

# Shedding some light

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Last week a remarkable newsitem made headlines. The Department of Public Works made the decision to shut down lighting on the highways during the nights, in order to reduce expenditure<sup>1</sup>, but in reality this proved to cost extra<sup>2</sup>. The idea to shut down the light had been controversial before. Lighting is used on highways to improve road safety, so shutting it down might introduce a safety risk. Research showed that at low traffic intensities (below 100 vehicles per hour) the effect would be negligible but above this level, there would be an effect. The assumption was that on many highways the intensity would drop below this threshold after 2300, and on some roads even after 2100. However, that assumption was not entirely correct. On some roads the traffic intensity was still higher after 2300. Shutting down the light on those sections with high intensity would thus increase the safety risk. A rough estimate was that it would result in two extra fatalities. In a response to this debate, the time for shutting down the lights was delayed from 2100 to 2300 on a number of highways.

In executing the plan, unfortunately, off was not really off. Sometimes the lights had to be put on again due to road maintenance or accidents or the like. The system, however, was not designed for this kind of operation. The lights were turned on at dusk by a sensor integrated in the system, and would be turned off at dawn, or perhaps at some other fixed moment like 2300. This fixed turn off moment could be clock based, but it could also be based on another signal. For example, in the electricity grid a signal is present that switches the meters to the night tariff at 2300, and that could be used for switching the lighting as well. But it is not possible to switch individual lamps or sections. If switching would be executed by means of a signal in the electricity grid, everybody meter that received the signal would switch to the normal tariff as well. The only way to switch on small sections would be by manual operation. The system may not be designed for this purpose, but apparently it is possible. But this requires sending someone there to do the job. As this is generally in the middle of the night, that someone most likely is sleeping. That cannot be a cheap exercise. The fact that this costs more than what is saved by putting the lights off, should not be very surprising, at least with the benefit of hindsight.

As confirmed asset management maniacs we immediately wonder how the decision was made if we read news like this. The generation of the idea is understandable, and in a way even appreciated. If an organization needs to reduce costs, every angle on the problem is welcome. Even the fact that the idea made it through the first round of selection is quite imaginable, lighting the highways is a significant cost in absolute terms. A carriage way of a highway is lit every 50 meters with a 150 W lamp<sup>3</sup>. This adds up to 3 kW per kilometer of carriage way or 6 kW per kilometer of highway. If the lights are on in the dark, they would burn for on average 12 hours per day or 4380 hours per year. Lighting 1 kilometer of highway would thus cost 13140 kWh, which at a price of 6 ct per kWh would translate into a little less than 800 euro on an annual basis. If the lights would be shut down between 2300 and 0500, that would save 6 hours per night, or 400 euro per year in costs per kilometer. Suppose this regime could be applied on 1500 kilometer of highway, that would add up to  $400 \cdot 1500 = 600.000$  euro. This is similar to the amount the AD (one of the newspapers) mentioned. But the other news message mentions 35 million of savings, and that does not seem to comply with the facts. Saving 600.000 euro on an annual basis does not solve the entire crisis, but every journey starts with a single step.

But the next step becomes questionable. The amount of 600000 euro is the upper limit, which should be corrected for the risks that this measure introduces. Suppose there is an additional safety risk, because some roads carry more traffic than expected. A human life is generally valued between 1 and

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[http://www.rijkswaterstaat.nl/actueel/nieuws\\_en\\_persberichten/2013/juni2013/minder\\_verlichting\\_op\\_de\\_snelwegen\\_vanaf\\_3\\_juni.aspx](http://www.rijkswaterstaat.nl/actueel/nieuws_en_persberichten/2013/juni2013/minder_verlichting_op_de_snelwegen_vanaf_3_juni.aspx)

<sup>2</sup> <http://www.ad.nl/ad/nl/1012/Nederland/article/detail/3586480/2014/01/30/Licht-uit-op-snelweg-kost-juist-veel-geld.dhtml>

<sup>3</sup> Rough estimate

10 million euro, on average about 3 million euro. If the measure would result in one fatality every 5 years, the benefit of the cost saving would evaporate. Is that only a remote possibility? Given that there could be a safety effect above 100 vehicles per hour, it seems that this cannot be neglected.

The second reason the true saving will be lower is the cost of the measure, for example because of the required manual operation in case the lights need to be turned on again. Highways tend to be maintained every 10 years or so, resulting in longer periods of lights that should be on during the night. Suppose on average a highway has 10 days per year for maintenance. That does not really impact the saving, but if the manual switching would cost 25 euro per day that would add up to 250 euro per kilometer per year. Besides, some incidental switching at a much higher cost would be needed. With a few simple exercises it becomes clear that the idea is not nearly as valuable as may have appeared on first sight. It was an interesting idea, but it should not have propagated to detailed engineering and certainly not to execution, simply because there would be a very slim chance of a net positive outcome.

The key question then is how the idea got in the execution phase anyway. Although we certainly were not present at the decision, we like to bring Ockham into position: the simplest explanation is the most likely. In this case, the simplest explanation is that nobody really thought about it, perhaps for the very simple reason that the one responsible for lighting did not have any insight in other costs of the same asset.

There can be good reasons not to work out everything in detail, but to execute promising ideas immediately. If things work out according to plan, there is immediate benefit, and if they don't: as long as the consequences are manageable, there is always the option to stop the project. Strangely enough that was not the response with regard to lighting. Instead of abandoning the idea and leaving the lights on, the decision was made to invest in the remote operation of the lamps. Again, there can be a solid business case behind the decision, but regarding the chaotic decision making so far that can be doubted. It is more like an impetuous leap in the dark. Fortunately lighting on highways is only small beer. It is just that beer and traffic do not mix well ☺. Hopefully, the big savings are thought through better.

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