

**Cutting Costs without Cutting Safety:**  
Identifying Ways to Reduce Fire Department Expenditures  
While Maintaining Safety

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## **Certification Statement**

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

## **Abstract**

Like many departments in the nation, Noblesville Fire Department struggles to stay inside budget limits due to an increased demand for service, a decreased amount of money allocated to the fire department, and increased operating costs. Changes are recommended to achieve greater cost efficiency in day-to-day operations in addition to reducing capital projects costs.

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## **Introduction**

Evaluating the cost effectiveness of any organization, whether profit or non-profit, is always an important and enlightening task. Noblesville Fire Department (NFD) is no different. While Noblesville is positioned in one of the faster growing counties in the nation, we are still an area that feels the “crunch” of the current economy. NFD faces challenges because tax levies are not on pace with growth, meaning the demand is rising, but the revenue is rising slower. We are further challenged by recent Indiana legislation reforming property taxes, which subsequently will reduce money allocated to municipalities to fund budgets. Therefore, budgets all across Indiana will be slashed, resulting in less revenue to provide public safety; this all at the same time that fire departments across the nation attempt to become more specialized, and do more with less. By taking on more responsibilities the fire department become more needed by the community, thereby justifying larger requests for revenue, our existence, and the number of personnel we employ.

This research is focused specifically on the unique aspects of NFD to evaluate ways that a fire department can reduce short and long- term costs. It should be noted that the information contained here is not exclusive to NFD and may be applicable to other departments around the nation. Despite the current economic downturn nationwide, all departments owe it to the taxpayers to be as fiscally responsible as possible while maintaining the highest level of safe professional services. While the options and suggestions noted are wide ranging, there is an attempt to keep safety at the forefront in all options. Cutting costs in the area of safety should not be a serious consideration for any fire department. The research questions are:

1. What ways can NFD reduce costs relating to operational planning while maintaining safety?
2. What ways can NFD reduce costs relating to capital projects while maintaining safety?
3. How can these cost saving changes be presented to the department and taxpayers in a way that will assure compliance and acceptance of the changes?

### **Background and Significance**

The Noblesville Fire Department currently staffs 120 full time firefighters, 10 of which operate staff positions. We cover a rapidly growing area of over 55 square miles and over 41,000 residents, an increase of more than 11,000 since the year 2000. We have six stations, with the seventh under construction. Noblesville is experiencing a surge in commercial development and infrastructure in addition to residential development.

### **Literature Review**

First, we will address lighting. This is something that is relevant not only to fire departments, but also to our personal lives in how we can reduce energy costs specifically through lighting options. Eartheasy.com reports that the cost of electricity used over the lifetime of a single incandescent bulb is 5 to 10 times the original cost of the bulb itself. Compact Fluorescent Lights (CFL's) and Light Emitting Diode (LED) options are revolutionizing energy efficient lighting. CFL's are miniature versions of full size fluorescents. They screw into the standard light socket and give off the same light as a

common incandescent bulb. LED's are a small, solid light with bulbs grouped in clusters with diffuser lenses that are extremely energy efficient.

CFL's are four times as efficient, last up to 10 times longer than an incandescent, and use 50-80% less energy. A 22 watt CFL has about the same light output as a 100 watt incandescent. Although they are initially more expensive, they save money in the long-run. As an added bonus they are better for the environment. Replacing a single incandescent bulb with a CFL will keep a half ton of CO<sub>2</sub> out of the atmosphere over the life of the bulb, and also reduces sulfur oxide and high-level nuclear waste. Eartheasy.com reports that if everyone in the U.S. used energy-efficient lighting, we could retire 90 average size power plants. Also, the new CFL's give a warm, inviting light instead of the "cool white" light of older fluorescents and they don't flicker or hum. The CFL can now replace an incandescent in almost every application. Caution should be used if a CFL bulb breaks because of a small amount of mercury content that will be present.

Until recently LED's were limited primarily to spot lighting and flashlights because of their high cost. However, researchers are beginning to discover ways to produce them more cost effectively which may lead them to be the energy preferred method of lighting. An LED bulb will last 10 times as long as a compact fluorescent. They are a solid light that will hold up well to jarring and bumping because LED's do not have a filament. Therefore, they won't break under circumstances when a regular incandescent bulb will. They are safe because they do not cause heat build up; they produce 3.4 btu's/hour, compared to 85 for an incandescent. Also, there is no mercury used in an LED. They are even more efficient than CFL's, using 1/3<sup>rd</sup> to 1/30<sup>th</sup> of the

electricity of incandescent or CFL bulbs. Because these bulbs last for years, energy is saved in maintenance and replacement costs. Although the initial costs are expensive, over time the cost is recovered in energy savings.

While these suggestions are applicable to a portion of the lighting options around the stations, they don't include the T12 lighting that we find in the ceilings of most of the stations. The state of Oregon suggests replacing T12 bulbs with T8 lights and the magnetic ballasts with electronic ballasts. By doing these two things they say you will see a reduction of energy costs by 17% to 48% depending on the specific lights and ballasts used. They also suggest removing some of the existing T12 lights and not replacing them at all. They suggest using one electronic ballast for four lights instead of one magnetic ballast for the two lights previously installed. There is also an option to use specular reflectors to increase light distribution. The overall result may bring 50% savings without compromising the quality of the light delivered. Transitioning from T12 to T8 typically costs about \$20 per lamp with parts and labor. If it is too expensive to replace them all at once, consider replacing them as they burn out.

CFL's and LED's should be considered for lighting purposes where incandescents are currently in use. This would primarily include lamps and bay lighting. Also, the T12 bulbs should be replaced with T8 bulbs to be as energy and cost effective as possible.

### **Procedures**

Another cost savings route related to lighting is the use of automatic light sensor controls. These sensors, introduced more than 20 years ago, are gaining popularity

in public places and in the workforce. They are the most cost effective in areas that are occupied irregularly such as hallways and restrooms. Since the sensors introduction there has been a decline of issues related to sensor installation, causing them to become an increasingly popular option. Several different types of automated systems are available. Some have user controlled sensitivity levels, some detect air flow movement, some “plug and play” type models adjust to the traffic patterns and conditions of the room, and most have settings to adjust how long the lights will remain on before automatically shutting off. Other types of sensors are installed in rooms that have natural lighting. The sensors detect the amount of natural light present in the room and adjust the output of the lights accordingly. Cost savings for installation of these different sensors is widespread, typically ranging from 25%-50% depending on the type of application. For the fire department, the restrooms seem the most logical place to start when considering these types of devices. For restroom specific studies, research has shown the cost savings to be 73%-86%.

Research conducted by the Environmental Protection Agency (EPA) shows that the area with installed sensors to receive the quickest return on investment was the restroom. This is due to the higher incidence of the restroom being illuminated while unoccupied. This research seems to be relevant to fire stations. The table included in Appendix A illustrates the cost saving estimates depending on what the timeout period is set at (5 minutes up to 20 minutes). There is no concrete formula to determine how quick the return on investment will occur for implementing these sensors. NFD should consider first including these sensors in specifications for new stations, and then in implementing them in existing stations, primarily in restrooms. A more detailed cost analysis relevant to

our fire department could be provided by local lighting contractors who are aware of installation costs and current energy costs.

Yet another cost saving options for fire departments relates to staff vehicles. Currently, many of the staff vehicles used by NFD are SUV's or trucks. In Ohio, state workers recently began trading in their mid-size sedans for smaller, cheaper, and more fuel-efficient cars. Typically in Ohio, the vehicle of choice had been the Chevy Impala. Now, the state is opting for a Ford Focus. The cost savings estimated to the state is \$242,000 the first year (for 2,700 vehicles) by switching from the Impala to the Focus. The Focus costs about \$12,000 and gets 28 mpg, compared to the \$16,000 Impala that gets 21 mpg.

One of the primary staff vehicles at NFD currently is the Chevy Tahoe. For a 2007 5.3L V8, 4wd model, it is shown to average 11 mpg city, and 15 mpg highway. The base price for the basic model (LS) starts at over \$37,000. Currently, the department purchases vehicles through a government discount program, typically trading in vehicles every 5 years. The following is a direct comparison of the Chevy Tahoe and the Ford Focus by an independent evaluator:

<b>Chevy Tahoe</b>	<b>Ford Focus</b>
Base price: \$37,415 each	Base price: \$12,955 each
Average gas mileage: 13	Average gas mileage: 28.5
*5 year costs: \$45,064	*5 year costs: \$28,369

\*5 year costs include depreciation, financing, insurance, state fees, fuel, maintenance, and repairs.

Currently, the department has 11 staff vehicles. Hypothetically, if in one transaction the department was to purchase 11 new vehicles, and kept and maintained those vehicles for 5 years, the total costs are comparatively shown below:

<b>Chevy Tahoe</b>	<b>Ford Focus</b>
Total purchase price: \$411,564	Total purchase price: \$142,505
Total combined 5 year costs: \$495,704	Total combined 5 year costs: \$312,059
<b>Total: \$907,268</b>	<b>Total: \$454,564</b>

### **Results**

Based on the above numbers, when 11 vehicles of both types are purchased and maintained for 5 years, the total money spent on the Chevy Tahoe versus the Ford Focus is 99.59% higher. Based on this information it could be concluded that a more cost effective and fuel efficient vehicle, such as the Ford Focus, would save money in the long run. Additional fuel savings could be achieved at NFD by establishing a policy to limit reimbursable gas mileage in staff vehicles.

In Noblesville, not all of the staff vehicles are Chevy Tahoe's. That has been a commonly purchased vehicle in recent years and was used for comparison purposes only. Furthermore, there are numerous variables that could play into this comparison. While purchase prices and discounts vary from time to time with different dealers, it can at least be concluded that a more fuel-efficient vehicle would save money. While it is not practical for all staff members to operate out of small cars all the time, most would be

able to. Also, if all staff members were to switch to cars, they could use one of the utility vehicles located at different stations that have towing and hauling capabilities when needed. This particular issue will become even more relevant as we become an increasingly bigger department that fills more staff positions. Over the next five years NFD should phase out the existing fleet of administrative vehicles and replace all of them with a vehicle similar to the Ford Focus. Keep two utility/staff vehicles at headquarters station that are capable of hauling up to four personnel each, and have the capability of hauling and towing. With these two trucks and the utility trailer centrally located, administrative personnel should still be able to accomplish the same tasks they have in the past.

### **Discussion**

Another way to reduce costs is by having firefighters accomplish more of the station maintenance. By code, some things need to be done by licensed contractors, such as electrical work. However, tasks such as painting and some landscaping tasks could be carried out by firefighters. Many firefighters are knowledgeable in these types of tasks. There is no formula to calculate the savings this will produce, but obviously over time, money could be saved by reducing labor costs.

Yet another option to consider is purchasing stock or demo fire apparatus as opposed to custom models. It seems with most departments, that despite the time and effort put into specifications for new apparatus, that often after a few years, some of the equipment changes, or there is a new or different service we are providing, and suddenly the apparatus isn't as "perfect" as it seemed initially. The costs that could be saved by

going this route would vary by manufacturer and by apparatus. Savings of over \$100,000 in some cases would not be unrealistic. This method of purchase could be further appealing because it takes away the long building period for an apparatus, takes away the need for a specification committee, and keeps most of the apparatus fairly standard with each other as long as we stayed with the same manufacturer.

Additionally, as a mid-size department we could consider getting discounts by placing larger purchase orders. This could be accomplished by grouping orders with neighboring departments with similar needs. This could be evaluated by inquiring what area departments are purchasing, and then discussing discounts with the sales personnel they use.

One final consideration relates specifically to lawn maintenance. Currently crews perform lawn care once per week. This is a cost saving practice that should continue with one slight modification. With an increasing number of stations, it would be of value to consider having one centrally located utility trailer with all the lawn care equipment. By doing this we reduce the number of “sets” of lawn equipment from 7 to 1. Currently, all the stations do lawn maintenance on Wednesday’s. If each station performed this on different days of the week, it would not be an issue to share equipment. By changing to this plan it would reduce the overall cost of purchasing equipment, the maintenance of equipment, and the storage area costs of equipment. By only having to purchase one set of equipment, very high quality equipment could be purchased at a total price less than everything we have now.

## **Recommendations**

It would be valuable for Noblesville, or any other department, to consider the above recommendations and expand on them as needed. It should also be noted that if a department were to take a very proactive approach to enacting these changes in current economic times, they stand to demonstrate fiscal responsibility in the eye of the public. The department could at minimum do a press release and try to position itself as “an example of what a department concerned about rising costs and energy preservation is doing to make a difference.” We should portray to the public the specific short and long-term changes that are occurring. If the department is trading in the SUV’s for fuel-efficient cars then a big deal should be made about it. Report all these changes to the media and post them on the website. Tell the public why we are getting rid of all the incandescent bulbs. Give specifics about how the public can implement similar changes to save money and the environment. The fire department has typically always been viewed positively by the public and this is another way to capitalize in that aspect.

More specifically, we should consider the following specific changes:

1. All lights that can be changed to LED bulbs should be done so as they are replaced.
2. Replace all other lights with CFL’s, and the ballasts as well.
3. Phase out staff vehicles with compact, fuel-efficient cars, trading in every 5 years.
4. Use firefighters to accomplish more station maintenance, including upkeep and landscape.

5. Evaluate cost savings of purchasing demo trucks, and grouping purchases with other departments.
6. Have one centrally located set of lawn care equipment that all stations share.

Future studies should include evaluating the following for cost effectiveness:

1. The implementation of programmable thermostats.
2. The implementation of air dryers to reduce paper products and waste.
3. The use of water saving toilets.
4. Automated sink, urinal, and toilet controls.
5. Cost effectiveness of building stations that are smaller, thus being cheaper to build and maintain.

As you can see, there are many changes that NFD and most other fire departments can consider to save money in both the short and long-term. As with everything mentioned previously, and anything else that could be considered, we must strive to operate in the safest and most efficient manner possible. It is our utmost responsibility to our fellow firefighters, and to the public we serve.

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## Appendix A

**Table 3. Average daily energy use, and annual energy costs and savings for each application.1,2**

Daily energy use (kWh/day)	Annual energy cost (\$/year)	Annual energy cost savings (\$/year)	Annual energy cost savings (\$/year)
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### Restroom

<b>Baseline</b>	5.600	163.52 -		
<b>5-minute</b>	2.246	65.56	97.96	60%
<b>10-minute</b>	2.556	74.67	88.85	54%
<b>15-minute</b>	2.788	81.38	82.14	50%
<b>20-minute</b>	2.970	86.76	76.76	47%

Footnotes:

1. Daily energy use = [(Operating time in hours during 14 day monitoring period) X kWh/day] / 14 days)
2. Annual energy cost = (kWh/day X 365 days/year X \$.08/kWh)

Note: This research conducted by the EPA also included other areas of a commercial building. The most cost effective and most applicable application for fire departments was the restroom. For further data visit the website referenced above.