

TII National Roads Conference

Wexford

27 – 28 September 2018

Reducing Streetlighting Consumption on the M50 Motorway



Michael Brennan

Lumex Lighting Technology

LUMEX

M50 Motorway – Statistics

27 years in the making! 1983-2010

Western Parkway 1990 (J6 - J11)

Northern Cross 1996 (J3 - J6)

Southern Cross 2001 (J11 – J13)

South Eastern 2005 (J13 – J17)

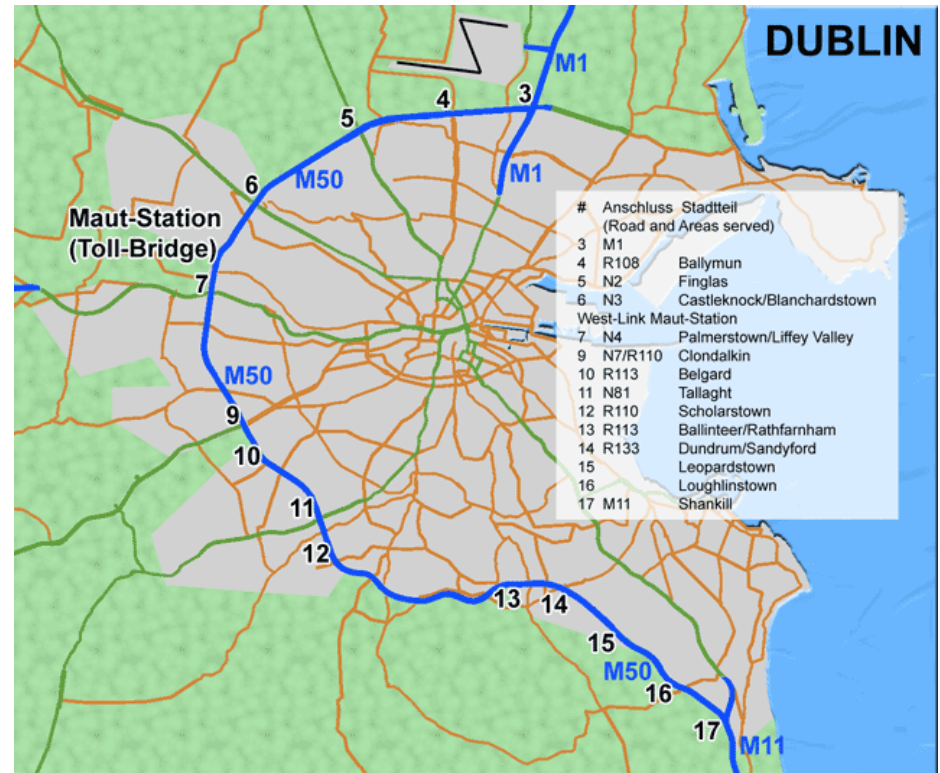
Port Tunnel Extension 2006

Upgrade 2006 – 2010 (J3 – J13)

M50 Concession Ltd – Operator

35 year PPP

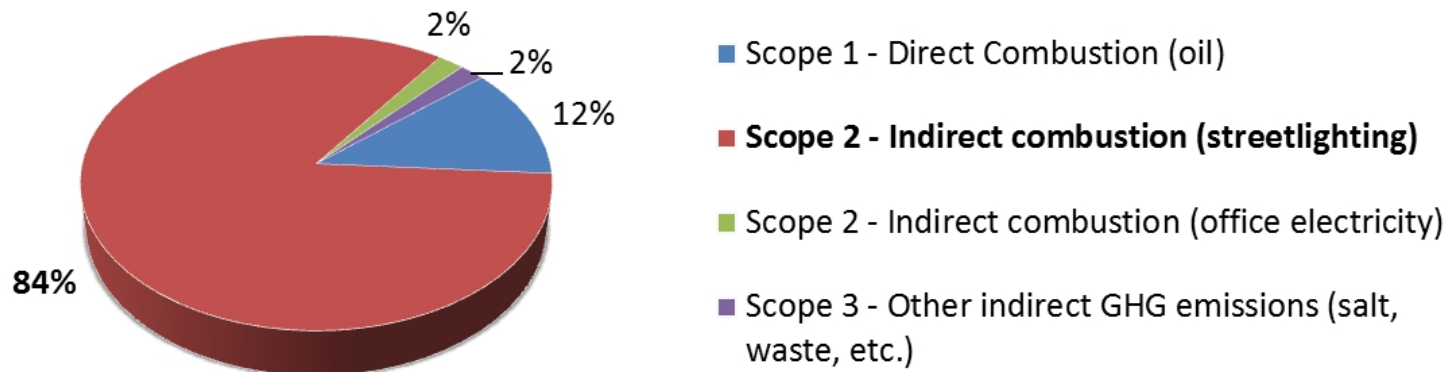
- 40 Km
- 16 Junctions



M50 Motorway – Statistics

National Energy Efficiency Action Plan (NEEAP) 2014 sets targets of 20% overall and 33% reduction in public sector energy use

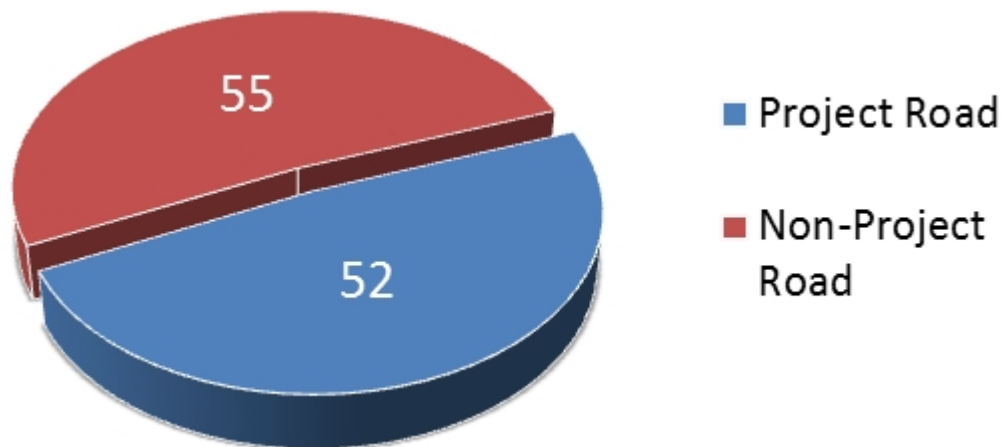
M50 PPP - Carbon Emissions Source (% of Total)



- **Total Carbon Emissions CO₂e: 3,494 tonnes per year**

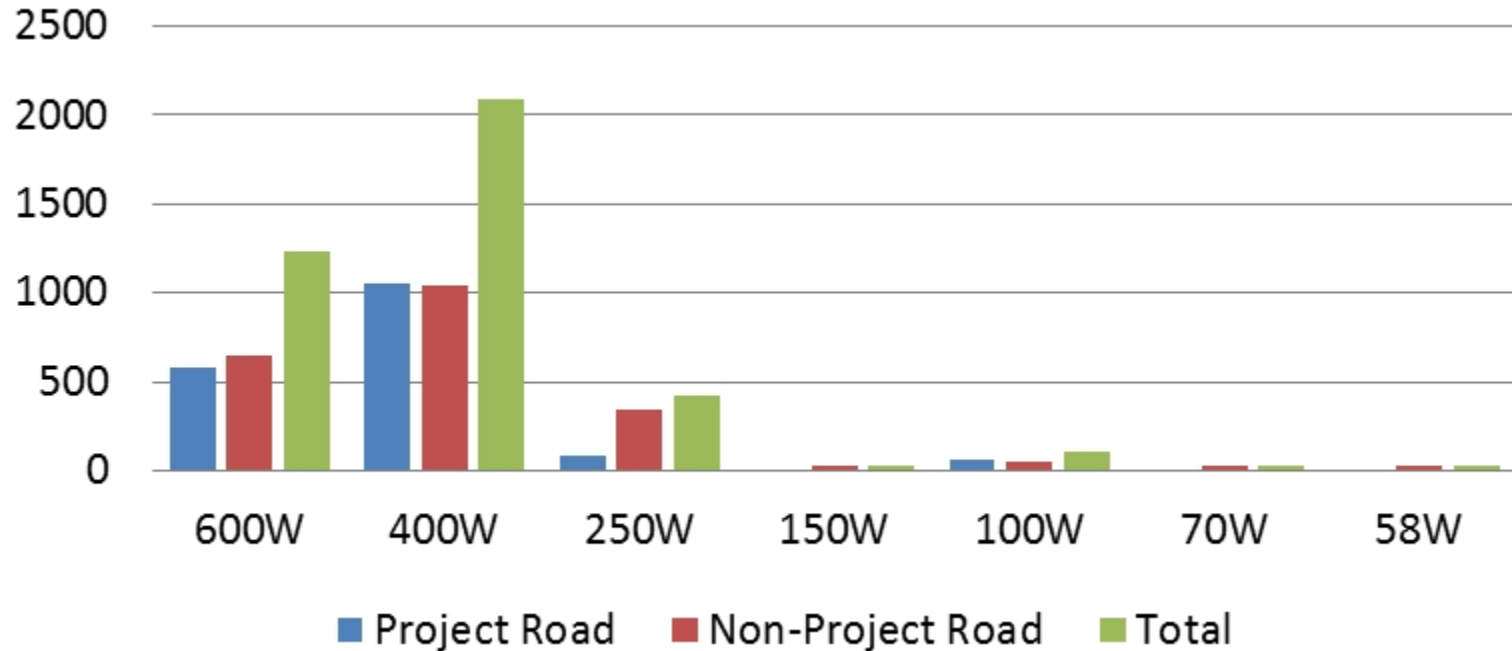
M50 Motorway – Metering & Load Profile

Metering



- Project Road: J3 M1 to J14 Sandyford (52 meters, 1,772 lamps)
- Non project Road : J15 Kilternan – J17 Shankhill (55 meters, 2,128 lamps)
- Total: 106 meters & 3,900 lamps

M50 Motorway – Metering & Load Profile

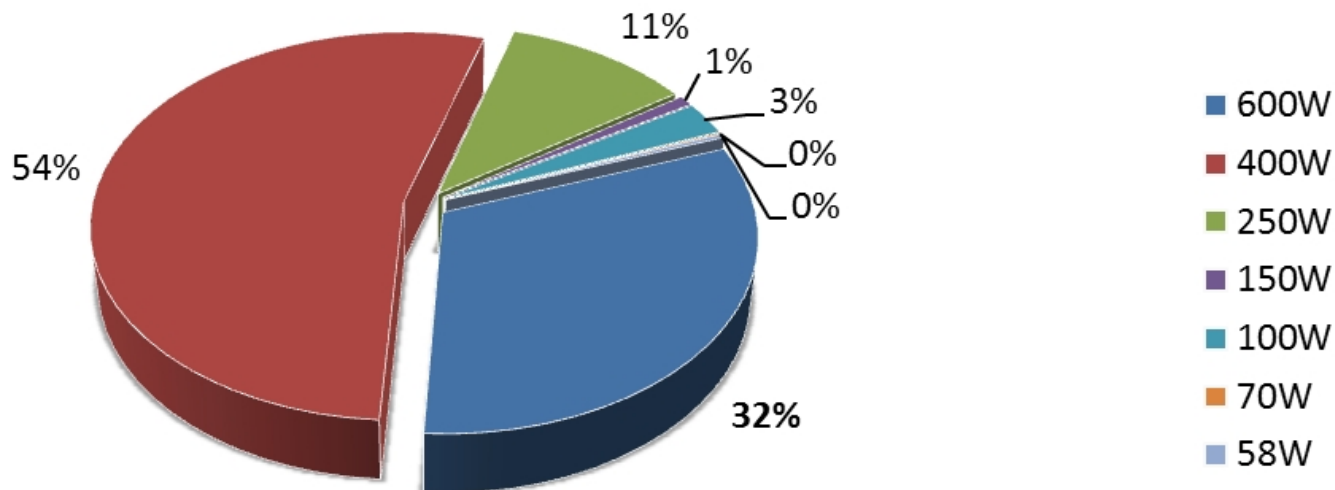


- Annual Consumption : 7.3 GWh
- Annual Running Cost: €825,000
- Represents carbon emissions CO₂e of 3,494 tonnes

■ M50 Motorway – Lighting Standards

- CEN/TR 13201
 - BS 5489-1
 - TR 27
 - PGL08
-
- Actual traffic volume at specific times , mainly at night, does not justify the lighting class required for peak hour traffic
 - Standards give practical guidance on how to apply reduced lighting levels at different times of the night due to changes in traffic flow
 - Three potential lighting levels are identified for low, medium and high traffic flow
 - Geometry such as distance between junctions, ambient luminosity, traffic speed are all factored.

M50 Motorway – Solutions



- All HPS with magnetic control gear
- Majority of 600W on high-mast
- M50CL & Globalvia's research and experience across projects worldwide

■ M50 Motorway – Solutions

LED

- At that time LED was not capable of matching 400W/600W for lighting 3-lanes plus slips & hard shoulder and 400W/600W high-mast
- Prohibitive on cost and to a certain extent still is (€ 500 - €750)
- Untold traffic management costs for mainline & some high-mast
- Long duration project
- Disposing 6-7 year old high quality die-cast aluminium flat-glass lanterns
- Multi million Euro investment required
- Unproven Long term reliability of high wattage LED and maintenance costs

■ M50 Motorway – Solutions

Electronic Dimmable Ballasts

- Specialised for 250W & 400W, non-existent for 600W
- Impractical

Power Control

- Voltage reduction units installed at each metering point
- Universal solution for all lamp wattages
- Typical Savings of 30 – 40%
- No TM required
- Typical payback 2.5 – 3 years

M50 Motorway – Power Control

- *106 pcs. ST Basic*
- *Ranging from 11A to 75A per phase*
- *External Fault Indicator*
- *Dimming Override for Road Incidents*
- *Projected 6 months Project Duration*
- *Projected Savings 38% > 42%*
- *Doubling of lamp life*
- *Increased control gear & lantern life*
- *Manufacturer's 40 years experience*



■ M50 Motorway – Power Control

Typical junction installation



■ M50 Motorway – Project Results

Power Control Myths:

- Lamps will fail prematurely! (*Opposite is true*)
- HPS ballasts to be outlawed in 2017 (Only inefficient A3 types)
- HPS Lamps to be discontinued shortly (No such plans)

Results

- **Project commenced in Jan 2017, completed 6 months later in June 2017**
- **Work carried out by M50CL's own maintenance personnel**
- **Saving 4 GWh per annum (43%)**
- **€310,000 reduction in annual running cost**
- **Carbon Reduction of 1,450 tonnes**
- **2.3 year payback**
- **Winner of SEAI award 2018**

■ M50 Motorway – Summary

TII Upgrade Policy

1. Remove lanterns no longer required under new 2018 standard
2. Implement dimming strategies for remainder using LED or Power Control as appropriate
3. Make economically informed decisions

Summary

- **LED is the most efficient solution in 55W/70W to 150W/250W with incremental increases in payback duration**
- **Power Control is most effective for larger load circuits and high wattage 250W/400W/600W lanterns**