

# Intelligent Road Lighting – “Light – on the road”

CIE Session 2003

Author:

Mr. Eirik Bjelland, Viken Nett, Norway

## **Background – Hafslund / Viken Nett**

Norway as one of the first in Europe, deregulated its electricity markets in 1991. Since then, both the traditional utilities and new actors have adapted and developed their services in order to meet the new challenge.

Viken Nett, who is owned by Hafslund ASA, is Norway's largest distribution company with 575 000 customers. Viken, together with the daughter company Østnett, are in addition responsible for the running and maintenance of 250 000 street lighting points in the greater Oslo area.

The recent years Viken has been involved in the development of new concepts especially adapted to a deregulated electricity market, involving running, control and administration of street lighting. Viken has initiated several studies both on the concept and more on the organisation of the street lighting activities in general.

Lighting represents 15-20% of the Norwegian yearly electricity demand of 120 TWh. Of this 3% goes to street lighting.

## **Benefits of the concept:**

### New improved customer services:

In a majority of systems today, the operator of the street lighting only has a limited overview of the actual energy use in his system. Hence, his customers are billed based on an anticipated amount of operating hours and wattage. The concept of intelligent road light enables direct measurement of the energy use and two-way communication with each individual fixture. Both the operator and the user would benefit from more accurate measurement. Furthermore, the incentive structure for the actors to invest in more cost efficient systems would be clearer.

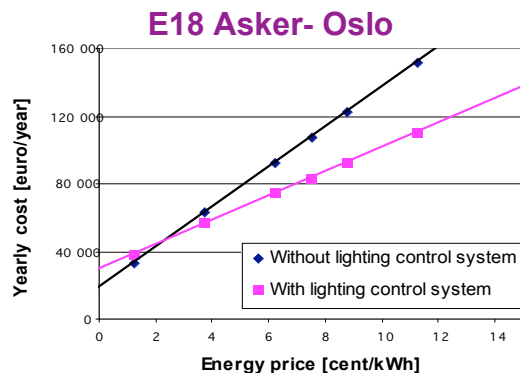
The concept for precise and correct billing is of course of interest for the authorities responsible the collecting of VAT and other taxes. Today's systems are often based on fixed operating hours.

### Energy savings of 30%:

Each lamp can be step-less dimmed individually depending on traffic, climatic conditions etc. In periods when the traffic is low, or when snow covers the streets the need for light is lower and the illumination level can be reduced.

In addition, the life expectancy of lamps and equipment is prolonged when the fixture is dimmed.

The figure on the left illustrates the obtainable cost reduction for different energy prices after installing a light control system for the highway between Oslo and Asker.



### Reduced maintenance and management costs

The concept of intelligent road lighting includes an online database connected to a GIS-database. The database contains every single fixture and the GIS-database links the fixture to standardised GIS co-ordinates. Burnt out lamps or lamps that are about to burn out can easily be identified and positioned. This enables the operator to plan maintenance and refurbishment more efficient than before.

Integration of the infrastructure of the street lighting and the distribution grid has an estimated efficiency potential of 30% that can be realised using this concept.

### Individual energy billing / new markets

The system opens for individual metering and subsequently billing of the energy consumption. In a deregulated electricity market, this enables the road authorities to buy the electricity on the market, and for example benefiting from lower night tariffs and special load curves.

The development of intelligent solutions will however require new standards for logging and gathering data from integrated lighting systems.

In the future one can imagine including other components such as traffic lights and boilers in the system. The operator will then have the possibility to monitor the functionality of the system and regulate the load of the connected equipment dependent of other loads in the grid.

The possibility of surveillance and control from an operation centre independent of physical position of the installation itself enables the operator to offer outsourcing services or performance contracts based on a price per service to the road authorities (owners). Since each fixture is described in the database it is easy to specify the desired functions.

### Environmental benefits:

Intelligent road light can reduce light pollution and improve the lighting quality in an area. Furthermore, it will reduce the energy consumption of the road light and thereby the CO<sub>2</sub>-emissions. This is of particular value for companies working in the public domain that they can go in front as “good examples”.

**Technical description of the system (see attached figure):**

- A central unit regulates each lamp depending on given triggers
- Regulation of illumination level down to 40%
- Communication between the central unit and the operation central
- Communication system (Power-line communication, open LON or company-protocol)
- Database of fixtures is linked to GIS- and CIS-databases.

**Reference projects:**

Intelligent road lighting – technology development and demonstration.

Partners: Viken Nett, Philips, Norwegian Water Resources and Energy Directorate (NVE), Norwegian University of Science and Technology, ENOVA and Municipality of Oslo and Bærum and the Norwegian Directorate of Public Construction and Property. The project has been supported financially by NVE and ENOVA.

The concept that is to be introduced, includes the building up of an infrastructure for measurement, control and surveillance of the road lighting and it has the potential of serving several “road owners” independent of where they are situated.

The energy saving potential has been estimated to 1,5 GWh

Oslo by Light – integrated approach to efficient running and maintenance of street lighting in Oslo

Partners: Viken Nett, the Norwegian Public Roads Administration, ENOVA and the Municipality of Oslo.

Elements in the project are:

- energy efficiency integrated into overall lighting planning of the inner Oslo area.
- changing of inefficient lamps and fixtures
- installation of control systems.
- fine-tuning and maintenance of photo-cells (sensors)

The energy saving potential has been estimated to 5 GWh

Highway lights – energy efficiency in the main road network in Norway, including tunnels

Partners: Viken Nett, the Norwegian Public Roads Administration, ENOVA and Interconsult ASA.

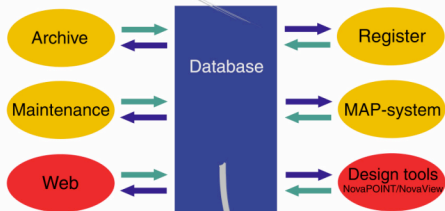
The project is a response to the difficult electricity situation in Norway last winter.

Elements in the project are:

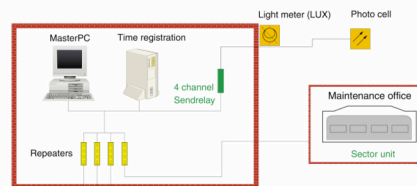
- fine-tuning and maintenance of photo-cells (sensors)
- changing of inefficient lamps and fixtures
- installation of control systems
- optimisation of tunnel ventilation and pumps



# Administration of control and maintenance of the road light network



## Top-down Structure of the light - control system



## Detail from Map - system



## New technology makes dimming possible at several levels



## Example of intelligent road light control (to - way communication)

