

The following is a summary of the recommendations in the Library Energy Studies prepared by GWR Engineering and Zero By Degrees. Jennifer Chiodo (Town Energy Committee) synthesized and summarized the reports and performed the additional analysis. The Charlotte Energy Committee and Library Board Chair Bonnie Christie reviewed the synthesis and analysis on Wednesday, September 10th at the Energy Committee meeting. The following includes input from that meeting.

HVAC Study – received 6/26/2014 (Parts A&B)

1. Replace DHW (domestic hot water) with point of use instantaneous electric units
2. Repair the existing HVAC (heating, ventilating and air conditioning) system as recommended by Patterson (Energy Committee understands this has been completed)
3. Investigate the issue with airflow into children's room
 - a. Heating deficiency should be addressed by insulation and air sealing of the roof – current issue is that there is an opening from above the lay in ceiling directly to the building exterior which causes the space to be very cold and the mechanical system cannot overcome the heat losses in the space.
4. Hold off on other HVAC upgrades at this time
 - a. Energy committee notes that ongoing maintenance costs will continue to be high due to the fact that the equipment is approaching end of life. One of the key benefits that owners cite from energy efficiency upgrades to equipment is lower maintenance costs. The Town should carry adequate budget for near term maintenance necessary to ensure equipment remains functional until it is replaced.

Whole Building Recommendations to advance to Zero Net Energy

1. Insulate and air seal the roof – estimated savings \$1,700 first year + \$300/year electric savings from eliminating the electric heat tape¹. The \$1,700 is conservative – the model assumed an existing roof insulation of R-15 – according to Zero By Degrees' report the effective roof R-value is likely degraded by 50% by air blowing through it - which means that the savings estimated in the report are at the low end of what will likely be achieved.
 - a. Assumptions for energy committee analysis:
 - i. \$50,000 – estimated insulation and air sealing cost.
 - ii. \$2,000 in first year fuel and electricity savings.
 - iii. 3% average annual energy cost escalation
 - b. Assuming the new roof lasts 30 years – by year 30 the town will have accumulated \$45k in net energy savings which would offset a significant portion of the next roof replacement cost. In year 19 the town would have recouped its investment in roof insulation project. The insulation will last for the life of the building, generating additional cost savings from year 20 onwards.
 - c. If the town bonded for 30 years for \$50k at a 3% bond rate to pay for the roof insulation, we would have positive cash flow in year 9 of the bond (ie. at that time the energy savings would exceed the bond payments annually). The Town would have \$20k net savings by year 30.

¹ \$300 annual heat tape savings not included in report. This is from an email from Bill Root 9/10/14 (Dean Bloch and Fritz Tegatz were copied on this email)

- d. A properly insulated and installed roof will last longer. Failure to add insulation could result in the need to replace the roof earlier than its rated life and this would result in a significant increase in the life-time cost of the roof.
 - e. The inability of the existing mechanical systems to keep the space warm enough in the winter has been a significant issue at the library. While comfort is hard to quantify in terms of a cost/benefit – it is an important and expected attribute for our built environment.
 - f. Failure to insulate the roof will likely mean a higher cost for heating and cooling equipment replacement because the building loads will continue to be high absent insulation; therefore new mechanical equipment would need to be sized to handle the load of the poorly insulated building. This will result in higher than needed spending on mechanical equipment replacement which is expected in the next few years. Even with a larger mechanical system, comfort issues are likely to persist due to drafts and cold surface temperatures which will continue absent the insulation and air sealing project.
 - g. Investing in properly air sealing and insulation of the library roof will result in a more comfortable building, increase building longevity and is a prudent investment for Charlotte tax payers.
 - h. Members of the energy committee identified concerns about the global warming impact of spray closed foam insulation. Should the Board decide to proceed the Energy Committee recommends exploring options that could achieve the same benefits with a lower negative environmental impact.
2. Additional recommendations in the report did not have quantified costs and savings and would be undertaken over a period of time. These include:
- a. Additional air sealing
 - b. Energy recovery ventilation (similar to what we installed in the Town Hall)
 - c. Upgrade/fix exterior lighting controls – some porch lights are on 24/7 – these can be controlled off during daylight hours.
 - i. An option to consider for these lights, not mentioned in the report is an occupancy sensor. Occupancy sensors will clearly show when someone is present in the area of the porch and leave the lights off otherwise. This can improve security.
 - d. Change parking lot light from MH to LED
 - e. Increase overall efficacy of library lighting system (recommend this be done at year 20 which is typically the rated useful life of lighting equipment)