



**Feasibility Study of Potential for  
Electrical Energy Savings In Canadian  
Office Buildings Using Automatic  
Controls To Dim Perimeter Lights**

**Prepared For:**

CANMET Energy Technology Centre-Ottawa  
Buildings Group - Energy Sector  
Department of Natural Resources Canada  
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## NOTE

Funding for this project was provided by the Federal Panel on Energy Research and Development, Department of the Department of Natural Resources Canada (NRCan) and the Industrial Research Assistance Program (IRAP).

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## 1.0 SUMMARY

The Canadian Centre for Mineral and Energy Technology retained Engineering Interface to carry out this feasibility study.

The study quantifies the electricity savings achieved by an automatic lighting control system which dims the perimeter lights when natural daylight provides sufficient illumination.

North York Hydro constructed a new head office building at 18 Dyas Road, North York, Ontario in 1992. This building is equipped with several innovative design features and is intended to act as a demonstration centre for energy conserving technologies for building owners, operators and users. One of the energy efficient features in this building is an automatic control system which dims the perimeter lights. North York Hydro very kindly gave permission for their new head office to be used as a site for gathering performance data for the automatic light dimming system. Electrical energy use on two floors with identical lighting layouts was measured on 29 different days, with the perimeter lights dimmed by a daylight control system on one floor, but not on the other floor.

The results of this feasibility analysis showed that automatic control systems for dimming lights have become more reliable and can maintain light levels without disrupting the visual environment for occupants. The study showed the ambient light sensor used was inaccurate by 25%. The study recommends an increased research and development program by manufacturers to produce a more accurate light sensor.

The simple payback of the automatic light dimming installation at Dyas Road is estimated to be 6.2 years. In a larger, new building, and with more extensive use of the technology by building owners, the report estimates a payback on electricity cost savings can be achieved within three years.

The payback for installing an automatic light dimming system in existing office buildings is longer than is the case for new office construction. This is because the total cost, as against the premium cost of the dimming ballast, has to be carried against an existing installation.

There are criteria other than cost, such as the perception that an automatic control system for dimming perimeter lights makes a building more technically sophisticated and environmentally friendly. These criteria may influence some building owners to install an automatic dimming system.

The potential for electric demand avoidance through an automatic control system for dimming lights in larger Canadian office buildings is estimated to be 504 megawatts. The potential reduction to the peak electric lighting load in these office buildings is 28%, with a corresponding 28% saving on lighting electrical consumption. These electricity savings have an associated utility cost avoidance of \$183 million a year at 1993 electricity prices.

The daily electrical consumption savings resulting from dimming third floor perimeter lights evaluated at 63.5% of perimeter zone lighting, as compared to the fourth floor where perimeter lights were not dimmed. This evaluates as a 13.5% reduction to the daily electrical consumption for the entire floor as compared to the fourth floor where lights were not dimmed.

## RÉSUMÉ

### L'éclairage naturel

Le Centre canadien de la technologie des minéraux et de l'énergie (CANMET) a retenu les services de l'entreprise Engineering Interface afin de réaliser la présente étude de faisabilité.

L'étude avait pour but de quantifier les économies d'énergie électrique réalisables par l'utilisation d'un système de commande automatique pour diminuer l'intensité de la lumière artificielle sur le périmètre lorsque l'éclairage naturel suffit.

En 1992, la North York Hydro a fait construire un immeuble administratif au 18 Dyas Road à North York, en Ontario. L'immeuble, qui est pourvu d'équipement innovateur, servira de centre de démonstration de la technologie éconergétique à l'intention d'utilisateurs énergétiques qu'ils soient propriétaires, chargés d'entretien ou locataires. La North York Hydro a bien voulu donner la permission pour que son nouveau siège social serve à recueillir des données de rendement en ce qui concerne son système de gradation de l'éclairage. L'utilisation éconergétique sous forme d'électricité sur deux étages munies d'un aménagement électrique identique. L'utilisation de l'éclairage sur les deux étages fut mesurée pendant une période de 29 jours en utilisant le système de commande automatique sur l'un des étages, à titre comparatif.

Les résultats obtenus ont démontré que les systèmes de commande de l'éclairage artificiel sont devenus plus fiables et peuvent assurer un éclairage satisfaisant pour les occupants. L'étude a aussi démontré que le détecteur d'éclairage naturel utilisé faussait les données à 25 %. Les résultats démontrent qu'il y aurait place pour un programme de R-D qui permettrait aux fabricants d'améliorer la précision des détecteurs de lumière.

Le délai de récupération des coûts d'installation du gradateur de lumière au siège social de Dyas Road est d'environ 6,2 années. Dans un immeuble neuf de plus grande dimension et si l'usage de cette technologie était plus répandue, le présent rapport établit le délai de récupération en termes d'économies d'électricité à 3 ans.

Dans le cas d'immeubles existants, le délai de récupération est plus long que dans le cas d'immeubles neufs ou l'installation est prévue lors de la construction.

D'autres critères justifient également l'installation d'un système de commande de l'éclairage du périmètre comme par exemple le fait de rendre l'immeuble plus intéressant sur les plans technologique ou écologique. Pour certains propriétaires, ces critères suffisent amplement pour les convaincre d'installer un système de gradation automatique.

Selon les prévisions du rapport, l'utilisation d'un tel système dans les grands immeubles canadiens permettrait de réaliser des économies de l'ordre de 504 mégawatts. La diminution potentielle de la demande de pointe dans ces immeubles serait d'environ 28 % et représenterait des économies de consommation de 28 %. Selon les prix de l'électricité en 1993, cette diminution correspondrait à des économies de 183 millions de dollars.

Les économies de consommation d'énergie quotidienne encourues grâce à l'utilisation de gradateurs de lumière en périphérie est évaluée à 63 % pour le troisième étage comparativement à l'énergie utilisée au quatrième étage où il n'y a pas eu de mesures de gradation de l'éclairage.

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