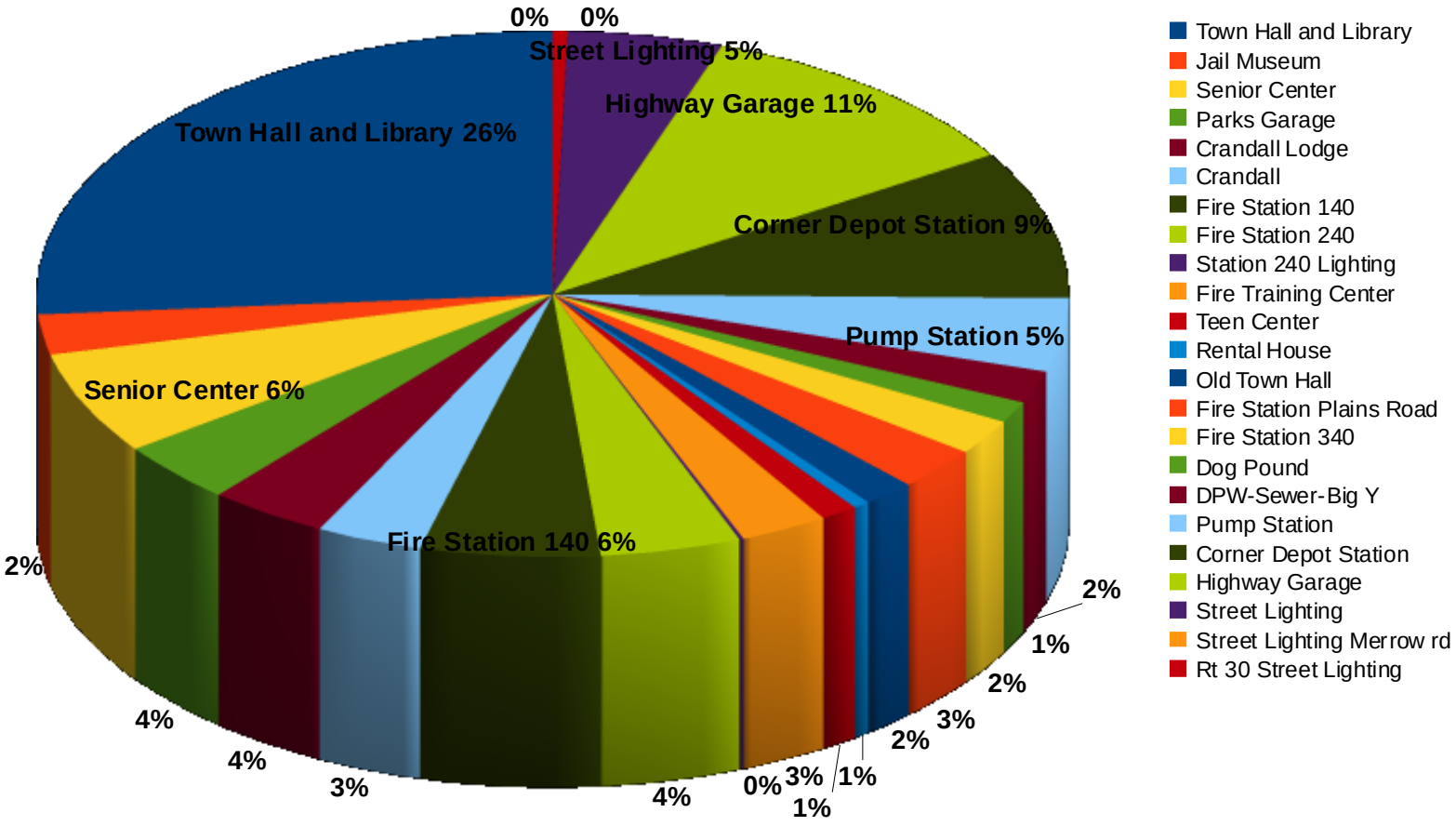
Town Hall HVAC System

Town Hall Background

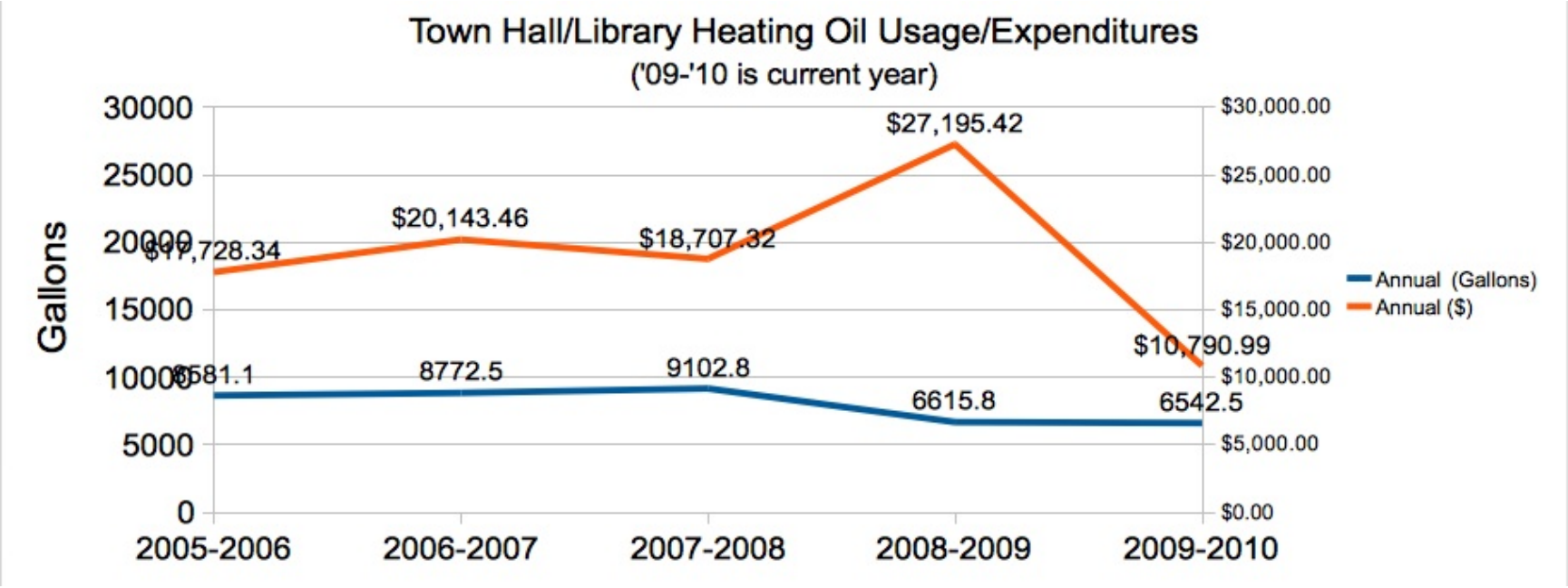
- The main structure has served the community for more than 100 years.
- Originally constructed in 1908 as the *Ratcliffe Hicks Memorial School*.
- Additions took place in 1940s and 1960s due to expanding needs of the school.
- Last renovated in 1984 when it was converted into the Town Hall and Library.
- The facility is now 40,000 sq feet stretched over 6 levels.
- It accounts for 26% of the town's energy expenditures (excludes BOE).

Total Energy Expenditures Municipal Facilities

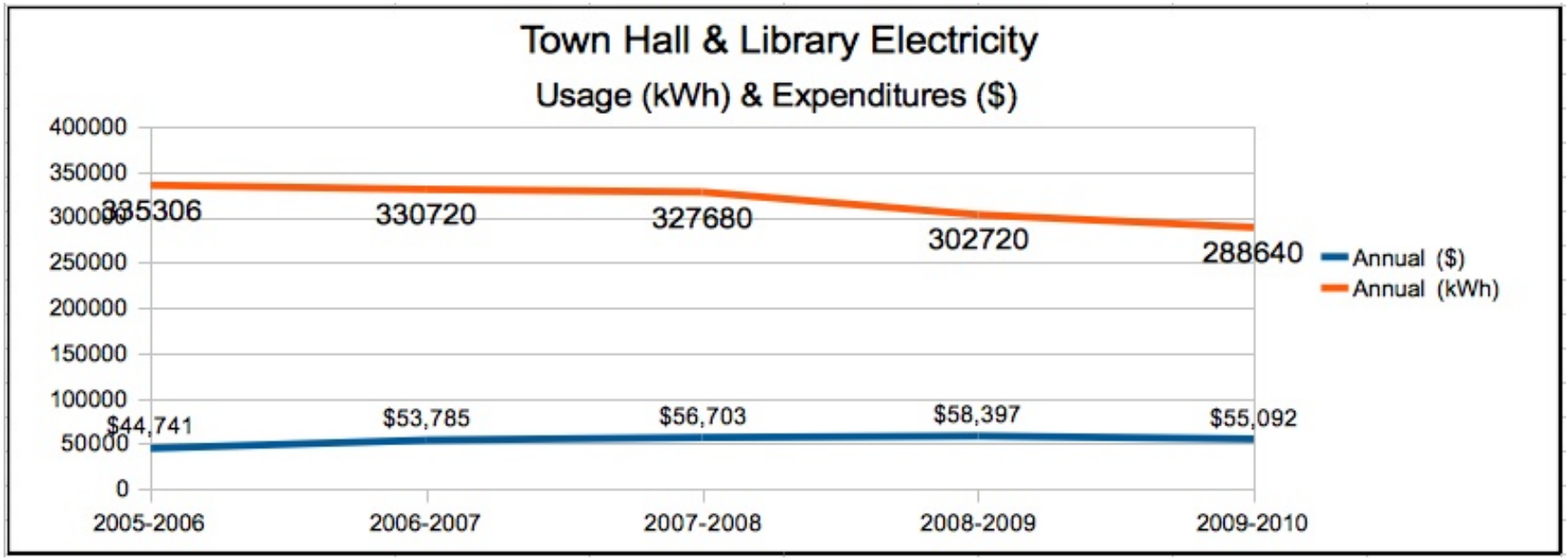
2005 - 2010



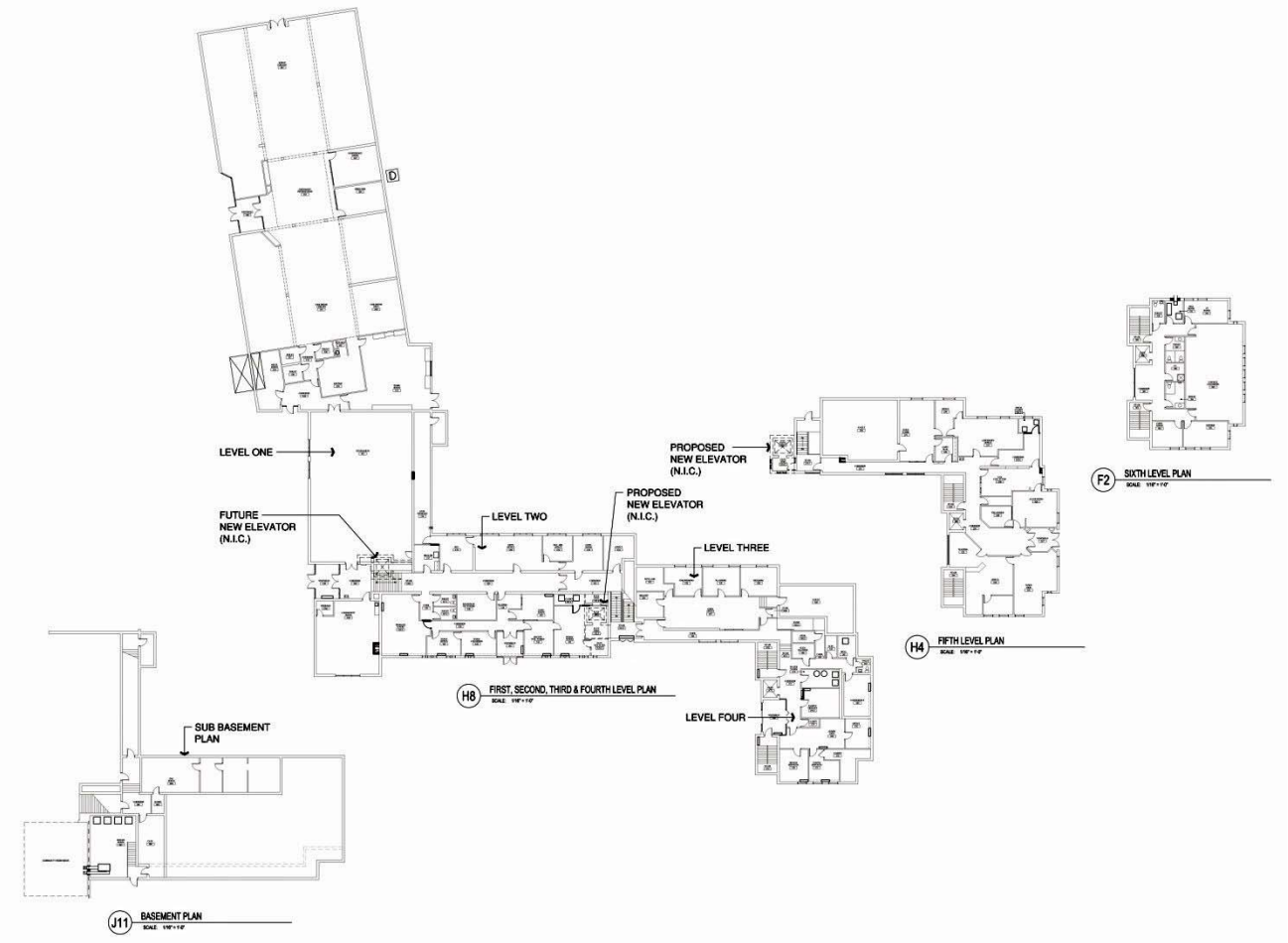
Town Hall Oil Usage



Town Hall Electricity Usage



Town Hall Layout



Reasons to Maintain the Town Hall

The town hall is a multi use facility. Town employees and Town leaders work from this facility.

Additional uses of this building include:

- Pre school.
- Library.
- Exercise classes.
- We vote here.
- Many committee meetings and Town meetings.
- The Town Hall is our main community building.
- Allowing this building to operate with low standards sends a negative message to all that work and visit there.

Current Maintenance Need for our Town Hall

- Most of the HVAC system components are about 25 years old and at the end of their usefulness.
- Poor air quality.
- Expensive and time consuming to maintain.
- Inefficient by today's standards and possibilities.
- Uneven heating and cooling.

Engineering Analysis of the Facility:

- In December, 2007, after continuous HVAC system failures, the Town of Tolland hired *Consulting Engineering Services* from Middletown, CT. CES was tasked with the job of assessing the condition of the Town Hall and Library HVAC system and provide recommendations. Their advice:
  - **Replace the HVAC system.**
  - **Bring fresh air into the facility.**

- The findings and recommendation from CES was confirmed by Tecton Architects.

Recommendation from Consulting Engineering Services, Middletown CT – December 2007

The building was renovated in 1984 and the HVAC system was replaced at that time. Most of the equipment is original to that renovation and appeared to be reasonably well maintained and in fair condition, but approaching the end of their useful lives.

We would recommend the following system modifications to address the issues stated above:

1. Replace all of the heat pump units, ductwork, grilles and thermostats because of their age and condition. Additionally, the building floor plan has had enough changes over the years that the ductwork system and thermostat placement no longer makes sense.

2. Repair or replace the cooling tower. The upper section of the cooling tower was replaced approximately 4 years ago and the lower section now needs replacing. A new cooling tower with additional capacity should be considered to accommodate the increased ventilation required under the current building code.

3. Replace the boilers, pumps, piping and controls in the boiler room and relocate the equipment well above the high water level of the boiler room because of occasional flooding.

Overview of Existing System Components

Oil Boilers need to be replaced with more efficient units or eliminated.

These 19 heat pumps are between 7 and 25 years old, inefficient and expensive to maintain. These heat pumps would be replaced and some would be relocated to better serve the building and be easier to maintain.

The ductwork that distributes the heat and air conditioning is made of fiberboard. Some of the ductwork is simply cavities in the wall of the building. Fiberboard is made of soft material that breaks down over time with near constant air blowing across it. Small particles are released into the air creating an unhealthy environment for building occupants. New sheet metal ducting would solve this problem.

Fiberboard ducting – New and Old

Comment from the Engineers regarding Town Hall Ductwork

….Issues with fiberboard ductwork have surfaced in the past 25 years. This type of ductwork is used less frequently today because of potential mold and bacteria growth within the ductwork, internal deterioration over time releases glass fibers into the airstream, and it is very difficult to clean without damaging.

New Ductwork will Add Some Efficiency

In certain cases, where there is not enough ceiling space for ductwork, the exterior walls have been built out to have a cavity between the masonry wall and the framed wall. This cavity is used as a supply air plenum with windowsill supply grilles installed at each window on the wall. The issue with this installation is that the wall cavity is not insulated so much of the energy in the heated or cooled air is transferred to the outside wall before reaching the supply grille and entering the room.

Sheet metal ductwork - can be cleaned to maintain good air quality.

Fresh Air

Air quality will be improved in two ways with a new Town Hall HVAC system.

- Fresh air will be brought into the building from outside to meet modern code requirements.

- New ductwork will not be releasing particles into the air.

Why Fresh Air is Important

- Indoor air pollution is caused by buildings and structures that have been constructed to be enclosed so tightly that odors and pollutants have no way of escaping outside, and are trapped inside together with moisture. The cleaning process of nature, which is activated oxygen and negative ions are not able to penetrate inside to freshen up the building. This combination leads to biodegradable matters to rot and emit dangerous gases within. Chemicals and other particle matters in the air also contribute to the toxic mixture. Many modern buildings suffer from such "sick buildings" syndrome, where contaminants penetrating from outdoors is mixed with contaminants trapped indoors.
- Opening the windows and trying to air the room may not be a feasible solution if you are living in the city or industrial area, as opening of our windows to the outside world, would be inviting even more smoke, smock, chemicals and air-borne particles from the traffic jam and industries near-by.
- Such contaminants in the air can cause irritation and allergic response from the occupants of the building or home. Among others, it weakens the immune system, leaving them vulnerable to other diseases. Other than the dust, pollen, molds and mildew, bacteria and viruses can also pollute the air in our homes and offices. Chemicals from daily "cleaning activities", such as fumes from cleaners, carpets, fabrics and paint, are also breathed in daily into our bodies.
- According to the Environmental Protection Agency (EPA), many pollutants in the typical home or office are at least 2-5 times higher than in outdoor air, and the average people spend 90% of their time indoors.
- WHO says that indoor air pollution is responsible for 2.7% of the global burden of disease, such as pneumonia, chronic respiratory disease, lung cancer and other diseases.

Cooling Tower – Replace or Eliminate?

Cost for replacement is about $200,000. Depending on new system options this component could be eliminated altogether. 40k invested in this device in the last few years. Much water is used to operate.

Piping

This piping is used to supply hot or cold water to the 19 heat pumps located around the building. Much of this piping can be reused regardless of what new system option is decided upon.

- The system is still functioning thanks to the hard work and creativity of Clem Langlois and the people that support him.

Project Components

- Heat pumps (7 – 25 years old)
- Oil boilers (25 years old)
- Cooling tower (25 years old)
- Circulator pumps
- Control system
- New ducting including fresh air system (current ductwork 25 years old)
- Add to piping system
- New ceiling tiles
- New windows
- New energy efficient lighting
- Possible well field for geothermal option
- System design
- System commissioning

What Options Do We Have?

- Do nothing.
- Replace the system in phases.
- Replace the system all at once.

Effects and Cost of “Doing Nothing”

- May appear to be the cheapest option available.
- Avoids borrowing money in a “bad economy”.
- Fails to take advantage of historically low interest rates and extremely competitive construction market that exists today because of the “bad economy”.
- Rebates or credits for efficiency projects may not be available at a later date when we are ready to proceed.
- Indoor air quality will remain a problem.
- The system will continue to deteriorate and will still need to be addressed at a later date with a higher price.
- Continue paying relatively high maintenance costs of supporting an older system.
- Would not see the benefit of a more efficient system – projected savings of $33k/year in energy costs.
- Replacing the system is inevitable. Material costs are projected to rise at least 3.5% per year, plus increases in labor costs as the economy improves, plus future interest rates will likely increase.

Replace the System in Phases

Advantages

1. The Town could possibly delay debt service if phased in over five years.

Disadvantages

1. Completion takes years not months. Disruption will be substantial.
2. Indoor air quality not realized immediately.
3. Engineering a phased project is very difficult and will cost a premium.
4. We still have to bond! Bonding is difficult to estimate as rates vary from year to year, but finance costs will rise.
5. Will likely have multiple referendums, what if one doesn't pass?
6. During "phased" period, we continue to maintain and pay for the use of the present failing system in addition to the new system.
7. Cost of construction materials is estimated to rise 3.5% per year.
8. Will incur extra mobilization and demobilization costs.
9. May end up with multiple contractors with no one responsible for the entire project.
10. May lose state rebates currently estimated at $135,000.
11. Will lose our swing space for a long time – gym.
12. Fuel savings associated with a possible geothermal system will be delayed.
13. Estimated additional cost for a 5 year phasing plan - $200,000 - $500,000.

Recommended Action

- **Replace the system all at once.**
  - The Tolland Energy Task Force, Town Manager, building maintenance chief, and the architects and engineers recommend replacing the Town Hall and Library HVAC system.
  - The advice is to replace the system all at once to get immediate benefit from the system and ultimately provide the citizens of Tolland with the greatest return on their investment.
  - **Estimated costs:**
    - $3.2M – $3.5M (*Referendum required).*
    - Bonding will affect the *Debt Services portion of the budget by an average of* ***$55*** *to the average homeowner in Tolland in the peak bonding* year.
    - *Debt Services is currently in a decline, so the project actually results in no increase in total debt service costs after fiscal year 2012/13. Principal and Interest peak at $332,500 in 2012/13 and decline to $182,000 in 2032.*

If we replace the system, what type should it be?

- Oil system similar to the current one?
- Geothermal system?
- Gas?

Geothermal Benefits

The recommendation is to replace the current system with a Geothermal Heating and Cooling System. Analysis of the replacement options was performed in 2009. Geothermal is known to have several advantages over conventional fossil fuel systems, such as:

- More efficient heating & cooling.
- Lower operating and maintenance costs versus traditional fossil fuel systems.
- Cost is around 6.5% more than a traditional system to install, but the payback is less than 6 years based on the lower operating and maintenance costs.
- Significant greenhouse gas emission reductions.
- Powered by electricity versus fossil fuels.

End