# St. Luke's Hospital

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## Company Background

St. Luke's Hospital in Duluth is a healthcare facility serving approximately 500,000 residents in a 17-county region spanning into three states. The facility employs 2,592 people and 365 physicians. The main hospital building was built in 1923 and has completed many additions and joint buildings, including the Clinic, Medical Office Pavilion, Building A, and Northland Medical Center, increasing the energy consumption of the entire campus. The facility meets its thermal energy needs by purchasing steam from the Duluth Cooperative Steam Association. The steam is then used for space heating, domestic water heating, autoclave sterilization, and laundry operations.

*"My internship project was one of the best, most rewarding experiences of my college career. I learned a lot about analyzing real systems and data, as well as common business practices. Not only did I benefit, but I was able to reduce energy consumption and ultimately save the hospital money."*

## Project Background

The electrical cost of lighting contributes significantly to St. Luke's total electricity bill. The hospital has been working to reduce lighting energy consumption and is in the process of completing a retrofit project, exchanging T12 fixtures with T8 lamps and electronic ballasts and exchanging incandescent lamps with compact fluorescent lamps. I examined the status of this retrofit as well as exchanging these lighting fixtures and others with more energy efficient lighting options. I also considered installation of occupancy sensors to further reduce lighting energy consumption. In addition, the hospital asked for an inspection of the steam traps for undetected failures.

## Incentives to Change

St. Luke's Hospital has been interested in reducing its energy consumption to counter rising utility costs. Electricity usage had increased by 6% from 2010 to 2012, while the overall cost of electricity increased by nearly 5%. During this same interval, steam consumption actually decreased by nearly 5%. However the rate per unit of steam increased by 26%, resulting in an overall higher utility bill. The Conservation Improvement Program has also provided the incentive for St. Luke's Hospital to receive energy audits, look into purchasing more efficient equipment, and receive rebates from the local electricity company, Minnesota Power.

## Solutions

### Replace Incandescent and CFLs With LEDs

The hospital is in the process of exchanging incandescent lamps for compact fluorescent lamps (CFLs). A savings of 120,983 kWh per year can be obtained if they instead exchange incandescent lamps and CFLs with LED equivalent lamps. The implementation cost is approximately $23,146, for an expected return in 1.5 years when both expected energy and maintenance savings are included. Installing occupancy sensors in offices, bathrooms, employee break rooms, and storage closets will increase electrical energy savings to 122,063 kWh per year, with a cost of $26,582 for implementation and a payback period of 1.9 years through energy and maintenance savings.


### Retrofit T12 and T8 Fixtures

The hospital is in the process of retrofitting all 48 inch T12 fixtures with T8 lamps and electronic ballasts. I recommended that the hospital retrofit both 48 inch T12 and T8 fixtures with 28W T8 lamps with electronic ballasts. This exchange would result in a savings of 585,291 kWh per year and a return on investment in 1.4 years when rebates and energy and maintenance savings are included. Adding occupancy sensors to offices, bathrooms, employee break rooms, and storage closets will further reduce electrical energy consumption by 704,241 kWh per year. With occupancy sensors installed in these designated areas, the expected payback period is 1.9 years.

### Replace Northland Parking Ramp Light Fixtures

The lights in the Northland Parking Ramp have some of the original lighting fixtures. These fifty-four 150 watt high pressure sodium (HPS) fixtures cost about $4,800 per year to operate. Replacing these 54 fixtures with T8 vapor-tight fixtures can save 61,495 kWh per year with an associated $3,293 in annual utility savings. Implementation will cost approximately $9,115, with a return on investment of 1.1 years when rebates and potential, energy and maintenance savings are included.

### Replace/Repair Failed Steam Traps

I performed steam trap testing for failures because no regular inspection had been completed on these systems. Through the inspection, I found that 13 traps were blown through, leaking, rapid cycling, plugged, or flooded, resulting in an estimated loss of 14,890,666 lbs. of steam and $256,715 in steam utility cost. Repairing or replacing these traps is estimated to cost $3,510, allowing the hospital to save all of the steam that is lost, with a payback period of only 0.2 years.

In summary, there are alternative options for each of the lighting system recommendations, typically with and without automated controls. The summary table below reflects the option that would achieve the highest level of energy savings within each lighting recommendation area.

| Recommendation | Reduction | Annual Savings | Status |
|---|---|---|---|
| Replace incandescent & CFLs with LEDs | 122,063 kWh/yr | $9,376 | Under review |
| Retrofit T12 & T8 fixtures | 704,241 kWh/yr | $57,444 | Planned |
| Replace Northland Parking Ramp lights | 61,495 kWh/yr | $6,975 | Under review |
| Replace/repair failed steam traps | 178,126 therms/yr | $256,715 | Implemented |