

SUMMARY OF FINDINGS FROM A
FIELD STUDY OF TASK TUNING

Adjusting lighting levels in commercial buildings



Lighting in commercial buildings has been the target of energy efficiency programs for many years. Historically, reductions in lighting energy consumption have been achieved by implementing new technology with improved luminaire efficiency, such as replacing T12 fluorescent lamps with T8 or T5 lamps or upgrading fluorescent fixtures to LEDs. However, recent changes to applicable codes and standards, have begun to change the baseline of installed lighting efficiency and are eroding the cost-effectiveness of existing programs. Given these market changes, energy efficiency program administrators must now consider implementing programs that go beyond efficacy-based, per product incentives.

Task tuning (sometimes called institutional tuning or high-end trim) is one form of lighting control that can be used in commercial buildings to save energy. It involves dimming lights in a space so that the average illuminance at the working plane is appropriate for the type of use in that space. Task tuning has the potential to save energy without decreasing occupant satisfaction because most commercial spaces, for a variety of reasons, are over lit. With more widespread adoption of dimmable ballasts and LED lighting there are more opportunities to apply this relatively simple-to-implement efficiency measure. The goal of this field study was to quantify the magnitude of energy savings from task tuning by field monitoring commercial lighting systems in Minnesota.

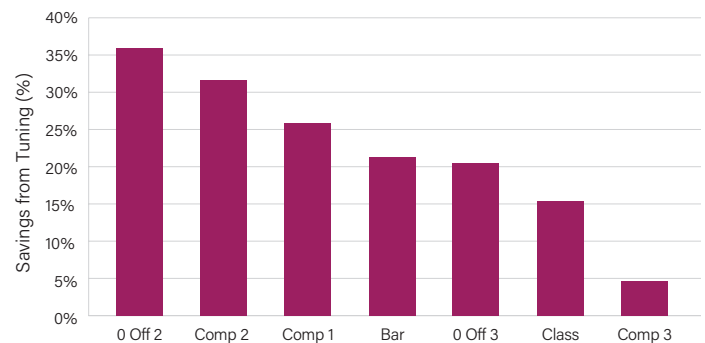
Performance

MEASURED SAVINGS RESULTS

The measured data shows that the average savings from task tuning was approximately 22 percent of the dimmable lighting energy. On a per square foot basis, for a typical

commercial space lit with 1 W/ft², this savings equates to 0.6 kWh/ft². The distribution of energy savings across the measured spaces is demonstrated below.

DISTRIBUTION OF ENERGY SAVINGS



AREAS OF GREATEST POTENTIAL

Our energy savings calculations highlighted the following characteristics that tended to correspond to high potential for task tuning savings:

1. A lighting system that had not been commissioned or was commissioned by the owner.
2. A lighting system that had been designed by a contractor as opposed to a lighting designer or electrical engineer.
3. A lighting system in an education, public assembly building or office.
4. A lighting system with dimming controlling significant electric power in spaces with longer hours of operation, such as open offices with photocontrol or LEDs. Dimmable systems for A/V equipment did not exhibit high levels of savings opportunity.



Adjusting light levels using handheld device.



Measuring light levels on the working surface.

ECONOMICS

On an increasing number of projects, the need for dimming controls are driven by design requirements such as daylighting, controllability needs, or occupant satisfaction (eliminate the distraction of on/off switching). In this situation, the only incremental cost is the time associated with tuning, which we estimated to range from \$0.03 and \$0.06 per square foot, resulting in a simple payback of between 0.5 and 1.1 years. **Due to these short payback periods, we recommend that task tuning be implemented in new construction projects or major renovations** in which a dimming system is already planned as part of the design requirements. For the same reason, if a dimming system already exists in a facility, task tuning should be strongly considered as a way to achieve cost-effective energy savings.

OCCUPANT COMFORT

Task tuning is essentially a tradeoff between energy consumption of a lighting system and light levels in a

space. When performing task tuning, it is important to balance energy savings with occupant visual comfort, as aggressive tuning will result in high energy savings at the expense of occupant satisfaction. Because of this, we recommend that task tuning be conducted with occupant feedback, due to the approach's balance of energy savings and occupant visual comfort. Although this may result in lower immediate energy savings, it would increase energy savings persistence, as facility managers would be less likely to override tuned controls based on occupant complaints.

Task Tuning for Programs

While there are CIPs in Minnesota that actively address lighting controls, our results suggest significant opportunities for expanding and improving efficiency programs promoting this technology.

Selected efficiency programs providing incentives for advanced lighting controls, including task tuning.

PROGRAM	DESCRIPTION
Efficiency Vermont RELIGHT	Rebate and incentive to offset the cost of hiring a professional lighting designer.
Focus on Energy SMART Lighting	Performance incentives offset the cost of hiring a professional lighting designer.
MassSave Networked Lighting Controls	Promotes the installation and commissioning of lighting control systems both for new construction and retrofit projects.
SMUD Advanced Lighting Controls	Encourage medium to large size commercial customers to adopt advanced lighting controls.
ComEd Smart Ideas® Advanced Lighting	Offers incentives for installation of new intelligent lighting control system when coupled with installed lighting power reduction and 30-day post measurement and verification measured kWh savings exceeding target values.



Occupant feedback during task tuning allows for energy savings while maintaining occupant comfort.

PROGRAM APPROACHES

We suggest three approaches to take advantage of the potential savings from advanced lighting controls: ranging from a simpler, lower cost prescriptive program to a more complex, higher cost program. We also recommend establishing the incentive on a per square foot basis as it is a number that building owners understand and are used to using in the decisions they make regarding their building.

PROGRAM	DESCRIPTION	INCENTIVE	DELIVERY
Prescriptive	Tier 1: install dimmable lighting power and associated controls	per sq. ft.	Use qualified contractors
	Tier 2: tune dimmable lighting	per sq. ft.	
Retrocommissioning	Tune existing dimmable systems	per kWh saved	Use qualified energy service representative or controls representative
Enhanced Lighting	Comprehensive approach from design through commissioning	per sq. ft.	Use qualified lighting designers/contractors

TRAINING

In order to successfully implement task tuning, program staff or trade allies should be trained and proficient in a variety of lighting-related subjects.

- 1. Fundamentals of lighting:** This course was developed by the Illumination Engineering Society and covers a range of lighting-specific subjects at an appropriate level for gaining proficiency in task tuning.
- 2. Lighting controls:** The Lighting Controls Association's Education Express offers a variety of lighting control and dimming control classes.
- 3. How to use a light meter**
- 4. Basics of major manufacturer control systems:** The biggest variable in any task tuning effort is understanding the nuances of the lighting control systems serving a given space. Efficiency program staff should work with control system manufacturers to develop training on the basics of their systems.

COST EFFECTIVENESS

The most cost effective task tuning programs would focus on buildings with large areas of similarly controlled lighting, such as large open offices or a number of classrooms for which the same level of tuning could quickly be applied. Regardless of the building, it is likely not cost effective to measure the light levels in all spaces. Rather, a sample of representative spaces should be identified and measured. The resulting lighting level reduction should then be applied to all similar spaces. Finally, higher program cost effectiveness is achieved when coupled with a lighting retrofit, since there is a high fixed cost in merely getting into the building, understanding the spaces, and associated lighting controls. Once this is done, the time associated with actually tuning the lights is small.

We cover many of the aspects above in more depth in our full report; we've also developed a how-to video specifically to assist in training.

FOR MORE INFORMATION

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slipstreaminc.org/research/adjusting-lighting-levels-commercial-buildings

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