The Cinderella of east European buildings: Energy conservation opportunities and barriers in municipal lighting

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1. SYNOPSIS

The goal of the poster is to investigate the state of energy efficiency of lighting in municipal buildings in Hungary, and the barriers hampering cost-efficient retrofits.

2. INTRODUCTION

Whereas most policy-makers and energy-efficiency program designers recognise that there is a vast potential for conserving electricity in municipal buildings of Central and Eastern Europe, these buildings are still in a Cinderella status after a decade of economic reconstructions. Our lack of understanding of the real magnitude of potential is primarily due to the lack of information on these buildings, and the significant market barriers hampering retrofit projects. The goal of the poster is to provide an overview of the state of energy efficiency of lighting systems in Hungarian municipal buildings, and to identify the key barriers to efficiency retrofits.

3. METHODS USED

A representative survey and audit of 421 municipally financed buildings throughout Hungary has been conducted to assess the state of lighting systems and to identify the potential for their energy efficiency upgrades. Table 1. Describes the sample in detail. Institutions were visited and audited by trained experts, and interviews were conducted by lighting system related decision-makers.

Table 1. Number of institutes surveyed by institute type and settlement type

Institution type	Settlement type					Total surveyed	Total number of institutes in Hungary
	100,000 < town	50,000 – 100,000	20,000 – 50,000	10,000 – 20,000	< 10,000 Village		
Kindergarten	29	9	22	11	71	142	4701
Elementary school	38	9	21	14	72	154	3732
Secondary school	34	6	19	10	2	71	1036
Higher education	9	6	6			21	89
Hospital	8	4	14	6	1	33	155
Total	118	34	82	41	146	421	9713

4. RESULTS

Hungarian schools and hospitals are generally located in old buildings: more than two-thirds of buildings were constructed prior to 1975. While half of the institutions responding have had their lighting systems retrofitted within the last 5 years, one quarter of them have lighting systems in place which are older than 10 years, some as old as 25 – 45 years.

The largest electricity consumers are hospitals, who consume on average three times as much electricity as an average higher educational institute. More than 10% of institutions admitted to having problems with paying electricity bills, among these hospitals are in the worst situation with one-third facing payment problems.

Kindergartens are in the best situation with only 3% of them reporting payment arrears. Efficiency upgrades could thus relieve some of the burdens of high bills in institutions facing payment difficulties.

Table 2. The share of lighting systems as a function of institution type

Technology	Institution type					Total
	Kinder-gartens	Elementary schools	Secondary school	Higher education	Hospital	
Incandescent	*16.45%*	*6.91%*	*9.01%*	*14.44%*	*19.36%*	*13.99%*
Screw-in CFL	*1.53%*	*0.58%*	*0.74%*	*1.04%*	*1.07%*	*0.93%*
Plug-in CFL	*0.92%*	*1.08%*	*1.86%*	*0.26%*	*5.19%*	*2.69%*
T8 magnetic ballast	*23.92%*	*25.73%*	*26.84%*	*57.54%*	*31.05%*	*33.33%*
T12 magnetic ballast	*52.39%*	*60.81%*	*56.57%*	*24.61%*	*40.92%*	*45.63%*
T8 electronic ballast	*4.42%*	*3.76%*	*3.91%*	*1.26%*	*0.95%*	*2.27%*
Metal halide	*0.16%*	*0.57%*	*0.69%*	*0.31%*	*0.26%*	*0.40%*
Halogen	*0.05%*	*0.46%*	*0.24%*	*0.49%*	*0.73%*	*0.52%*
Other	*0.15%*	*0.08%*	*0.13%*	*0.05%*	*0.48%*	*0.25%*

In terms of technology penetrations, the T12 linear fluorescent technology with magnetic ballasts dominate in municipal buildings by representing 48% of all lamps in educational institutions and 41% of lamps in hospitals (see Table 2). The T8 linear technology tends also to be widespread: T8s with magnetic ballasts constitute 35% of lamps in educational buildings and 31% of those in hospitals. Electronic ballasts are used only in a few institutes: in 3% of lamps in educational buildings, and in 1% of lamps in hospitals. Incandescents still dominate lighting after linear fluorescent systems: close to 20% of lamps in hospitals, and 11% in schools are incandescents. Compact fluorescent lamps can still be found only in a handful of institutions, comprising less than 4% of all lamps.

The most typical concerns raised were with the obsolete lighting systems including the wiring, transformers, and luminaires; the impossibility of switching parts of the system on in smaller units; and the nuisance from linear fluorescent systems (presumably T12s) such as flicker and hum. Also many institutes reported that linear fluorescent lamps fail earlier than they would be expected to based on reported lifetimes. These basic problems with lighting systems also represent a barrier to the cost-effectiveness of efficiency retrofits: retrofit projects also need to address replacement of other obsolete system components, and this often destroys the financial attractiveness of efficiency upgrades.

When lighting system related purchase decisions are made, 68% of institutes consider first costs as the key influencing criterion for purchase decisions. While 16% identified quality as the key criterion, many institutions thought that minimising energy costs are also important.

The most important barrier to efficient lighting retrofits in these buildings is the lack of available funding, or the lack of information on where to obtain financing. However, it is clear that the understanding related to cost-effectiveness is also often missing. Lighting-related decision-makers are often either unsure if such retrofits would be cost-efficient or would pay back in a reasonable time, or have misconceptions about efficient lighting which hamper realistic decisions. Thus, the need to educate decision-makers, and supply information on audits and financing options is vital for a move towards more efficient lighting systems in municipally funded buildings. In addition, decision-makers in many cases are not motivated to reduce electricity consumption, and institutional reforms are needed to address this problem.

5. CONCLUSION

The survey has shown that hospitals are most in need of energy-efficient lighting system retrofits, and also assistance for such retrofits. Hospitals use several times the electricity as other examined institutions, and have the highest magnitude of payment-related problems. Hospitals provide lighting by twice as many incandescents as educational institutions thus representing giant energy savings potentials. In addition, they burn their lamps for much longer hours than other building types thus reducing payback times. Hospitals are the least satisfied with their current lighting systems, but they have the least information on where to obtain financing for efficiency retrofits.

In conclusion, the lighting systems in municipally financed schools and hospitals in Hungary represent a significant electricity saving potential. Cutting on the electricity expenditures of these institutions will not only reduce national carbon emissions, but will bring significant further benefits through cutting costs and improving comfort and quality of services to these institutions themselves, their workers and occupants, the Hungarian municipalities, and last but not least Hungarian taxpayers. To realise energy and cost savings potentials, however, a concerted effort is needed from the side of the institutions themselves, municipalities (assisting with at least information), the government (institutional reforms), financing institutions, manufacturers, and the energy-efficiency community.