

Saving energy through the purchase of LED street lights

Geestland (Germany)

Background

Geestland is a municipality comprised of 16 villages, with a population of 32,000 inhabitants. It is located in the district of Cuxhaven in Lower Saxony (Germany). Like many rural areas in Germany, in the early 2000s it was dealing with increasing municipal debt while still having to provide for its citizens. Geestland embraced sustainable development as a way to both promote local prosperity and achieve economic savings through, for example, reduced energy consumption. The municipality seeks to mainstream sustainability throughout its departments and functions, including procurement. Geestland's mayor is also the ambassador for sustainability at the German Association of Towns and Municipalities.



The municipality of Geestland first piloted LED street lighting in 2009. As part of this pilot, Geestland conducted a public referendum on the introduction of LED lighting, which received a 96% vote in favour. Following this, Geestland continued to upgrade lighting infrastructure through until it decided to replace street lights across the entire municipality.

Procurement objectives

The goal of the procurement was to purchase public street lighting for the entire municipality, that would significantly reduce energy consumption, increase the lifespan of the street lights purchased and reduce the overall maintenance needed to operate the street lighting.

For this reason and due to the good experiences collected during various pilot projects and wide public support, Geestland opted for LED street lighting.

To ensure bidders were able to offer the best possible LED lamps, a tender was created which focused purely on the LED luminaires, to ensure that lighting experts would be attracted to bid. The construction works related to the street lighting renewal was tendered in a separate process.

Criteria used

Subject matter of the contract: LED lights for public street lighting

The call for tender was divided in two lots. Lot one asked for the delivery of LED street lights in “mushroom shape”, and lot two asked for the delivery of rectangular LED street lights. Within each lot, street lighting of different sizes, suitable for mounting at different heights was demanded.

Technical specifications:

- Certificates for **IP 65** (Ingress Protection: describing the degree of protection of the lamp against dust and water) or higher as well as the **CE** and **ENEC** mark or equivalent (a quality certification for street lights).
- Luminaire life of at least 50,000 hours, calculated following the standard method for estimating luminaire life, based on the product data sheets submitted by the bidders.¹
- The lights must be controllable with a **Dali or 1-10 V interface or equivalent**.²
- Light colour of the luminaires 3800 to 4300 Kelvin: This is an average, light-white light colour, which is neither very warm nor perceived to be very cold. While warm, yellow coloured LED requires more electricity, very cold, white-coloured LED light has aesthetic drawbacks and lower acceptance rates.

Award Criteria:

Bidders who could meet the technical requirements were assessed on the following criteria:

- Price (30 points)
- Quality and performance criteria (70 points)

Quality and performance was divided into the following subcriteria:

- Average energy consumption over a lifespan of 50,000 lighting hours in watts per lamp and hour (40 points, with the lowest energy consumption receiving 40 points)
- Ease of maintenance: evaluated based on ease of opening the luminaire to exchange the illuminant (5 points)
- Illuminance E in Lux (lx) (max. 5 points for entries with $lx \geq 3.3$) over one square meter, based on the specifications of the model street
- Minimum illuminance Emin in lux (lx) (max. 5 points for entries with $lx \geq 0.66$)
- Luminous flux in lumens: The specified luminous flux must be constantly available for the life of the lamp / luminaire (max. 5 points for entries achieving > 5400 Lumen)
- Colour rendering index in Ra (max. 5 points for entries with $Ra \geq 80$)
- Aesthetics: Evaluated by a city council appointed commission, max. 5 points for the highest acceptance rate by the commission

As verification of the quality criteria, bidders were asked to submit calculations based on a model street situation that reflects the actual average situation of where the street lighting would be installed. The information about the model street included the desired lighting class, lighting side, lane width, mounting point height and overhang, mast distance to the road, mounting point distance, the road surface, and a maintenance factor.

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¹ See the JRC technical background report on road lighting and traffic signals: https://ec.europa.eu/environment/gpp/pdf/tbr/190125_JRC115406_eugpp_road_lighting_technical_report.pdf

² The control device can be used to dim the lamps or turn them off completely at night.

The contract also includes a clause for delivering replacement illuminant for up to 15 years after delivery, when the illuminant needs to be replaced.

Geestland encouraged bidders to submit alternative bids, if their product range allowed, so that Geestland would have a wider range of bids to evaluate and select from.

Results

A total of 15 bids were submitted, with some bidders submitting several bids as asked for by Geestland. The contract for the first lot was awarded to Philipps, and the second lot went to Profilet, with a total contract value of €1.6 million. The operation costs are about 67% lower compared to the conventional lights the city used before. Prior to the instalment of LED light, electricity costs were at €316,000 annually. The LED street lights combined with turning the lighting off at night reduced the energy bill to about €71,000 per year. The construction works for the light instalment were awarded in a separate procurement.

Environmental impacts

Street lighting has three key environmental impacts:

- The electricity consumption of the light, and associated CO₂ emissions.
- The material and resource use and disposal of materials, and the associated potential for environmental pollution especially from hazardous materials.
- Light pollution, which impacts biodiversity by disrupting nocturnal animal behaviours.

LED lights have a reduced environmental impact in all three categories compared to other types of lighting. They use significantly less electricity and also have a longer lifespan and lower maintenance requirements. The Municipality of Geestland compared its CO₂ emissions prior to the installation of city-wide LED lights to after. In 2009, before any LED lights had been installed, CO₂ emissions related to electricity use amounted to 600 t CO₂ annually. In 2016, this number had been reduced to 169 t CO₂. Since then, Geestland has begun operating a control system that turns the lights off from 1am to 5am, further reducing this number to 135 t CO₂, while also reducing light pollution. Furthermore, the lights are designed to give off non-aggressive light pointed toward the road to reduce light pollution as much as possible, while maintaining acceptable rates of colour rendering and electricity consumption. LED lights do not heat up in the same way as conventional lights which makes them less harmful for insects.

Finally, the average replacement rate for the lights is about 1% per year, a much lower rate than before, which saves resources and reduces waste generation and pollution.

Lessons learned

Geestland's most important lesson learned concerns the investment in relatively more expensive LED lights. Geestland has concluded that thanks to the high energy savings, the very low maintenance cost and the low replacement rate of the individual light bulbs, the investment, including the necessary construction work, will be paid off within a 2 – 3-year time frame.

Thanks to the good experience installing LED lighting, the municipality highly recommends going this route to other local governments. Encouraging bidders to submit multiple bids to offer a broader range of lamps proved a good strategy to ensure the best possible bid could be selected.

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For related information, please see European GPP criteria for [road lighting](#) and traffic signals and the [Technical Background Report](#). See also the [European GPP LCC tools for outdoor and indoor lighting](#).