Eastford Elementary School—Major Goals of the Energy Efficiency Study commissioned by the Board of Education ad the Board of Selectman:

- Get the best value from the building;
- Minimize the energy expenditures;
- Plan on what needs to be replaced and a timeline that will continually improve the facility; and
- Meet aggressive energy cost reduction goals.

After a bidding process, the Energy Efficiency Study was conducted by Jamie Spalding, a mechanical engineer from Hallam-ICS, an engineering company with an office in Middletown, CT. After assessing the building himself and combining his findings with those of an architect and a structural engineer, Mr. Spalding rank ordered the projects that would reduce energy consumption and improve the quality of the building. The top two projects based on the above criteria were converting the boilers and replacing the gymnasium roof. Both projects were considered urgent and worthwhile for improving the overall facility. When the Board of Education received the report and discussed which project to pursue first it was decided that replacing a failing gymnasium roof and preparing it for solar panels should be the highest priority and addressed immediately. It is possible that with the current energy incentives, installing a photovoltaic (PV) system on the gym roof could achieve the original goals of the project and more. The electricity produced by the PV system could offset the entire project and reap energy and financial savings well into the future. It is also possible that the town could save more in energy dollars than the cost of the project.

1. RATIONALE:

The average life expectancy of a built-up roofing system is between 15 and 18 years. The built-up roof on the Eastford Elementary School gymnasium was installed in 1992 and is 25 years old; it has met and exceeded its life expectancy. There are numerous areas of leaking as evidenced by staining and moisture damage. An architect from TLB Architecture, hired by Hallam-ICS, conducted an analysis of the gymnasium roof and his conclusion states that, "Temporary repairs are not recommended since multiple attempts have been undertaken and are currently failing." The architect further commented that "The temporary repairs, cold-applied, asphaltic-based mastic flashing, are now displaying cracking and bubbling, alligatoring and open lacerations in the field of the mastic repair areas. These failures will continue to deteriorate over time and will create areas for further potential water infiltration into the roofing system and the interior gymnasium space below." Extensive damage could be caused if the roof is not replaced.

2. LONG -RANGE PLAN

The findings of the report indicate that the existing gymnasium roof structure is sound for the current snow loads, but has no spare capacity for solar panels, added insulation, or rooftop equipment. A new roof, of the adhered membrane type with tapered foam insulation would eliminate standing water, and remove 5 pounds per square foot (PSF) of dead load on the joists, making the roof suitable for some solar panel loading on the roof.
According to Daniel Morrissey PE (Morrissey Engineering):
"If the gymnasium roof is re-roofed without the use of ballast, the load on the existing joists will be decreased and will allow for solar panels with a weight of up to five pounds per

square foot to be installed on the roof. If the selected solar panels exceed five pounds per square foot in weight, the capacity of the bar joists will be exceeded. To address this, the existing steel bar joists could be reinforced with steel rods, nested in the corner of the top and bottom chord angles. This reinforcing would be designed by an engineer and welded according to the design. To avoid bar joist reinforcing, solar panels over 5 PSF could be installed over a reduced roof footprint. Leaving the area above the midspan of the trusses free of solar panels would be most effective."

3. THE PROJECT

A new roof, of the adhered membrane type with tapered foam insulation would eliminate standing water, and remove 5 pounds per square foot (PSF) of dead load on the joists, making roof suitable for solar panel loading on the roof. The project proposes the following components of this flat roof replacement project:

- Remove the existing roofing system down to the metal roof
- Inspect and repair the areas of the metal deck that might be deteriorated because of ongoing water infiltration issues
- Once the metal deck was observed to be in satisfactory condition, the new insulated EPDM roofing system inclusive at a minimum of 4" polyiso insulation for an R-Value of R-40 would be installed
- The new system will have integrated flashings and drains with walk pads as required
- Replace deck with a single ply, 0.060 mil EPDM roofing.
- Insulation would be tapered to drains.
- All roof flashing and drainage components should be removed and replaced with new in accordance with current practices and in conformance with the roofing manufacturer's recommendations.
- The exterior facade needs flashing and weep venting repairs to be made to remove moisture and stop damage being caused by water infiltration. This work is highly prioritized, as a solid building envelope is paramount to maintaining a facility for longevity.
- Replacement of all roof drains will be included in the scope as well as installing scuppers and other secondary drains as required by code.
- Secondary drains for this flat roof may be required with interior piping to the exterior wall, or provisions of overflow spout is to be placed.
- A fixed ladder with a roof hatch or a protected ladder off the back of the building is recommended for installation for safe roof access.
- The existing gymnasium roof is detailed on the contract documents from the 1991 construction as a built up roof with stone ballast. This roof has been repaired in the past and maintained.
- The current school includes grades preschool to eight and the gymnasium serves as the gym, auditorium, cafeteria, music room, and small kitchen.

4. Estimated Costs

Replacement of Gym Roof and adding Insulation	$129,000
Hiring an Engineer to Design the proper roof and reinforcements to support the load of a PV system	$ 16,000
Total	$145,000