensure data security               | Ensure data security               |
| <b>1.3. Project Scope</b>                 |                                    |                                    |                                    |                                    |
| Scope Item 1                              | Software Development               | Software Development               | Software Development               | Software Development               |
| Scope Item 2                              | System Integration                 | System Integration                 | System Integration                 | System Integration                 |
| Scope Item 3                              | Testing & Deployment               | Testing & Deployment               | Testing & Deployment               | Testing & Deployment               |
| Scope Item 4                              | Documentation                      | Documentation                      | Documentation                      | Documentation                      |
| Scope Item 5                              | Training                           | Training                           | Training                           | Training                           |
| <b>1.4. Project Budget</b>                |                                    |                                    |                                    |                                    |
| Budget Item 1                             | Personnel                          | Personnel                          | Personnel                          | Personnel                          |
| Budget Item 2                             | Hardware                           | Hardware                           | Hardware                           | Hardware                           |
| Budget Item 3                             | Software Licenses                  | Software Licenses                  | Software Licenses                  | Software Licenses                  |
| Budget Item 4                             | Travel                             | Travel                             | Travel                             | Travel                             |
| Budget Item 5                             | Other                              | Other                              | Other                              | Other                              |
| <b>1.5. Project Risks</b>                 |                                    |                                    |                                    |                                    |
| Risk Item 1                               | Scope Creep                        | Scope Creep                        | Scope Creep                        | Scope Creep                        |
| Risk Item 2                               | Resource Availability              | Resource Availability              | Resource Availability              | Resource Availability              |
| Risk Item 3                               | Technical Debt                     | Technical Debt                     | Technical Debt                     | Technical Debt                     |
| Risk Item 4                               | Communication Breakdown            | Communication Breakdown            | Communication Breakdown            | Communication Breakdown            |
| Risk Item 5                               | Market Changes                     | Market Changes                     | Market Changes                     | Market Changes                     |
| <b>1.6. Project Performance</b>           |                                    |                                    |                                    |                                    |
| Performance Metric 1                      | Progress                           | Progress                           | Progress                           | Progress                           |
| Performance Metric 2                      | Cost                               | Cost                               | Cost                               | Cost                               |
| Performance Metric 3                      | Quality                            | Quality                            | Quality                            | Quality                            |
| Performance Metric 4                      | Time                               | Time                               | Time                               | Time                               |
| Performance Metric 5                      | Customer Satisfaction              | Customer Satisfaction              | Customer Satisfaction              | Customer Satisfaction              |
| <b>1.7. Project Conclusion</b>            |                                    |                                    |                                    |                                    |
| Conclusion Item 1                         | Project Summary                    | Project Summary                    | Project Summary                    | Project Summary                    |
| Conclusion Item 2                         | Lessons Learned                    | Lessons Learned                    | Lessons Learned                    | Lessons Learned                    |
| Conclusion Item 3                         | Recommendations                    | Recommendations                    | Recommendations                    | Recommendations                    |
| Conclusion Item 4                         | Final Report                       | Final Report                       | Final Report                       | Final Report                       |
| Conclusion Item 5                         | Project Closure                    | Project Closure                    | Project Closure                    | Project Closure                    |

[illegible]

| General Information |           | Financial Data |          | Operational Metrics         |          | Compliance & Risk    |            | Human Resources       |       | Customer Engagement   |       | Marketing & Sales |         | IT & Infrastructure  |        | Legal & Governance        |        |
|---------------------|-----------|----------------|----------|-----------------------------|----------|----------------------|------------|-----------------------|-------|-----------------------|-------|-------------------|---------|----------------------|--------|---------------------------|--------|
| Category            | Value     | Category       | Value    | Category                    | Value    | Category             | Value      | Category              | Value | Category              | Value | Category          | Value   | Category             | Value  | Category                  | Value  |
| Revenue             | 123456789 | Profit         | 98765432 | Units Sold                  | 56789012 | Compliance Score     | 87.5       | Employee Count        | 12345 | Customer Satisfaction | 4.5   | Marketing Spend   | 1234567 | IT Budget            | 987654 | Legal Fees                | 543210 |
| Expenses            | 87654321  | Loss           | 54321098 | Units Produced              | 45678901 | Audit Findings       | 12         | Turnover Rate         | 15%   | Net Promoter Score    | 3.8   | Sales Volume      | 2345678 | Hardware Costs       | 876543 | Contractual Obligations   | 321098 |
| Assets              | 34567890  | Liabilities    | 23456789 | Inventory Levels            | 12345678 | Regulatory Updates   | 5          | Recruitment Rate      | 8%    | Churn Rate            | 2.1%  | Lead Generation   | 3456789 | Software Licenses    | 456789 | Dispute Resolution        | 210987 |
| Equity              | 23456789  | Debt           | 12345678 | Order Fulfillment           | 9876543  | Industry Trends      | 3          | Training Hours        | 56789 | Retention Rate        | 85%   | Acquisition Cost  | 150     | Cloud Migration      | 321098 | Litigation Status         | 109876 |
| Debt                | 12345678  | Equity         | 98765432 | Production Efficiency       | 8765432  | Competitor Analysis  | 2          | Employee Satisfaction | 7.2   | Customer Retention    | 90%   | Marketing ROI     | 2.5x    | Network Uptime       | 99.9%  | Shareholder Meetings      | 98765  |
| Equity              | 98765432  | Debt           | 54321098 | Quality Control             | 7654321  | Market Share         | 15%        | Customer Churn        | 3%    | Employee Turnover     | 12%   | Sales Growth      | 5%      | Disaster Recovery    | 100%   | Board of Directors        | 87654  |
| Debt                | 54321098  | Equity         | 34567890 | Customer Acquisition        | 6543210  | Growth Rate          | 10%        | Employee Retention    | 88%   | Churn Rate            | 2.1%  | Revenue Growth    | 12%     | Security Incidents   | 2      | Executive Compensation    | 76543  |
| Equity              | 34567890  | Debt           | 23456789 | Product Development         | 5432109  | Innovation Index     | 8.5        | Customer Loyalty      | 80%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | System Downtime      | 0.1%   | Shareholder Rights        | 65432  |
| Debt                | 23456789  | Equity         | 12345678 | Supply Chain Mgmt           | 4321098  | ESG Score            | 7.8        | Customer Feedback     | 95%   | Employee Training     | 90%   | Sales Volume      | 2345678 | Incident Response    | 100%   | Director Elections        | 54321  |
| Equity              | 12345678  | Debt           | 9876543  | Logistics Efficiency        | 3210987  | Carbon Footprint     | 12000 tons | Employee Satisfaction | 7.2   | Customer Churn        | 3%    | Marketing ROI     | 2.5x    | Business Continuity  | 100%   | Stakeholder Communication | 43210  |
| Debt                | 9876543   | Equity         | 8765432  | Warehouse Management        | 2109876  | Waste Reduction      | 5%         | Customer Retention    | 90%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Regulatory Reporting | 100%   | Public Relations          | 32109  |
| Equity              | 8765432   | Debt           | 7654321  | Transportation Costs        | 1098765  | Renewable Energy     | 30%        | Customer Feedback     | 95%   | Employee Training     | 90%   | Revenue Growth    | 12%     | Annual Reports       | 100%   | Investor Relations        | 21098  |
| Debt                | 7654321   | Equity         | 6543210  | Fuel Efficiency             | 987654   | Green Building       | 20%        | Employee Retention    | 88%   | Churn Rate            | 2.1%  | Marketing ROI     | 2.5x    | Press Releases       | 100%   | Analyst Coverage          | 10987  |
| Equity              | 6543210   | Debt           | 5432109  | Inventory Turnover          | 876543   | Sustainable Sourcing | 15%        | Customer Loyalty      | 80%   | Employee Engagement   | 75%   | Sales Volume      | 2345678 | Media Interviews     | 100%   | Rating Agencies           | 9876   |
| Debt                | 5432109   | Equity         | 4321098  | Order Accuracy              | 765432   | Water Conservation   | 10%        | Customer Churn        | 3%    | Employee Training     | 90%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Regulatory Filings        | 8765   |
| Equity              | 4321098   | Debt           | 3210987  | Delivery Speed              | 654321   | Energy Efficiency    | 5%         | Customer Retention    | 90%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Kits           | 100%   | SEC Filings               | 7654   |
| Debt                | 3210987   | Equity         | 2109876  | Customer Retention          | 543210   | Waste Recycling      | 30%        | Customer Feedback     | 95%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Releases       | 100%   | 10-K Filings              | 6543   |
| Equity              | 2109876   | Debt           | 1098765  | Product Launch Success      | 432109   | Green Procurement    | 25%        | Employee Retention    | 88%   | Churn Rate            | 2.1%  | Revenue Growth    | 12%     | Press Conferences    | 100%   | 8-K Filings               | 5432   |
| Debt                | 1098765   | Equity         | 987654   | Market Penetration          | 321098   | Carbon Footprint     | 10000 tons | Customer Loyalty      | 80%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Kits           | 100%   | Quarterly Earnings        | 4321   |
| Equity              | 987654    | Debt           | 876543   | Competitive Advantage       | 210987   | Waste Reduction      | 5%         | Customer Churn        | 3%    | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Releases       | 100%   | Annual Earnings           | 3210   |
| Debt                | 876543    | Equity         | 765432   | Supply Chain Resilience     | 109876   | Renewable Energy     | 20%        | Customer Feedback     | 95%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 2109   |
| Equity              | 765432    | Debt           | 654321   | Logistics Network           | 98765    | Green Building       | 15%        | Customer Retention    | 90%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Kits           | 100%   | Quarterly Profit          | 1098   |
| Debt                | 654321    | Equity         | 543210   | Transportation Innovation   | 87654    | Sustainable Sourcing | 10%        | Customer Churn        | 3%    | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Releases       | 100%   | Annual Revenue            | 987    |
| Equity              | 543210    | Debt           | 432109   | Warehouse Automation        | 76543    | Water Conservation   | 5%         | Customer Feedback     | 95%   | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Profit          | 876    |
| Debt                | 432109    | Equity         | 321098   | Order Processing Efficiency | 65432    | Energy Efficiency    | 5%         | Customer Retention    | 90%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Kits           | 100%   | Quarterly Revenue         | 765    |
| Equity              | 321098    | Debt           | 210987   | Customer Retention          | 54321    | Waste Recycling      | 30%        | Customer Feedback     | 95%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 654    |
| Debt                | 210987    | Equity         | 109876   | Product Launch Success      | 43210    | Green Procurement    | 25%        | Customer Churn        | 3%    | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 543    |
| Equity              | 109876    | Debt           | 98765    | Market Penetration          | 32109    | Carbon Footprint     | 10000 tons | Customer Loyalty      | 80%   | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Revenue         | 432    |
| Debt                | 98765     | Equity         | 87654    | Competitive Advantage       | 21098    | Waste Reduction      | 5%         | Customer Churn        | 3%    | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 321    |
| Equity              | 87654     | Debt           | 76543    | Supply Chain Resilience     | 10987    | Renewable Energy     | 20%        | Customer Feedback     | 95%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Conferences    | 100%   | Quarterly Revenue         | 210    |
| Debt                | 76543     | Equity         | 65432    | Logistics Network           | 9876     | Green Building       | 15%        | Customer Retention    | 90%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 109    |
| Equity              | 65432     | Debt           | 54321    | Transportation Innovation   | 8765     | Sustainable Sourcing | 10%        | Customer Churn        | 3%    | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Revenue         | 98     |
| Debt                | 54321     | Equity         | 43210    | Warehouse Automation        | 7654     | Water Conservation   | 5%         | Customer Feedback     | 95%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 87     |
| Equity              | 43210     | Debt           | 32109    | Order Processing Efficiency | 6543     | Energy Efficiency    | 5%         | Customer Retention    | 90%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Conferences    | 100%   | Quarterly Revenue         | 76     |
| Debt                | 32109     | Equity         | 21098    | Customer Retention          | 5432     | Waste Recycling      | 30%        | Customer Feedback     | 95%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 65     |
| Equity              | 21098     | Debt           | 10987    | Product Launch Success      | 4321     | Green Procurement    | 25%        | Customer Churn        | 3%    | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Revenue         | 54     |
| Debt                | 10987     | Equity         | 9876     | Market Penetration          | 3210     | Carbon Footprint     | 10000 tons | Customer Loyalty      | 80%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 43     |
| Equity              | 9876      | Debt           | 8765     | Competitive Advantage       | 2109     | Waste Reduction      | 5%         | Customer Churn        | 3%    | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 32     |
| Debt                | 8765      | Equity         | 7654     | Supply Chain Resilience     | 1098     | Renewable Energy     | 20%        | Customer Feedback     | 95%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Conferences    | 100%   | Quarterly Revenue         | 21     |
| Equity              | 7654      | Debt           | 6543     | Logistics Network           | 987      | Green Building       | 15%        | Customer Retention    | 90%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 10     |
| Debt                | 6543      | Equity         | 5432     | Transportation Innovation   | 876      | Sustainable Sourcing | 10%        | Customer Churn        | 3%    | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Revenue         | 9      |
| Equity              | 5432      | Debt           | 4321     | Warehouse Automation        | 765      | Water Conservation   | 5%         | Customer Feedback     | 95%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 8      |
| Debt                | 4321      | Equity         | 3210     | Order Processing Efficiency | 654      | Energy Efficiency    | 5%         | Customer Retention    | 90%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Conferences    | 100%   | Quarterly Revenue         | 7      |
| Equity              | 3210      | Debt           | 2109     | Customer Retention          | 543      | Waste Recycling      | 30%        | Customer Feedback     | 95%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 6      |
| Debt                | 2109      | Equity         | 1098     | Product Launch Success      | 432      | Green Procurement    | 25%        | Customer Churn        | 3%    | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Revenue         | 5      |
| Equity              | 1098      | Debt           | 987      | Market Penetration          | 321      | Carbon Footprint     | 10000 tons | Customer Loyalty      | 80%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 4      |
| Debt                | 987       | Equity         | 876      | Competitive Advantage       | 210      | Waste Reduction      | 5%         | Customer Churn        | 3%    | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 3      |
| Equity              | 876       | Debt           | 765      | Supply Chain Resilience     | 109      | Renewable Energy     | 20%        | Customer Feedback     | 95%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Conferences    | 100%   | Quarterly Revenue         | 2      |
| Debt                | 765       | Equity         | 654      | Logistics Network           | 98       | Green Building       | 15%        | Customer Retention    | 90%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 1      |
| Equity              | 654       | Debt           | 543      | Transportation Innovation   | 87       | Sustainable Sourcing | 10%        | Customer Churn        | 3%    | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 543       | Equity         | 432      | Warehouse Automation        | 76       | Water Conservation   | 5%         | Customer Feedback     | 95%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 432       | Debt           | 321      | Order Processing Efficiency | 65       | Energy Efficiency    | 5%         | Customer Retention    | 90%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 321       | Equity         | 210      | Customer Retention          | 54       | Waste Recycling      | 30%        | Customer Feedback     | 95%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 210       | Debt           | 109      | Product Launch Success      | 43       | Green Procurement    | 25%        | Customer Churn        | 3%    | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 109       | Equity         | 98       | Market Penetration          | 32       | Carbon Footprint     | 10000 tons | Customer Loyalty      | 80%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 98        | Debt           | 87       | Competitive Advantage       | 21       | Waste Reduction      | 5%         | Customer Churn        | 3%    | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 87        | Equity         | 76       | Supply Chain Resilience     | 10       | Renewable Energy     | 20%        | Customer Feedback     | 95%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 76        | Debt           | 65       | Logistics Network           | 9        | Green Building       | 15%        | Customer Retention    | 90%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 65        | Equity         | 54       | Transportation Innovation   | 8        | Sustainable Sourcing | 10%        | Customer Churn        | 3%    | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 54        | Debt           | 43       | Warehouse Automation        | 7        | Water Conservation   | 5%         | Customer Feedback     | 95%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 43        | Equity         | 32       | Order Processing Efficiency | 6        | Energy Efficiency    | 5%         | Customer Retention    | 90%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 32        | Debt           | 21       | Customer Retention          | 5        | Waste Recycling      | 30%        | Customer Feedback     | 95%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 21        | Equity         | 10       | Product Launch Success      | 4        | Green Procurement    | 25%        | Customer Churn        | 3%    | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 10        | Debt           | 9        | Market Penetration          | 3        | Carbon Footprint     | 10000 tons | Customer Loyalty      | 80%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 9         | Equity         | 8        | Competitive Advantage       | 2        | Waste Reduction      | 5%         | Customer Churn        | 3%    | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 8         | Debt           | 7        | Supply Chain Resilience     | 1        | Renewable Energy     | 20%        | Customer Feedback     | 95%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 7         | Equity         | 6        | Logistics Network           | 0        | Green Building       | 15%        | Customer Retention    | 90%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 6         | Debt           | 5        | Transportation Innovation   | 0        | Sustainable Sourcing | 10%        | Customer Churn        | 3%    | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 5         | Equity         | 4        | Warehouse Automation        | 0        | Water Conservation   | 5%         | Customer Feedback     | 95%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 4         | Debt           | 3        | Order Processing Efficiency | 0        | Energy Efficiency    | 5%         | Customer Retention    | 90%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 3         | Equity         | 2        | Customer Retention          | 0        | Waste Recycling      | 30%        | Customer Feedback     | 95%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 2         | Debt           | 1        | Product Launch Success      | 0        | Green Procurement    | 25%        | Customer Churn        | 3%    | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 1         | Equity         | 0        | Market Penetration          | 0        | Carbon Footprint     | 10000 tons | Customer Loyalty      | 80%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 0         | Debt           | 0        | Competitive Advantage       | 0        | Waste Reduction      | 5%         | Customer Churn        | 3%    | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 0         | Equity         | 0        | Supply Chain Resilience     | 0        | Renewable Energy     | 20%        | Customer Feedback     | 95%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 0         | Debt           | 0        | Logistics Network           | 0        | Green Building       | 15%        | Customer Retention    | 90%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 0         | Equity         | 0        | Transportation Innovation   | 0        | Sustainable Sourcing | 10%        | Customer Churn        | 3%    | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 0         | Debt           | 0        | Warehouse Automation        | 0        | Water Conservation   | 5%         | Customer Feedback     | 95%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 0         | Equity         | 0        | Order Processing Efficiency | 0        | Energy Efficiency    | 5%         | Customer Retention    | 90%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 0         | Debt           | 0        | Customer Retention          | 0        | Waste Recycling      | 30%        | Customer Feedback     | 95%   | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 0         | Equity         | 0        | Product Launch Success      | 0        | Green Procurement    | 25%        | Customer Churn        | 3%    | Employee Training     | 90%   | Sales Volume      | 2345678 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 0         | Debt           | 0        | Market Penetration          | 0        | Carbon Footprint     | 10000 tons | Customer Loyalty      | 80%   | Employee Satisfaction | 7.2   | Marketing ROI     | 2.5x    | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 0         | Equity         | 0        | Competitive Advantage       | 0        | Waste Reduction      | 5%         | Customer Churn        | 3%    | Employee Engagement   | 75%   | Marketing Spend   | 1234567 | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Equity              | 0         | Debt           | 0        | Supply Chain Resilience     | 0        | Renewable Energy     | 20%        | Customer Feedback     | 95%   | Employee Turnover     | 12%   | Sales Growth      | 5%      | Press Conferences    | 100%   | Quarterly Revenue         | 0      |
| Debt                | 0         |                |          |                             |          |                      |            |                       |       |                       |       |                   |         |                      |        |                           |        |





1. The first part of the document is a list of the names of the members of the committee who have been appointed to the various sub-committees.

2. The second part of the document is a list of the names of the members of the committee who have been appointed to the various sub-committees.

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9. The ninth part of the document is a list of the names of the members of the committee who have been appointed to the various sub-committees.

10. The tenth part of the document is a list of the names of the members of the committee who have been appointed to the various sub-committees.

# NORA RESEARCH

NORA Board of Directors Meeting  
May 25, 2021

Tom Butcher

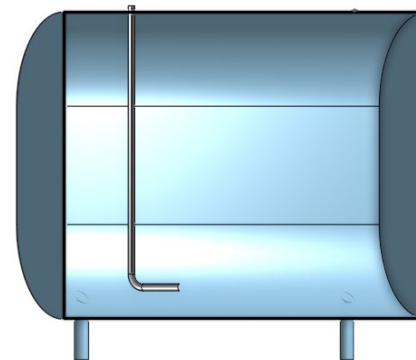
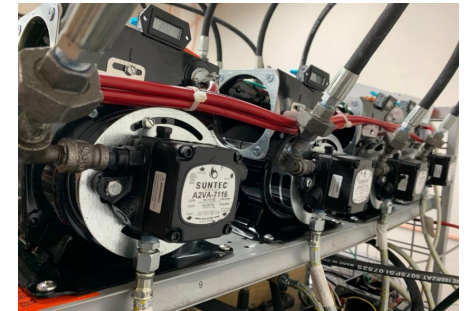
NORA R&D Team: Ryan Kerr, Neehad Islam, Bob O'Brien, Tom Butcher

# Topics

- Advancing Biodiesel
- Ethyl Levulinate (EL)
- Heat Pump Field Study
- SMTI Fuel-Fired Heat Pump Project
- ACT Burner Development Project
- Efficiency / Rebate Program
- Publications and Presentations

# Biodiesel

- Cubby B50 Field Test
  - Focus on changes in fuel over time and burner performance
  - Currently looking at summer performance with properly additized fuels
  - Test will end December 2021
- Other B100 Field Tests
  - Studies of impact of burner setup on long term performance
- In-Lab Additive Tests
  - Effect of additives on pump start torque with degraded fuels
- Long term durability of future pump designs with different blend levels
  - Suntec collaboration – forced cycling under carefully controlled conditions
  - Some field tests
- Outside tanks, high blend levels, cold climates
  - Recently completed extensive tests of different heater options
  - Best practices report recently completed



# EL

Considerable pre-commercial activity;  
We are moving forward with ASTM Specification process;  
Need to better understand long-term storage stability of EL.

| Property                              | Specification                | Test Method (suggested) |
|---------------------------------------|------------------------------|-------------------------|
| API Gravity @60°F                     | Report                       | ASTM D4052              |
| Haze Rating                           | < 2                          | ASTM D4176              |
| Electrical Conductivity               | >2,000 pS/m                  | ASTM D2624              |
| Water content % mass                  | <2.0                         | ASTM D1364              |
| Non water impurity components, % mass | <2.0                         | ASTM 8276               |
| Total acidity mg KOH/g                | <0.5                         | ASTM D664               |
| Flash Point (°C)                      | > 91 °C                      | ASTM D93A               |
| Cloud Point                           | < - 0 °F                     | ASTM D5773              |
| Pour Point                            | < -40 °C                     | D97                     |
| Sulfur Content                        | < 15 ppm                     | ASTM D2622              |
| Bottom Sediment and Water             | < .05%                       | ASTM D2709              |
| Kinematic Viscosity at 40°C           | <2.5 cSt                     | ASTM D445               |
| Copper Strip Corrosion                | No. 3 Max                    | ASTM D130               |
| Heating Value (HHV)                   | 95,000 BTU per gallon<br>Min | ASTM D240               |
| Oxidative Stability, hours, min       | > 40 hours                   | EN15751                 |

# Heat Pump Field Study

- Report completed, accepted by cosponsor NYSERDA;
- Best practices for use of integrated hydronic/ductless heat pump systems;
- Single head ductless heat pumps when installed with existing hydronic heating systems take over only a small part of the home load;
- Detailed analysis of cost and energy savings demonstrate no or minimal payback with use of heat pump;
- We need to complete a peer-reviewed publication;
- Ideas for additional analyses.

# SMTI Biofuel-Fired Heat Pump

- Converted burner approach to pressure-atomized, 2/1 modulation;
- Combustion testing very encouraging with this approach;
- Difficult application – 1.6” backpressure, 0.25 to 0.5 gph firing rate;
- Now planning more realistic test bed;
- Team moving forward rapidly now.





# Development Project

## Advanced Combustion Technologies (ACT)

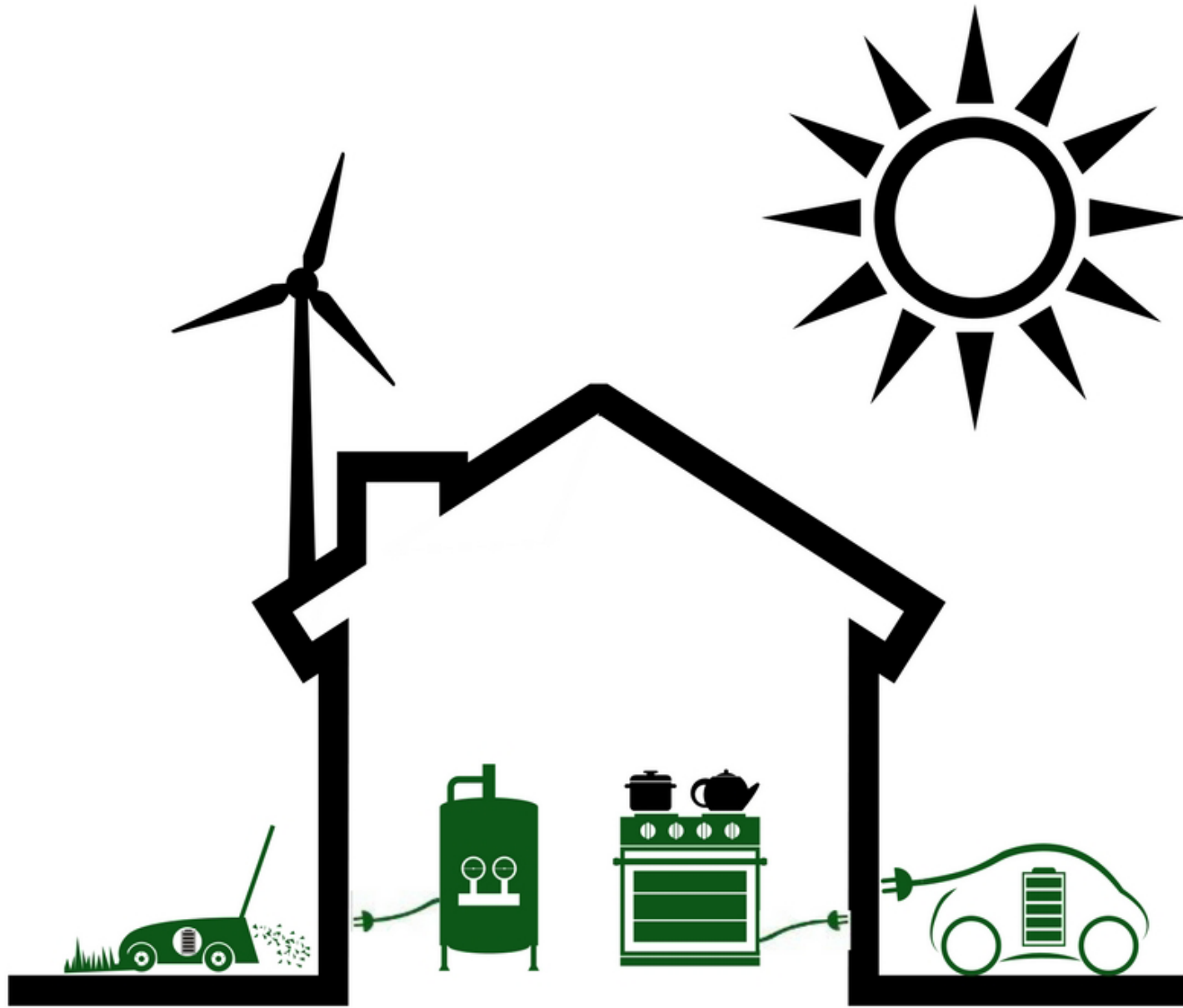
- Phase I funded by NORA after considerable due-diligence;
- As a first Phase of this project, ACT, with some technical support from NORA, will be developing a proof-of-concept prototype of a novel, air-atomized burner using their proprietary fuel injection technology.
- The prototype is being targeted for 3/1 turndown and biodiesel firing;
- Project target firing rate matches SMTI project needs;
- Work started May 17, 9 months.

# Efficiency / Rebate Program

- Focus is on quantifying energy savings as a function of installed system type;
- For this detailed delivery data is needed. We have received this and will seek more to broaden the scope of the analysis;
- Based on sites to date – with some upgrades (replacing old system with a similar new system) savings disappointing;
- Upgrade to systems with high efficiency and low idle losses leads to stronger savings;
- New intern for this summer to advance the tedious analysis work. Michael Persch, Stony Brook Engineering Undergraduate.

# Reports and Presentations

- Report on long term cycling tests with legacy pumps over a range of biodiesel blend levels on NORA website;
- Combustion test report with EL100 in a commercial boiler on NORA website;
- Multiple presentations at EEE on biodiesel and heat pumps;
- Talk at National Biodiesel Conference;
- Invited talk for American Oil Chemists Society (AOCS);
- Presentation on biodiesel and transition of the industry at ASHRAE Annual Conference (June 28-30);
- Presentation on EL at ASTM Summer Meeting (June 1)



## **GHG EMISSION REDUCTIONS AND COSTS OF ELECTRIC HEAT PUMP CONVERSIONS VERSUS INCREASING BIOBLEND**

**RICHARD SWEETSER**  
**NORA TECHNICAL RESEARCH**

# DEMAND SIDE ANALYSIS

# Input Variables

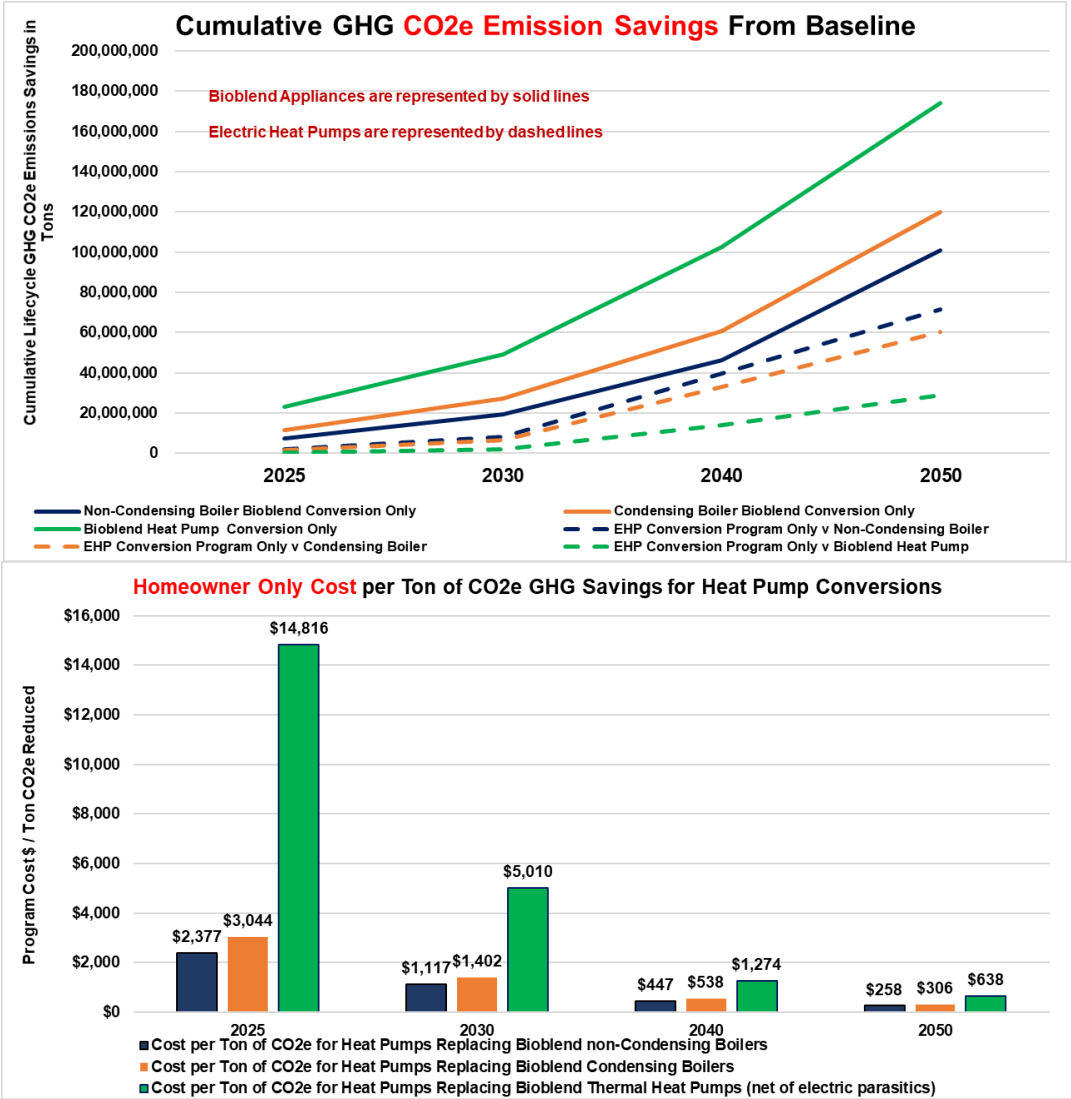
| Variable   | Inputs   | Comment   |
|--|--|---|
| Select City to Determine Weather BIN data for electric Heat Pump Performance   | Worcester, MA  | Selecting a city provides the weather data for the EHP COP and capacity as well as the required backup electric resistance heating capacity required                                  |
| Select Global Warming Atmospheric Lifetime to Determine GHG Emissions Impact.<br>NOTE: 20 Year Lifetime is Most Credible | 20 Year Lifetime-AR5   | Toggle between IPCC 100 year and 20 year atmospheric lifetime to show the impact of this critical variable. 20 year atmospheric lifetime focuses on near term impact                  |
| Select Biodiesel Feedstock which Directly Impacts GHG emissions  | Average Bioblend of Feedstocks   | Used Cooking Oil (UCO) Feedstock, Animal Fats Feedstock, Soy Oil Feedstock, Canola Oil Feedstock, Distillers corn oil (DCO) Feedstock, Average Bioblend of Feedstocks                 |
| Select Liquid Fueled Baseline Efficiency for Existing Homes under Examination  | 78%  | Select the efficiency of the existing oil heated (model assumes ULSD) homes you want to examine   |
| Select Seasonal Liquid Fueled Non-Condensing Boiler Efficiency   | 86%  | Select Liquid Fueled Conversion Efficiency for all oil heated homes in the study for comparison.  |
| Select Seasonal Liquid Fueled Condensing Boiler Efficiency   | 95%  | Select Liquid Fueled Conversion Efficiency for all oil heated homes in the study for comparison.  |
| Select Seasonal Liquid Fueled Thermal Heat Pump (net of electric parasitics) Efficiency                                  | 135%   | Select Liquid Fueled Conversion Efficiency for all oil heated homes in the study for comparison.  |
| Select Electric Heat Pump (EHP) Performance Curve - See graph below  | HP7  | Select EHP Performance based on NYSERDA report titled "Development of a Best Practices Guide for Integrated Hydronic and Ductless, Air-source Heat Pump Systems"                      |
| Select Electric Resistance Seasonal Performance Efficiency   | 100%   | Select heating efficiency of the electric resistance back up heating  |
| Select Annual Home Heating Load in MMBtu   | 100  | Select annual load in MMBtu per heat. 100 MMBtu is about the load for an average 2,000 sq ft home on Massachusetts  |
| Select the Bioblend Uptake Scenario  | Scenario 2: B5 2021-2024, B20 2025-2029, B50 2030-2039, B100 2040-2050 | Select the Bioblend Scenario (Scenario 1 is slow adoption of bioblending and Scenario 2 is Aggressive Adoption of Bioblends)  |
| Marginal Electricity Decarbonization rate over 2021 Baseline for EHP and Electricity Used for Biofuels                   | Scenario 3: 15%@2025, 25%@2030, 50%@2040 & 100%@2050                   | Select the electricity decarbonization rate. Scenario 1 is the least aggressive and Scenario 3 is the most aggressive. This applies to the EHP and electricity used in bio-feedstocks |
| Select the Total Number of Home Conversions to Lower Carbon Liquid Fuel Blends to Lower GHG Emissions                    | 646,103  | Enter the number of oil heated homes to be examined for conversion. This number represents all the oil heated home in Massachusetts.  |
| Percentage of Existing Liquid Fueled Homes to be Converted Annually  | 5.00%  | Use the dropdown menu to select the percentage of the examined home above that will be annually converted to EHPs   |
| Annual Number of Home Conversions to EHPs with Electric Backup (reduces Liquid Fuel Total Annually)                      | 32,305   | This is the conversion percentage times the heated homes to be examined. e.g. 646,103 x 5% = 32305 homes annually.  |
| Heat Pump Conversion Cost Estimation Curve (see cost graph below)  | High Conversion Cost Scenario 1  | Select from the two EHP cost conversion curves developed based on HVAC contractor consensus.  |
| Heat Pump Conversion Design - Whole House vs Partial House Heating. Enter the Percentage of Load Served by Heat Pump     | 100.0%   | Use the dropdown menu to enter the percentage of the house the EHP will heat.   |
| Average Cost of One Whole House Heat Pump with Electric Backup Conversion  | \$25,000   | This is the Annual Number of Home Conversions times the percentage of the house the EHP will heat cost curve.   |
| Select Discount Rate for Heat Pump Program Cost Calculation  | 2.00%  | This is the discount rate to be applied to HP costs to properly account for the time value of money. 2% is a good current rate for state and local governments.                       |

# HOW TO WORK THE CALCULATOR



# Use Case: High EHP Whole House Conversion Rate with Slow Bioblend Adoption Rate

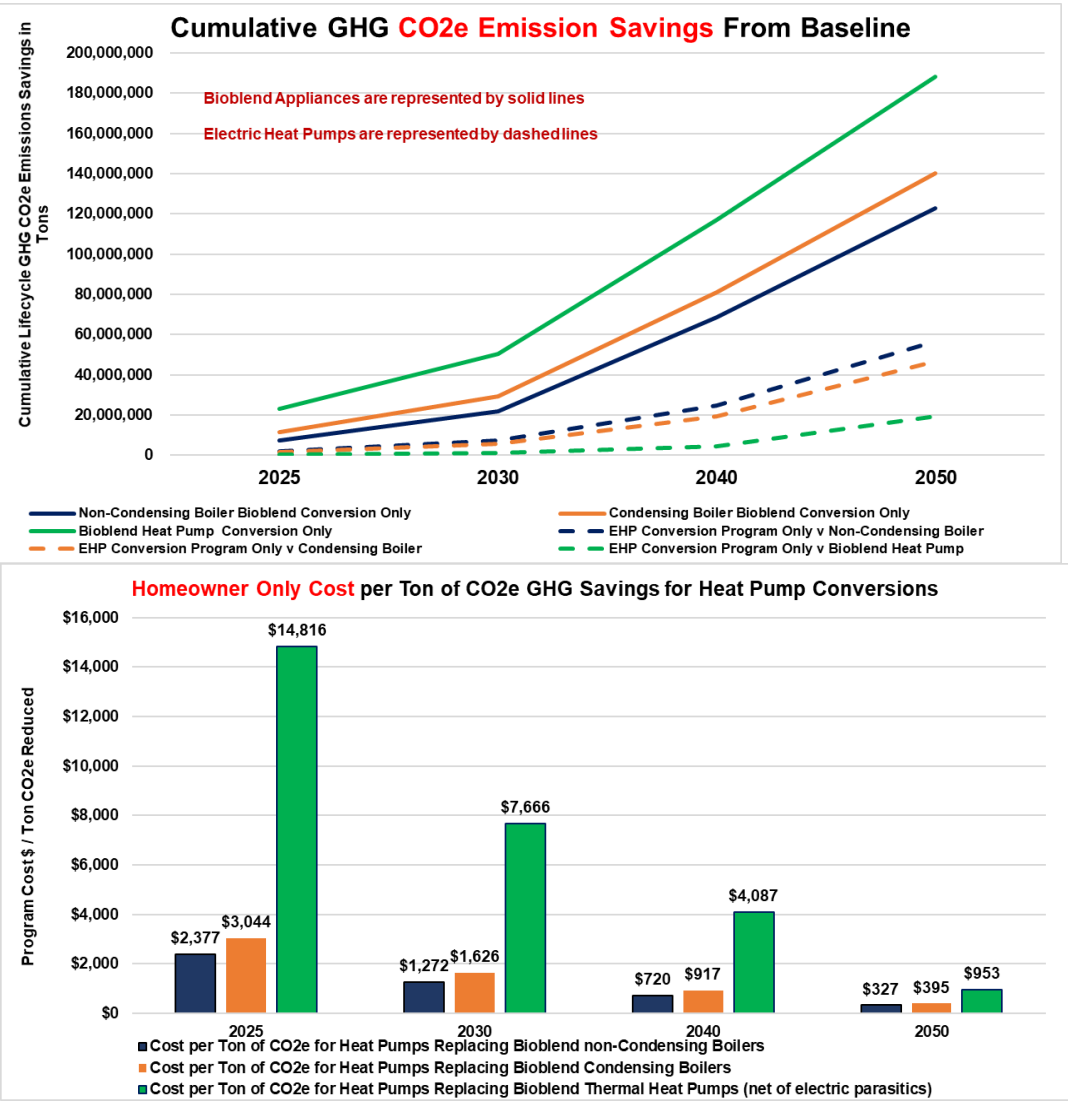
|   |
|---|
| Worcester, MA   |
| 20 Year Lifetime-AR5  |
| Average Bioblend of Feedstocks                                    |
| 78%   |
| 86%   |
| 95%   |
| 135%  |
| HP7   |
| 100%  |
| 100   |
| Scenario 1: B5 2021-2024, B20 2025-2039, B50 2040-2049, B100-2050 |
| Scenario 3: 15%@2025, 25%@2030, 50%@2040 & 100%@2050              |
| 646,103   |
| 5.00%   |
| 32,305  |
| High Conversion Cost Scenario 1                                   |
| 100.0%  |
| \$35,000  |
| 2.00%   |





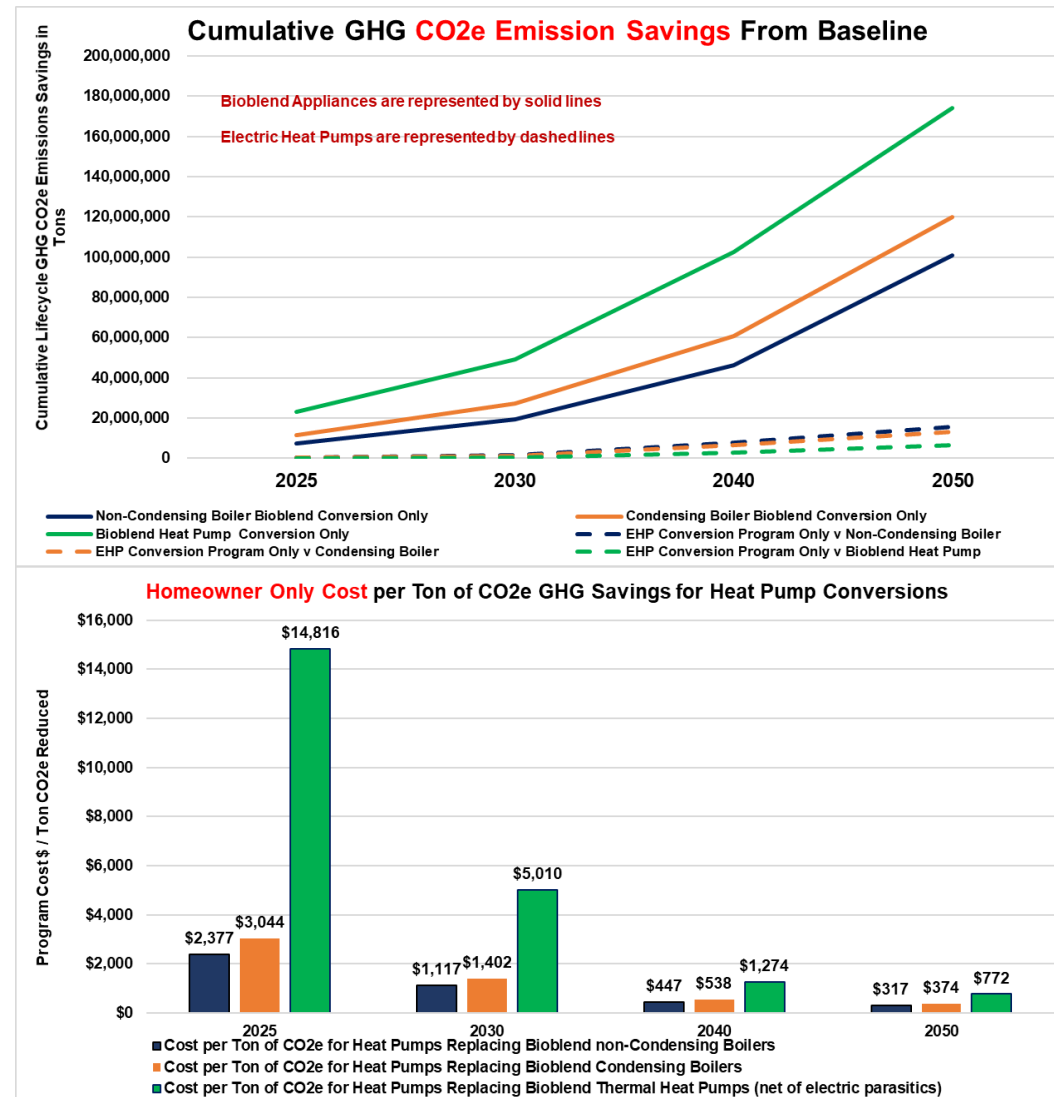
# Use Case: High EHP Whole House Conversion Rate with Aggressive Bioblend Adoption Rate

|  |
|--|
| Worcester, MA  |
| 20 Year Lifetime-AR5   |
| Average Bioblend of Feedstocks   |
| 78%  |
| 86%  |
| 95%  |
| 135%   |
| HP7  |
| 100%   |
| 100  |
| Scenario 2: B5 2021-2024, B20 2025-2029, B50 2030-2039, B100 2040-2050 |
| Scenario 3: 15%@2025, 25%@2030, 50%@2040 & 100%@2050                   |
| 646,103  |
| 5.00%  |
| 32,305   |
| High Conversion Cost Scenario 1  |
| 100.0%   |
| \$35,000   |
| 2.00%  |



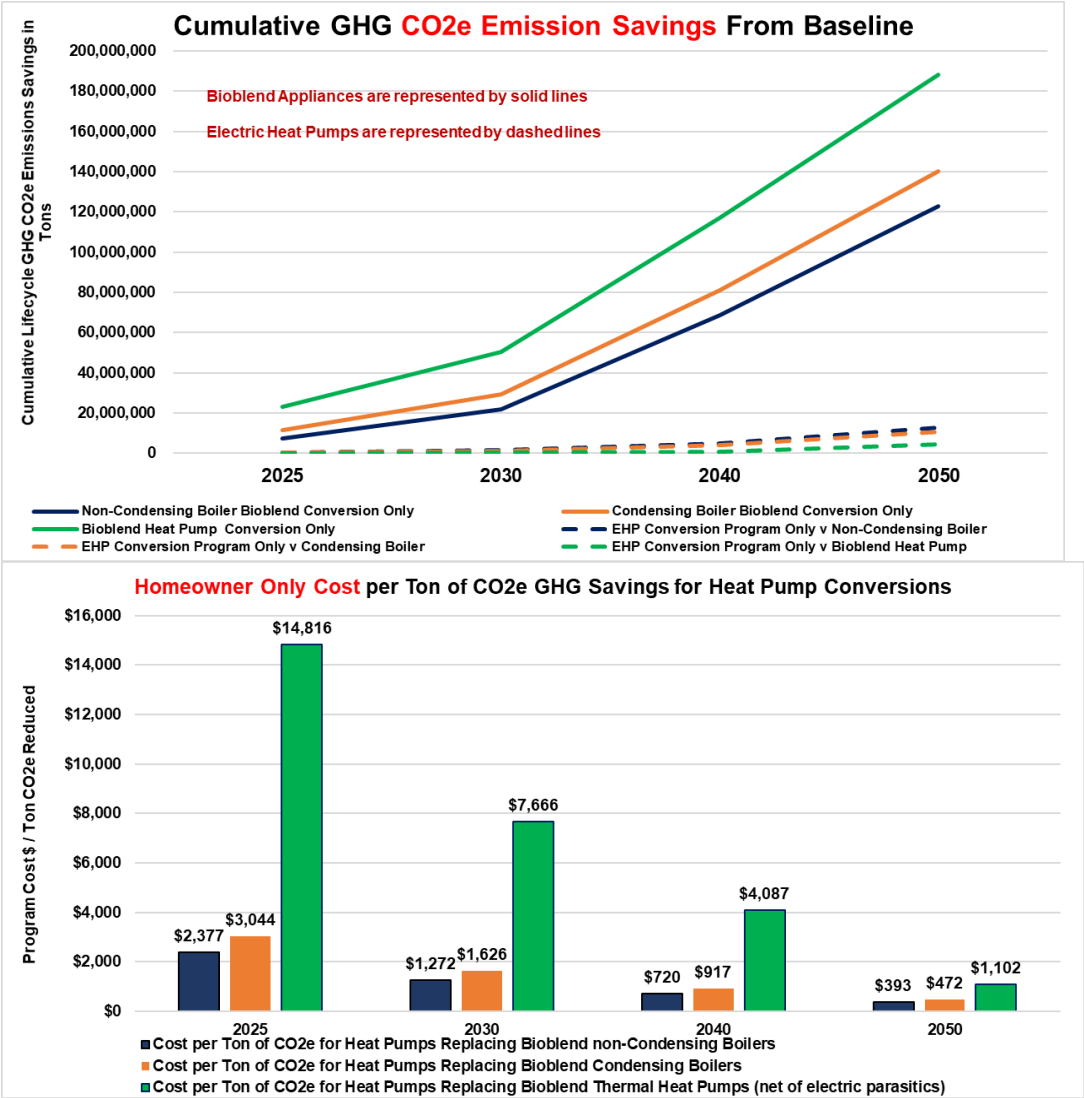
# Use Case: Low EHP Whole House Conversion Rate with Slow Bioblend Adoption Rate

|   |
|---|
| Worcester, MA   |
| 20 Year Lifetime-AR5  |
| Average Bioblend of Feedstocks                                    |
| 78%   |
| 86%   |
| 95%   |
| 135%  |
| HP7   |
| 100%  |
| 100   |
| Scenario 1: B5 2021-2024, B20 2025-2039, B50 2040-2049, B100-2050 |
| Scenario 3: 15%@2025, 25%@2030, 50%@2040 & 100%@2050              |
| 646,103   |
| 1.00%   |
| 6,461   |
| High Conversion Cost Scenario 1                                   |
| 100.0%  |
| \$35,000  |
| 2.00%   |



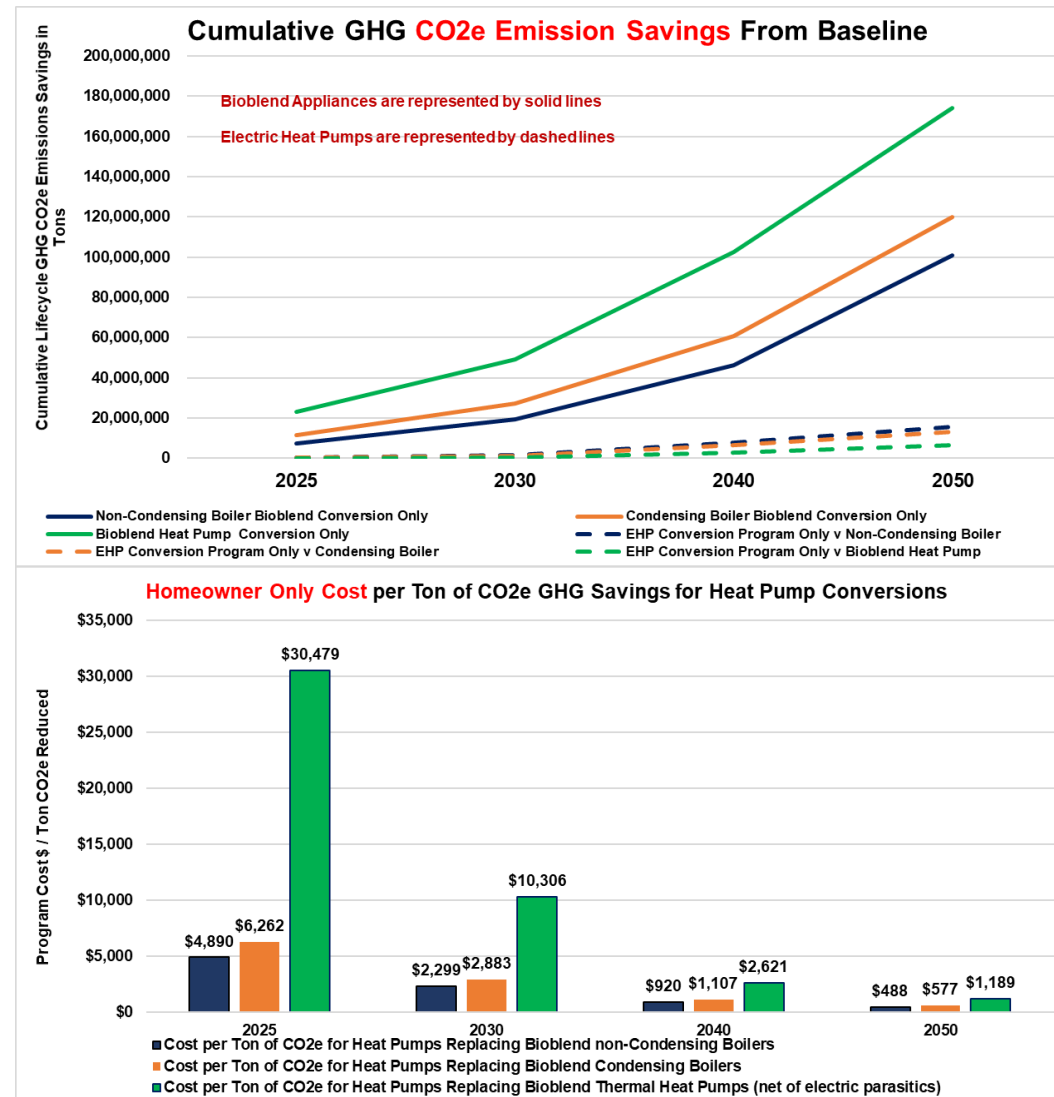
# Use Case: Low EHP Whole House Conversion Rate with Aggressive Bioblend Adoption Rate

|  |
|--|
| Worcester, MA  |
| 20 Year Lifetime-AR5   |
| Average Bioblend of Feedstocks   |
| 78%  |
| 86%  |
| 95%  |
| 135%   |
| HP7  |
| 100%   |
| 100  |
| Scenario 2: B5 2021-2024, B20 2025-2029, B50 2030-2039, B100 2040-2050 |
| Scenario 3: 15%@2025, 25%@2030, 50%@2040 & 100%@2050                   |
| 646,103  |
| 1.00%  |
| 6,461  |
| High Conversion Cost Scenario 1  |
| 100.0%   |
| \$35,000   |
| 2.00%  |



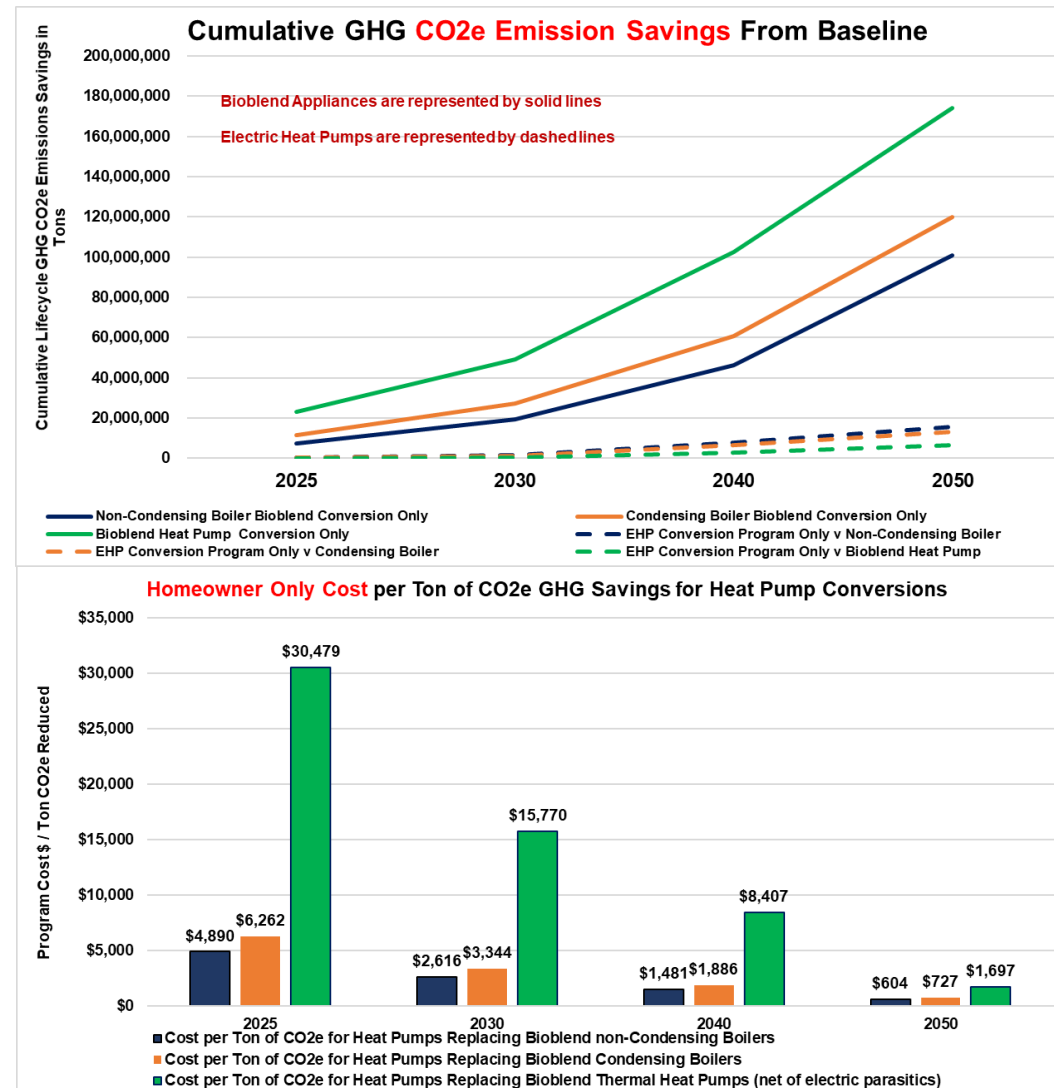
# Use Case: High EHP Partial (25%) House Conversion Rate with Slow Bioblend Adoption Rate

|   |
|---|
| Worcester, MA   |
| 20 Year Lifetime-AR5  |
| Average Bioblend of Feedstocks                                    |
| 78%   |
| 86%   |
| 95%   |
| 135%  |
| HP7   |
| 100%  |
| 100   |
| Scenario 1: B5 2021-2024, B20 2025-2039, B50 2040-2049, B100-2050 |
| Scenario 3: 15%@2025, 25%@2030, 50%@2040 & 100%@2050              |
| 646,103   |
| 5.00%   |
| 32,305  |
| High Conversion Cost Scenario 1                                   |
| 25.0%   |
| \$18,000  |
| 2.00%   |



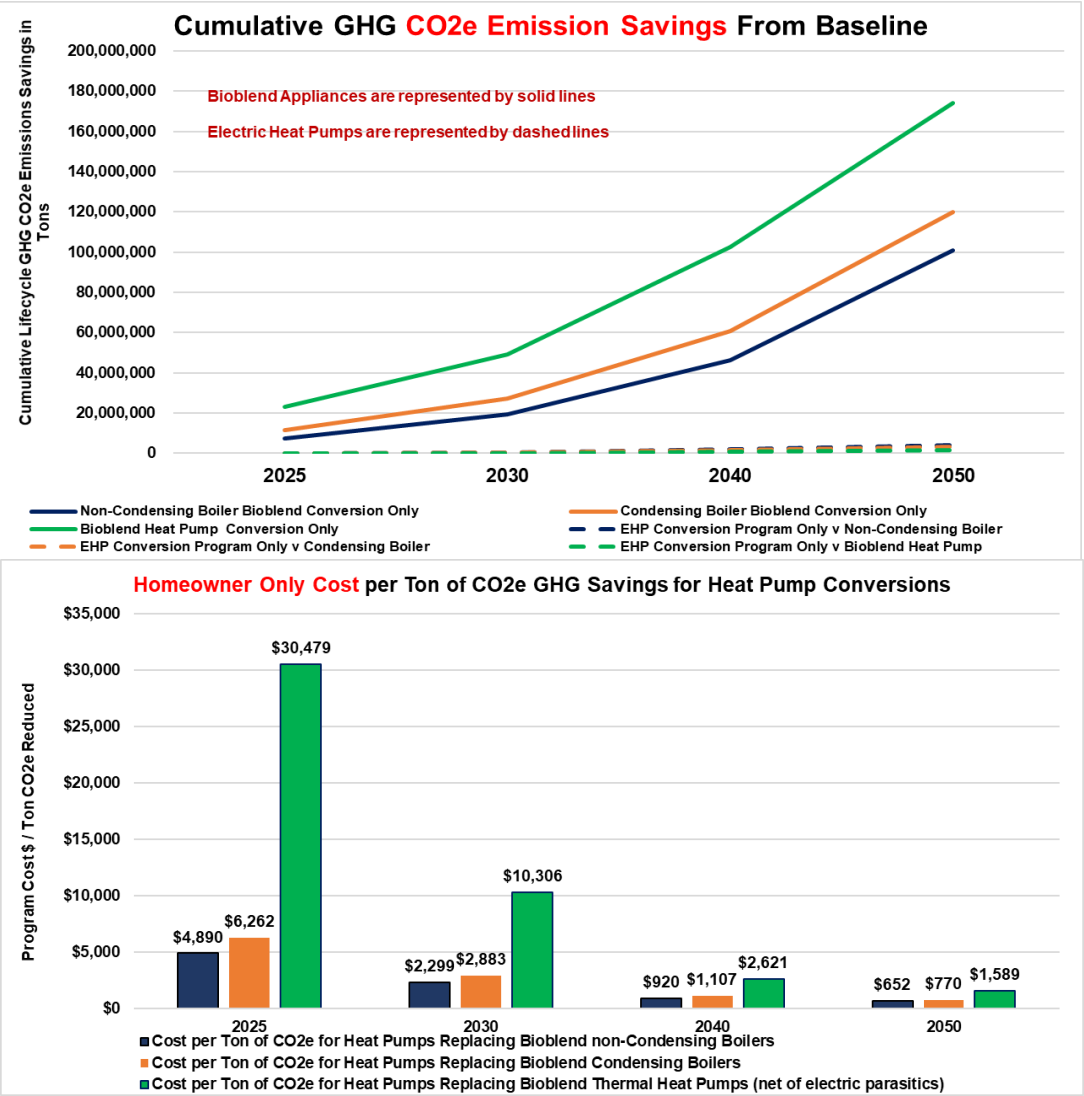
# Use Case: High EHP Partial (25%) House Conversion Rate with Aggressive Bioblend Adoption Rate

|  |
|--|
| Worcester, MA  |
| 20 Year Lifetime-AR5   |
| Average Bioblend of Feedstocks   |
| 78%  |
| 86%  |
| 95%  |
| 135%   |
| HP7  |
| 100%   |
| 100  |
| Scenario 2: B5 2021-2024, B20 2025-2029, B50 2030-2039, B100 2040-2050 |
| Scenario 3: 15%@2025, 25%@2030, 50%@2040 & 100%@2050                   |
| 646,103  |
| 5.00%  |
| 32,305   |
| High Conversion Cost Scenario 1  |
| 25.0%  |
| \$18,000   |
| 2.00%  |



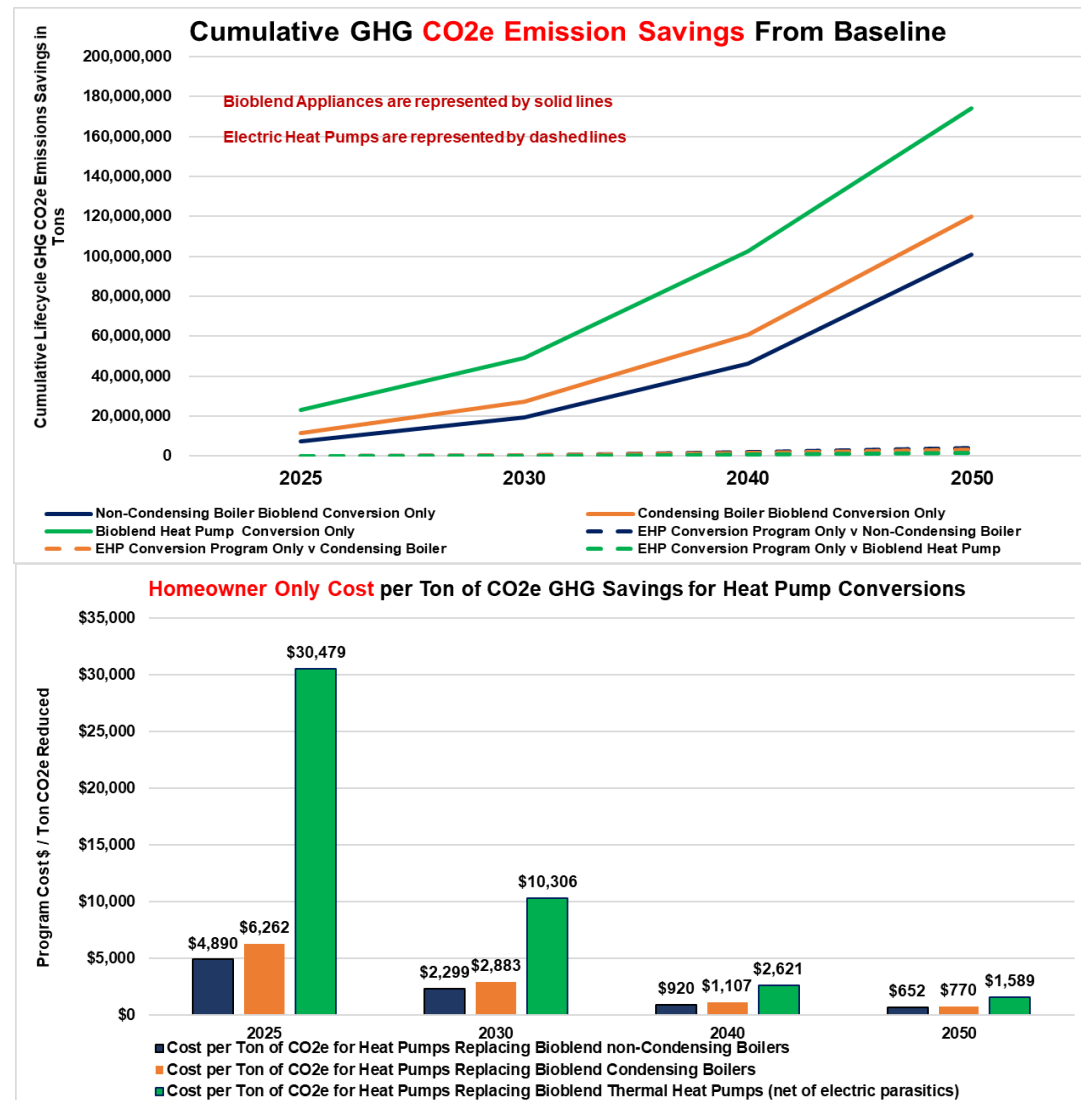
# Use Case: Low EHP Partial (25%) House Conversion Rate with Slow Bioblend Adoption Rate

|   |
|---|
| Worcester, MA   |
| 20 Year Lifetime-AR5  |
| Average Bioblend of Feedstocks                                    |
| 78%   |
| 86%   |
| 95%   |
| 135%  |
| HP7   |
| 100%  |
| 100   |
| Scenario 1: B5 2021-2024, B20 2025-2039, B50 2040-2049, B100-2050 |
| Scenario 3: 15%@2025, 25%@2030, 50%@2040 & 100%@2050              |
| 646,103   |
| 1.00%   |
| 6,461   |
| High Conversion Cost Scenario 1                                   |
| 25.0%   |
| \$18,000  |
| 2.00%   |



# Use Case: Low EHP Partial (25%) House Conversion Rate with Aggressive Bioblend Adoption Rate

|   |
|---|
| Worcester, MA   |
| 20 Year Lifetime-AR5  |
| Average Bioblend of Feedstocks                                    |
| 78%   |
| 86%   |
| 95%   |
| 135%  |
| HP7   |
| 100%  |
| 100   |
| Scenario 1: B5 2021-2024, B20 2025-2039, B50 2040-2049, B100-2050 |
| Scenario 3: 15%@2025, 25%@2030, 50%@2040 & 100%@2050              |
| 646,103   |
| 1.00%   |
| 6,461   |
| High Conversion Cost Scenario 1                                   |
| 25.0%   |
| \$18,000  |
| 2.00%   |



# Conclusions

- Electric heat pump conversions are costly for homeowners
- Electric heat pump conversions substantially have higher cost per ton of GHG (CO<sub>2e</sub>) than current market prices (RGGI = March 3, 2021, resulted in a clearing price of \$7.60 per ton of CO<sub>2</sub> and on February 26, 2021 the Biden administration announced an initial estimate of \$51 per ton of carbon). The eight scenario CO<sub>2e</sub> ranged from a high of over \$30,000 in 2025 to a low of \$258 in 2050.



# SUPPLY SIDE ANALYSIS

# IMPACT OF RESIDENTIAL TRANSITION FROM OIL HEAT TO ELECTRIC HEAT PUMPS IN NEW ENGLAND

## Two Topics:

1. Need for infrastructure research for the conversion to electric heat pumps with a completely renewable electric grid for residential heating systems.
2. The cumulative importance of economically saving carbon today versus waiting to create the perfect solution for tomorrow.

# Final 2020 Heating Electrification Forecast ISO-NE April 30, 2020

- According to ISO-NE “The 18 residential ASHPs used in the analysis reflect a variety of legacy heating displacement applications, and in aggregate, **do not reflect full heating displacement. In aggregate the selected sites represent <50% legacy heating displacement.**”
- This analysis does not focus on the core issue of creating renewable residential heating, as the peak heating will be served by fossil fuel and not the heat pump in this analysis.
- The following work is a high level estimate of the true peak electric demand impact of replacing oil heated homes with electric Asps using electric resistance backup for low temperature capacity and performance.

## Final 2020 ASHP Adoption Forecast

*Excludes Assumed Legacy Electric Heat Replacement*

- ASHP adoption values are net of installations assumed to replace resistance heat.
  - Assumed state residential shares with a primary heat source in 2017 (prior slide)
- Without data to verify otherwise, no net impact on winter energy and demand is assumed for applications with legacy electric heat, recognizing:
  - Some installations will replace active resistance heating systems (resulting in decreased electricity use), but others may replace unused resistance heating systems (resulting in increased electricity use) or result in continued use of resistance or other pre-existing backup systems during cold weather conditions

749.9  
ASHP  
Units

| Year             | Annual ASHP Installs (Thousands) |       |       |      |      |      | ISO-NE |
|------------------|----------------------------------|-------|-------|------|------|------|--------|
|                  | CT                               | MA    | ME    | NH   | RI   | VT   |        |
| 2020             | 4.2                              | 12.8  | 12.2  | 2.6  | 0.4  | 5.4  | 35.3   |
| 2021             | 4.8                              | 14.7  | 15.0  | 3.0  | 0.5  | 5.8  | 43.9   |
| 2022             | 5.6                              | 16.9  | 18.3  | 3.3  | 0.8  | 6.4  | 51.2   |
| 2023             | 6.4                              | 19.4  | 21.6  | 3.7  | 1.2  | 6.8  | 59.1   |
| 2024             | 7.3                              | 22.3  | 25.9  | 4.2  | 1.8  | 7.4  | 68.9   |
| 2025             | 8.4                              | 25.6  | 27.1  | 4.7  | 2.7  | 8.0  | 76.6   |
| 2026             | 9.7                              | 29.5  | 28.5  | 5.2  | 4.1  | 8.6  | 85.6   |
| 2027             | 11.2                             | 33.9  | 29.9  | 5.8  | 6.2  | 9.2  | 96.2   |
| 2028             | 12.8                             | 39.0  | 31.4  | 6.5  | 9.2  | 9.8  | 108.9  |
| 2029             | 14.8                             | 44.9  | 33.0  | 7.3  | 13.8 | 10.5 | 124.3  |
| Cumulative Total | 85.3                             | 258.9 | 243.0 | 46.3 | 40.8 | 77.9 | 749.9  |

## Final 2020 Heating Electrification Forecast

*Winter Demand*

661  
MW  
Peak

| State         | Winter Peak (MW) |      |      |      |      |      |      |      |
|---------------|------------------|------|------|------|------|------|------|------|
|               | 2022             | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
| Connecticut   | 8                | 12   | 18   | 24   | 31   | 39   | 48   | 72   |
| Massachusetts | 23               | 37   | 54   | 71   | 92   | 116  | 144  | 217  |
| Maine         | 12               | 25   | 41   | 60   | 83   | 106  | 131  | 188  |
| New Hampshire | 3                | 5    | 8    | 11   | 15   | 19   | 24   | 36   |
| Rhode Island  | 0                | 1    | 1    | 2    | 4    | 6    | 10   | 15   |
| Vermont       | 6                | 11   | 17   | 24   | 31   | 39   | 47   | 55   |
| Total         | 35               | 73   | 118  | 169  | 227  | 293  | 366  | 448  |

# Best Transition Strategy

- NORA believes that the impact of transitioning from heating oil appliances to electric heat pumps in New England will result in unanticipated electric grid upgrades that may indeed be cost prohibitive. This hypotheses needs to be further researched and developed.
- The Demand for Heating Oil is very irregular, and demand surges are moderated by customers having significant storage in their homes, on average they have 15 days storage. Additionally, terminals typically have several weeks of product stored which are available during cold snaps.
- NORA further believes that transitioning the liquid fuels industry from ultra low sulfur diesel to 100% advanced biofuels can be done seamlessly with minimal costs to customers, and will have no impact on overall electric costs.
- We believe that if the impact on competing energy delivery systems is not evaluated, the opportunity for this alternative low carbon source of heat may die, as the liquid fuels industry enters a death spiral.

# Rough Estimated Peak Electric Demand Increase Transitioning from Heating Oil to Electric Heat Pumps

Using EIA residential delivered distillate data, Minnesota seasonal cold climate heat pump performance to determine average hourly MW hours for complete transitions and the cold weather 1.0 electric COP from previous slide, one can estimate a peak electric demand impact of 13,901 MW could be required on the coldest days for ISO New England .

**Complete Residential Oil Heating Transition to Electric Heat Pumps EIA 2018 Data**

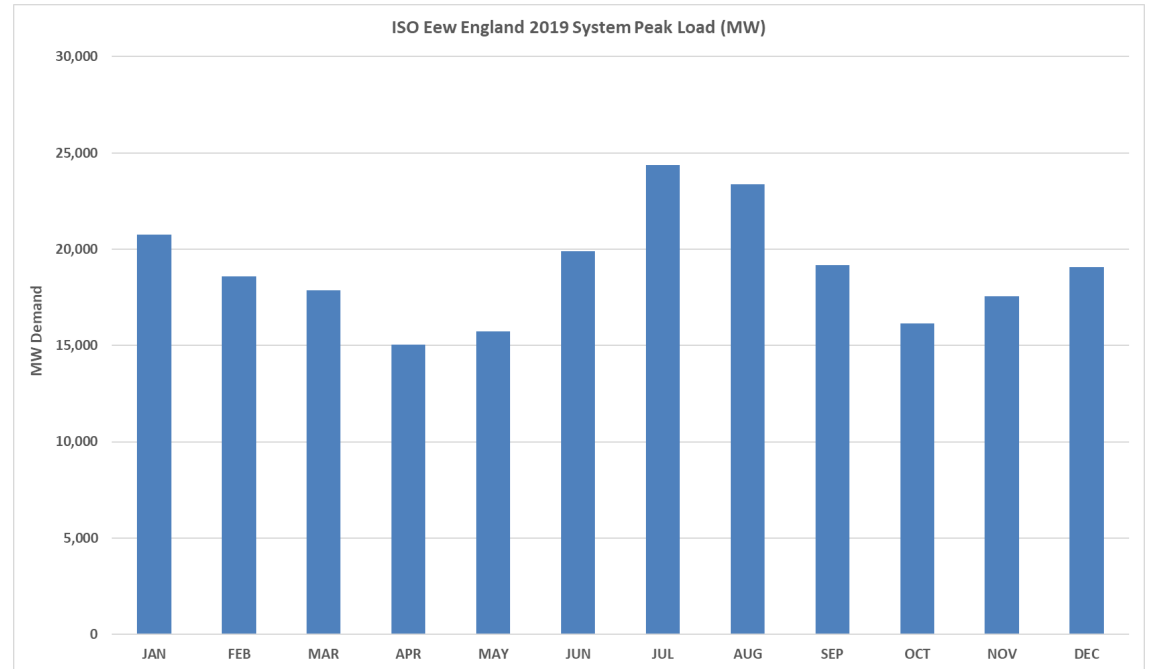
| State           | Consumption<br>in gallons | Btu per<br>Gallon | Consumption<br>in Btu | Fuel Conversion<br>to Load | Percent Fuel<br>for Heating | Seasonal<br>COP | MWh        | Heating Hours<br>per year | Average<br>Hourly MW | Peak to Avg Hourly<br>based on 1 COP on Peak | Peak MW |
|-----------------|---------------------------|-------------------|-----------------------|----------------------------|-----------------------------|-----------------|------------|---------------------------|----------------------|--|---------|
| Connecticut     | 400,213,000               | 138,500           | 5.54E+13              | 4.43E+13                   | 75%                         | 2.5             | 3,906,510  | 2,500                     | 1,563                | 250%   | 3,907   |
| Maine           | 234,928,000               | 138,500           | 3.25E+13              | 2.60E+13                   | 78%                         | 2.2             | 2,709,867  | 3,000                     | 903                  | 220%   | 1,987   |
| Massachusetts   | 561,257,000               | 138,500           | 7.77E+13              | 6.22E+13                   | 78%                         | 2.0             | 7,121,436  | 3,000                     | 2,374                | 200%   | 4,748   |
| New Hampshire   | 186,424,000               | 138,500           | 2.58E+13              | 2.07E+13                   | 78%                         | 1.9             | 2,489,912  | 3,000                     | 830                  | 190%   | 1,577   |
| Rhode Island    | 105,477,000               | 138,500           | 1.46E+13              | 1.17E+13                   | 75%                         | 2.5             | 1,029,569  | 2,500                     | 412                  | 250%   | 1,030   |
| Vermont         | 77,172,000                | 138,500           | 1.07E+13              | 8.55E+12                   | 78%                         | 1.9             | 1,030,723  | 3,000                     | 344                  | 190%   | 653     |
| ISO New England |                           |                   | Fleet                 | 80%                        |                             |                 | 18,288,017 |                           |                      |  | 13,901  |

Source: [https://www.eia.gov/dnav/pet/pet\\_cons\\_821dst\\_dcu\\_SCT\\_a.htm](https://www.eia.gov/dnav/pet/pet_cons_821dst_dcu_SCT_a.htm)

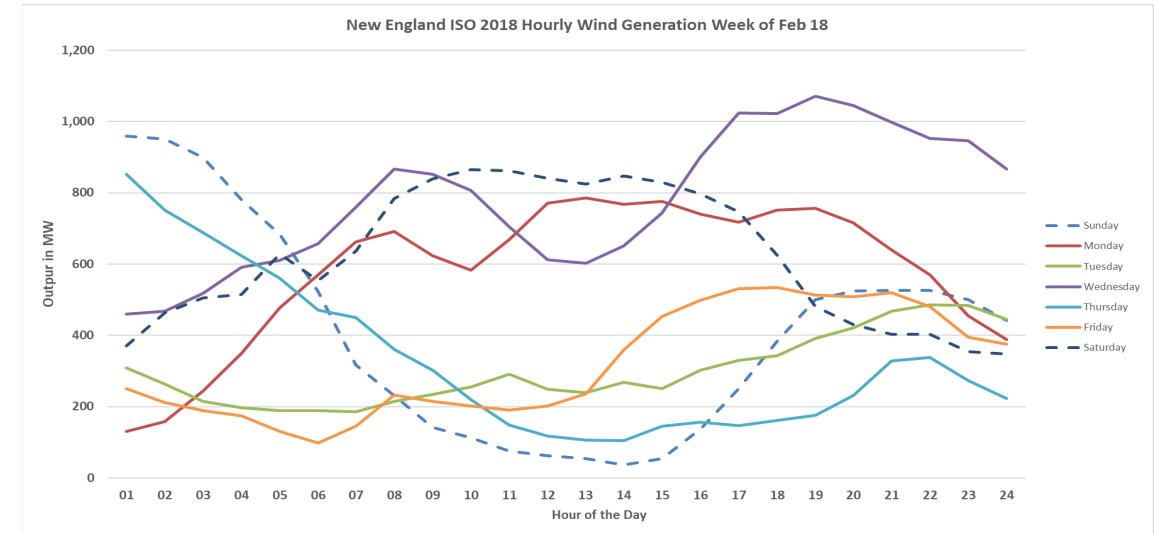
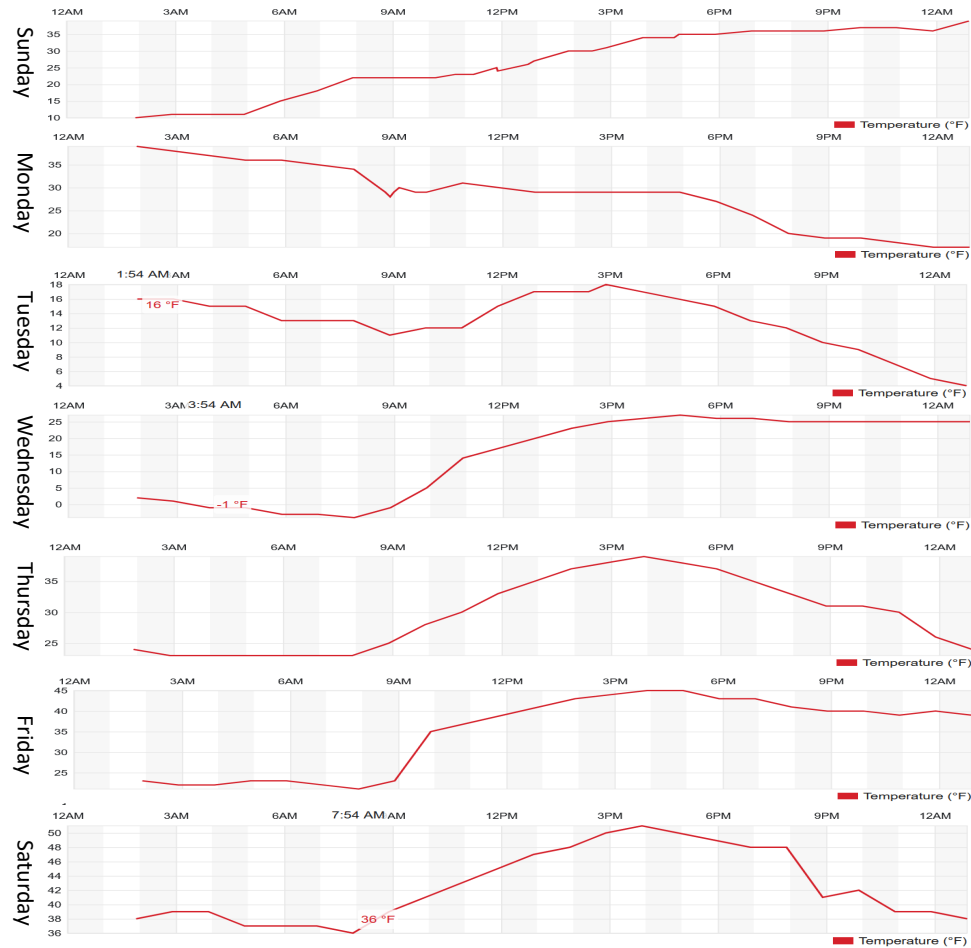
Seasonal COP Source – using weather Bins: Cold Climate Air Source Heat Pump Field Study 11/2017,  
<https://www.mncee.org/resources/resource-center/technical-reports/cold-climate-air-source-heat-pump/>

# Average Impact on ISO New England Transmission and Distribution Infrastructure

- 2019 Summer Peak 24,361 MW
- 2019 Winter Peak 20,773 MW
- Potential HP Transition Impact 13,901 MW
- New Winter Peak with HP Transition Increase over 2019 Summer Peak of 10,313 MW
- Imagine 3,000 MW of batteries for peak reduction this would yield 7,313 MW increase.



# Hourly Winter Wind Generation versus Ambient Temperature



During the week of February 18, 2018 wind production varied for 37 MW to 1,071 MW. There is no time of day correlation for wind power production.

During the week of February 18, 2018 ambient temperature in Burlington, VT varied from a high of 56°F at 4PM on Saturday February 24 to a low of -5°F on February 21 at 8AM. Generally speaking, higher temperatures occur during the day due to solar radiation.

To have a safe and efficient grid will require these to match, and to do so with a significant margin of error.

# NORA Board Meeting 5/25/2021

## Education Report





# Bronze & Silver Programs



# Certifications

- Gold- 2,320
- Silver- 12,720
- Bronze- 9,317

# Certification Tests

- Vast majority of schools successfully using online testing
- Online proctored exams available due to geography and/or Covid- 19

# Technician's manual

Rewrite is completed, layout & publication in  
Summer 2021



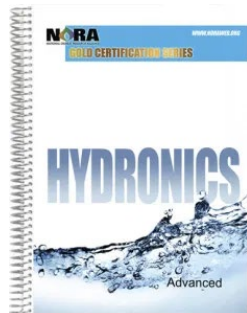
# New Bronze Programs

- Trades Up LLC – VT
- Associated Builders & Contractors- Nationwide
- Northampton CC- PA

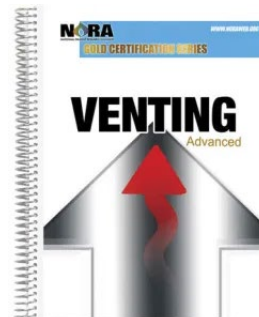
# In-house Bronze Programs

- Petro
- Irving Oil
- Isaac Heating

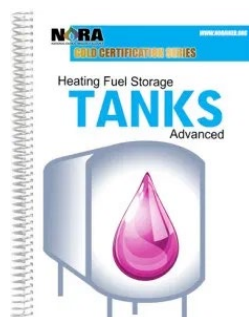
# Gold Program Online



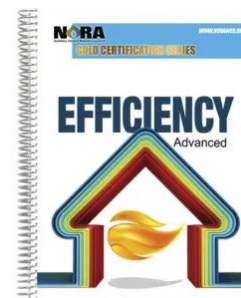
297-341



63

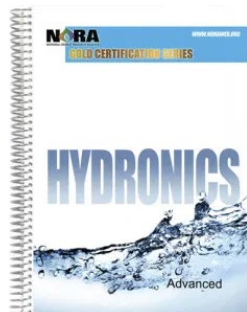


30-103

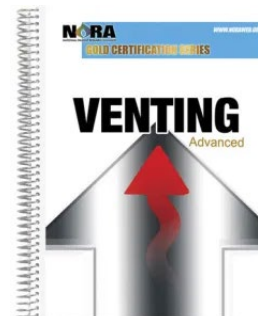


20-128

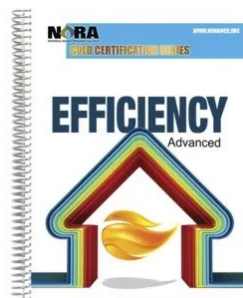
# Gold Program Equivalents



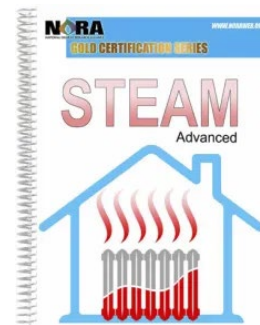
Taco  
Peerless  
Weil-McLain



Field



BPI



Peerless



# CEUs

- Bioheat technical guidance online – 25/68
- Added emphasis on manufacturers & reps to add online content

# New Website Tool

**Have a service or technical question  
you would like answered by NORA?**



# Questions

- *Q: How much condensate water is produced per gallon of oil used by a condensing oil burner like the Granby KLC-100? I am not inquiring as to total water produced, just the condensate. What is the pH of the condensate water?*

# Questions

- Q: On a residential steel tube boiler when cleaning the tubes should a wire brush or a soft brush be used? Please don't give me a "follow your manufactures recommendation" type answer. Whatever is common practice is what I'd like to know.

# Questions

- *Q: I recently read a sticker on a new oil tank and it said, “Do not transfer oil from the old tank to this new tank.” This makes no sense, what are we supposed to do, pay to throw away oil that the customer paid for and then charge them for new oil?*

# Planning for the Future

- Zoom meetings with trainers
- Best practices for in person and online sessions
- Transition to online/hybrid education
  - Bronze with a combination of Zoom type classes and hands on with employer

# Planning for the Future

- NORA as locus of info
- Short task oriented videos
  - Programming Controls
  - Checking Pump Pressure
  - Interpreting Combustion Readings

# Questions??





LEADERSHIP  
Nora 2021 – Mid-Year Changes

|                               |                       |
|-------------------------------|-----------------------|
| Immediate Past Chairperson    | – Charlie Uglietto    |
| Chairman                      | - Rick Bologna        |
| 1 <sup>st</sup> Vice Chairman | - <b>Roger Marran</b> |
| Treasurer                     | - Eric DeGesero       |
| President                     | - John Huber          |

Members

|                       |                                  |
|-----------------------|----------------------------------|
| John McCusker         | Global                           |
| Mario Bouchard        | Granby Industries                |
| Steve Clark           | Genessee Fuel                    |
| Charles Uglietto      | Cubby Oil                        |
| Matt Meehan           | Mirabito Fuels                   |
| Matt Cota             | Vermont Fuel Dealers Association |
| Rick Bologna          | Westmore Fuels                   |
| Leann Panebianco      | Panco Petroleum                  |
| Kate Duffey           | D.E. Duffey & Sons               |
| Scott Vadino          | F.W. Webb                        |
| Sandra Farrell        | Northboro Fuel                   |
| Michael Devine        | World Energy                     |
| Gary Sippin           | Sippin Energy                    |
| <b>Roger Marran</b>   | <b>Energy Kinetics</b>           |
| <b>Daniel Mattice</b> | <b>Reinhardt Home Heating</b>    |