



Lower energy consumption in public lighting at Podenzana (I) EAMS – Energy Agency of Massa Carrara Province, Italy

Summary

The Energy Agency of Massa Carrara has made a study relating to public lighting in the Municipality of Podenzana. By using efficient technique the energy consumption for lighting can be decreased with more than 52 %. Besides energy reduction the project also will lead to decrease of greenhouse gases emissions in the atmosphere, the decrease of the use of natural resources, and the decrease in the energy dependence. The present project will be used to improve the conditions in ten other Municipalities in the province, which have the same characteristic of Podenzana. Preliminary studies have been already done in six of them with results similar to the ones set out in this case study.

End-user area

- New buildings
- Refurbishment of buildings
- Transport and mobility
- Financial instruments
- Industry
- Legal initiatives (regulations, directives, etc)
- Planning issues
- Sustainable communities
- User behavior
- Education
- Other : Local authorities and citizens

Target Audience

- Citizens
- Households
- Property owners
- Schools and universities
- Decision makers
- Local and regional authorities
- Transport companies
- Utilities
- ESCOs
- Architects and engineers
- Financial institutions
- Other

Technical

- Energy efficiency
- Heating
- Cooling
- Appliances
- Lighting
- CHP
- District Heating
- Solar energy
- Biomass
- Wind
- Geothermal
- Hydro power
- Other

Context

The Podenzana city, a Municipality of the Province of Massa Carrara, has 1818 inhabitants and a total area of 17,26 km². The public lighting of Podenzana consists of 350 light points divided as in the table below:

Nr of bulbs	Power (W)	type
96	80	Mercury, vapour (Hg)
205	125	Mercury, vapour (Hg)
7	250	High pressure sodium (HPS)
14	150	High pressure sodium (HPS)
13	70	High pressure sodium (HPS)
15	250	Mercury, vapour (Hg)

At the present the energy consumption for public lightening is 204 246 kWh/year (taking the use for 4200 h/y, datum by the Authority of Energy – Resolution 52/04). The total cost for public lighting amounts to 24 508 €/year (0,12 €/kWh, datum by the Authority of Energy – Specification N° 18 passed with the resolution 70/05).



The targets of this intervention are to:

- increase the energy efficiency,
- reduce the environmental impacts (lower greenhouse gases emission and less natural resources used),
- increase the security (less equipments containing mercury),
- reduce the costs (electricity costs).

Objectives

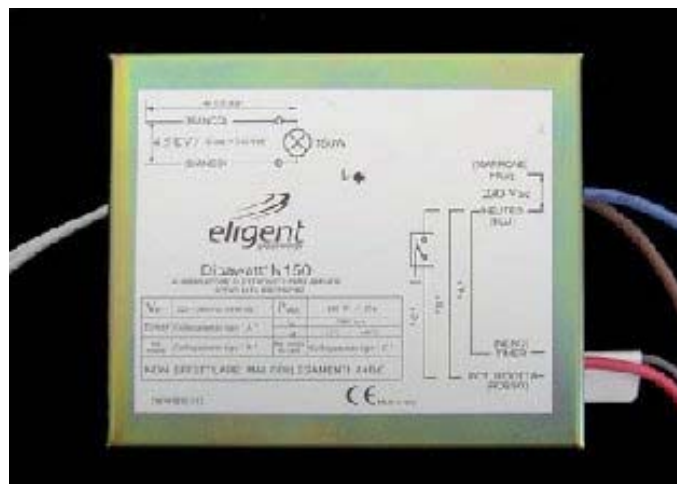
The task of the project is the detection of a series of interventions geared to energy, environmental, security and economic improvement relating to the public lighting of Podenzana. To reach technology objectives we have worked on two different fronts: the replacement of bulbs with others which have better energy efficiency (without mercury) and the use of equipments, which decreases the used power. From an economic point of view we have looked for a system which allowed the local Government to avoid paying out immediately.

Process

The first step consists on the replacement of the mercury vapour bulbs with the high-pressure sodium bulbs. To maintain the light efficiency, the replacement had the correspondence indicated in the following table:

Old bulb (Hg)	New bulb (HPS)	Energy saving
80 W	70 W	12 %
125 W	70 W	44 %
150 W	100 W	33 %
250 W	150 W	40 %

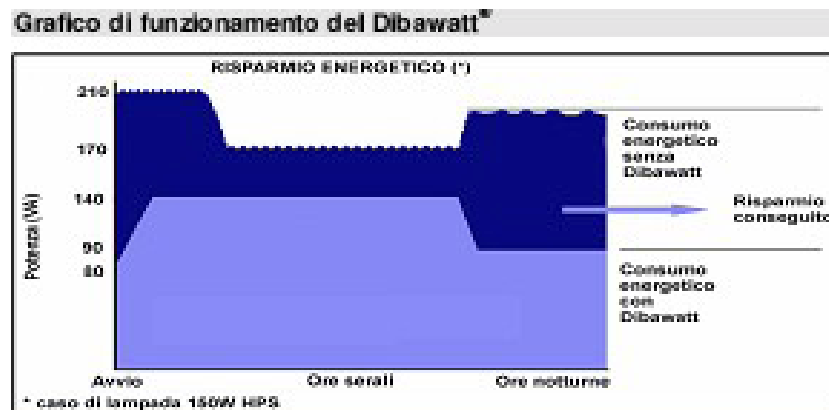
The second step consists of the replacement of ferromagnetic ballasts with electronic ballasts. For this purpose it is used an electronic appliance called Dibawatt®, commercialised in our territory from the firm 3EFFEGI of Fornaci at Barga (LU). This appliance respects the directives 89/336/CEE and 73/23/CEE and replaces the switcher, the reactor and the condenser. Because of its size (151 x 69 x 115 mm) it can be put directly in the correspondence of the existing lighting bodies and the electric connections are very simple.



By using this technique the performance is improved, and shocks from power surge is removed which increase the lifetime of the bulb. Also sudden changes in voltage during the working are removed. Besides this it decreases the dissipation of power, which is an iron and copper characteristic. You can get an energy saving between 10% and 35% when using this technique.



The third step consists of the introduction of variable electronic ballasts. The function is guaranteed from the same Dibawatt[®] which by its *dimmer* function allows decreasing the absorbed power in fixed hours in connection with the luminous flux wanted. The trend of the working is painted out in the following graphic:



By this further function it is possible to decrease the power between 10% and 25%. Calculating the energy saving you can have:

Present consumption (kWh/year):	204 246
Consumption after the change of the bulbs (kWh/year):	146 559
Consumption after the installation of the Dibawatt [®] (kWh/year):	96 729

The total energy saving is more than **107 000 kWh/year** (more than 52%).

Financial resources and partners

- The total investment reaches 53 228 € (including VAT),
- 38 178 € for buying the Dibawatt[®],
- 4 550 € for the replacement of the bulbs
- 10 500 € for the installation costs.
- Using a leasing time of 5 years, the amount is 63 367,50 € with a 12 141 €/year installment, beyond the final surrender value of 2262,00 €
- Energy costs before the intervention is amounted to 24 508 €/year and after the intervention 11 460 €/year which mean that the economic saving is 13 048 €/y.

Results

Following results were achieved during the project:

- reduction of the electricity consumptions from 204 246 kWh/y to 96 729 kWh/y (107 517 kWh/year)
- reduction of energy costs from 127 508 €/year to 114 460 €/year (13 048 €/year)
- reduction of polluting emissions with 55 000 kg/year of CO₂
- reduction of the use of natural resources.
- possibility to pay the investment by the energy saved (payback of 4,08 years)
- replacement of the bulbs containing the mercury (noxious)
- possibility to apply this success results to the other 10 Municipalities of the Province of Massa Carrara



Lessons learned and repeatability

The Province of Massa Carrara has 17 Municipalities, 11 of them have the same lighting typology of Podenzana, while 6 of them have too long electric lines to use the power regulators. For them the Energy Agency of Massa Carrara is studying a different system which reduces the energy consumptions using a flux regulator instead of the Dibawatt[®] mentioned before, even if the replacement of the old bulbs with higher efficiency bulbs still holds (for example HPS).

The present project will be used to improve the conditions of the other 10 Municipalities, which have the same characteristic of Podenzana. Preliminary studies have been already done in 6 of them with results similar to the ones set out in this case study.

This project is an excellent example of how simple actions by a community using existing techniques can make a difference and play an important role fighting our common environmental problems.

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