

Fact sheet concerning various efficient lighting alternatives for municipalities

1 Specific indicators

General

Different types of lamps have a different luminous efficacy, nominal lifetime and energy consumption values, therefore such specific indicators can be compared (actual with desired values).

There exist different definitions for the average “nominal” life time, it can be defined as follows:

- for “thermal radiator” bulbs (filament lamps/incandescent and tungsten halogen lamps): time until a failure rate of 50 %
- for discharge lamps (fluorescent lamps, sodium vapour, metal halide lamps): reduction of luminous flux after a certain operating time is considered together with failure rate
 - **Lifetime 12B10** is defined as time in which 10 % of the lamps in a plant are failed (failure rate 10 %), based on a 12 hours switching cycle (11 hours on, 1 hour off). The decreasing of luminous flux is up to 10 % in this moment (in other cases up to 15 %: – according to **IEC/EN standards**).
 - The **expected useful lifetime** is achieved if the remaining luminous flux is 80 % of the initial luminous flux (100 hours value). The expected useful lifetime is considering early failures and decreasing luminous flux of the lamps. The measurements follow the **IEC/EN standards** (e.g. IEC/EN 60081 for tubular fluorescent lamps), based on a 3-hours-switching cycle.

Light yield of different types of lamps

Lamp type, wattage	Luminous efficacy
Incandescent lamps 25W...150W	9....15 lm/W
Compact fluorescent lamps 5W...80W	23...88 lm/W
Tube shaped fluorescent lamps 18W...80W	43...94 (104) lm/W
High pressure Mercury vapour lamps 50W...400W	40...60 lm/W
High pressure Sodium vapour lamps 50W...1.000W	70..147 (150) lm/W
Low pressure Sodium vapour lamps 18W...180W	69..152 (up to 200) lm/W
Metal Halide lamps 60 – 150 W	80..118 lm/W

Specific indicators of street lighting

Indicator	Bad values	Average values	Desired values after renovation
Luminous efficacy [lm/W]	< 60	50 – 80	90 – 120 (up to 150 for low pressure sodium)
Nominal lifetime [h]	< 10,000	15,000	12,000 * ...20,000 (for long life high pressure sodium vapour lamps under 12B10: up to 48,000)
Failure rate at indicated life time [%] for Metal Halide-lamps*	30	15	5 – 10

Indoor lighting

Indicator	Bad values (incandescent)	Average values (fluorescent)	Desired values after renovation (T 8 fluorescent/ compact fluorescent)
Luminous efficacy [lm/W]	11 – 19	60 - 65	80 – 93 (T 5: up to 104)
Nominal lifetime [h]	1,000	8,000	10,000 - 16,000 (for long life T 8 type under 12B10: up to 60,000 with electronic ballast)

Specific energy demand indicators for indoor lighting

(based on guidelines, VDI3807-4*, SIA 380-4 06 – summary by ages GmbH: consumption indicators (Verbrauchskennwerte) 2005)

Room type	Bad value kWh/m ² *a	Average value kWh/m ² *a	Target value kWh/m ² *a
Office (3– 6 places)	20-24 (33*)	(33*)	6-12
Meeting room	20 (35*)	(35*)	4-10
School room	15-21	9	2-7
library	11		4
auditorium	26-30	22*	5-13



2 General efficiency measures

- Efficient long-life lamps
- Electronic ballasts
- Additional energy saving via Dimming
- Optimized switch times/motion detectors
- Optimized luminaires/reflectors resulting in bigger spacing (less luminaires per km etc.)
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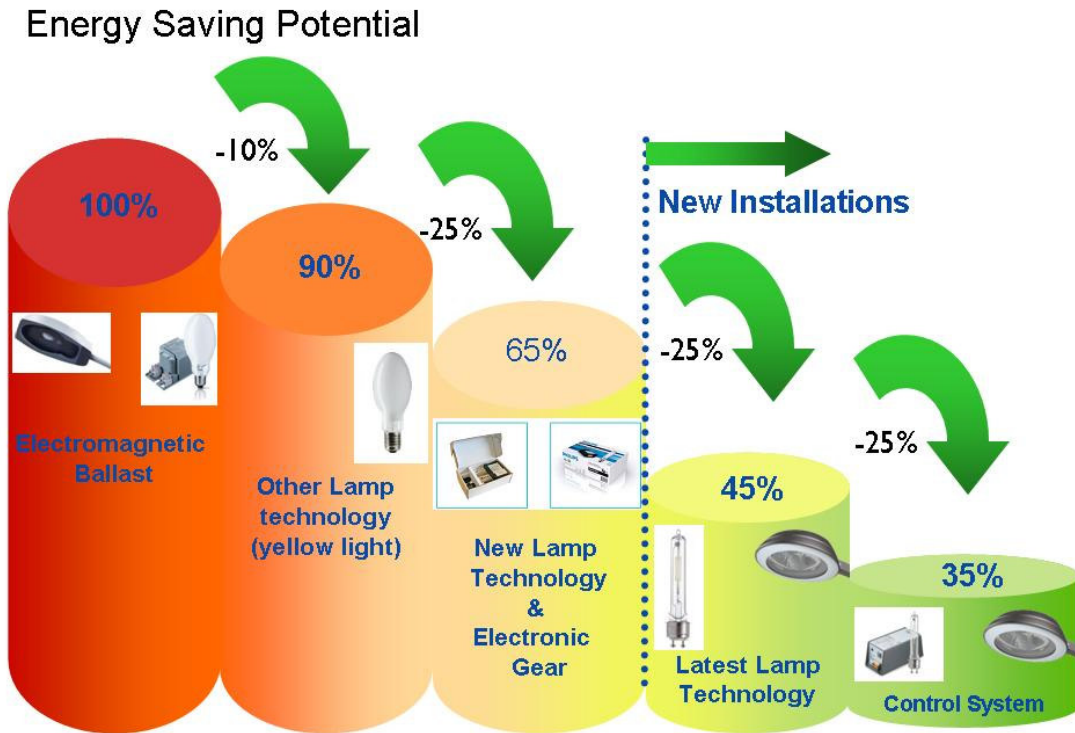
3 Saving measures street lighting

1. Optimization of switch times (e.g. dusk control, tele-management)
2. Light dimming during low traffic times (e.g. between 23:00 and 05:00), Intelligent street light control (with traffic sensors, powerline communication , dimmable electronic gear etc..)
3. Better lamps
4. New light heads/luminaires (e.g. with better optics, lower sensitivity for pollution and easier cleaning opportunities)
5. Electronic gear
6. Lowering of supply voltage (central control switch and/or lamp)
7. Implementation of power reduction devices (Power reduction of the street lighting systems - the uniformity of illumination will be constant)
8. Increasing of distance between poles/luminaires (using of lamps with higher efficacy and better optics)
9. using white light lamps (advantage: level of illumination on subsidiary roads may be reduced a further 30% when colour rendering is greater than 60)

New products on the Light+Building fair 2008, Frankfurt/M.

Following information concerning new/advanced developed Metal Halide-lamps with highest light behaviour for street lighting can be given:

- *a lamp with luminous efficacy of 100 lm/W, color temperature of 3,000 K (allows surroundings to appear in their natural colours), fast replacement and no further retrofitting costs because possibility of 1:1 replacement of sodium vapour lamps (same base and dimensions)*
- *night-time dimming of a Metal Halide-lamp with electronic ballast system (the new system enables power savings of 40 % over the previously operated high-pressure sodium vapour lamps)*



1

→ In general the typical overall cost saving potentials amount 30 - 40 % (50% and more including Operation & Management) in comparison between systems of high pressure mercury lamps/electromagnetic ballasts and new lamp technologies (e.g. Metal Halide-lamps) with electronic ballasts