

Interactive comment on “Coupling urban drainage–wastewater systems and electric smart grids during dry periods: a gain/loss framework using the relative economic value with ensemble flow forecasts to predict the switch” by Vianney Courdent et al.

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Dear reviewer,

We greatly appreciate the review and acknowledge that the comments and suggestions will lead to an improved paper. Our reply to the general comments:

The manuscript presents an interesting topic within the scope of the journal. While enough information on the used methodology is given to enable a rough understanding,

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the reader will not be able to reproduce the applied methods based on that information. Result interpretation will be difficult for the reader without more specific information on the used hydrological model (its calibration and accuracy) [1] and the WWTP and the potential impact of the described method on its performance in terms of energy consumption and effluent water quality [2].

[1] Section 2.3 (P5 and 6) will be split in 2, the first on the study case which will be expanded with more data on the WWTP and the second on the hydrological model which will be further developed. We will also explain with more clarity that further information on the hydrological model is available in (Courdent et al., 2016). As suggested in the specific comment 19, the model output based on rain gauge data input will be added on figure 9 to illustrate the performance of the hydrological model.

Courdent, V., Grum, M. and Mikkelsen, P. S.: Distinguishing high and low flow domains in urban drainage systems 2 days 25 ahead using numerical weather prediction ensembles, *J. Hydrol.*, doi:<http://dx.doi.org/10.1016/j.jhydrol.2016.08.015>, 2016.

[2] Further information on the WWTP energy consumption will be added to the manuscript (e.g. the energy consumption per m³ treated in 2015 was 0.267 kWh/m³). Additional references on the proportion of the energy consumption related to the inflow/load will be added. E.g. the aeration of the bioreactor represents between 50 and 70

We do not have precise data regarding the impact on the effluent water quality. However the effluent water quality is of primary interest. The Danish WWTPs pay taxes on their effluent pollution load. Therefore the boundaries of the energy optimization scheme will be defined to respect the performance of the WWTP.

Aymerich, I., Rieger, L., Sobhani, R., Rosso, D. and Corominas, L.: The difference between energy consumption and energy cost: Modelling energy tariff structures for water resource recovery facilities, *Water Res.*, 81, 113–123, doi:[10.1016/j.watres.2015.04.033](https://doi.org/10.1016/j.watres.2015.04.033), 2015.

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More information in the results section on the performance of the proposed method and a discussion of its risks and benefits would be very desirable as without them it is difficult to draw clear conclusions about the value of the method [3].

[3] The scope of this article is to develop a method to determine when the IUDWS management can be switched to optimizing its energy consumption, which is possible during dry weather (flow below a given threshold). Further information on the energy optimization scheme will be added, but for a comprehensive description of the optimization scheme we refer to a manuscript by R. Halvgaard et al. that is currently under review (see below). The framework developed in this article provides a framework to activate this optimisation scheme given the potential gain expected.

We agree that further information on results and performance would be appreciated and we are currently working towards it. Indeed, two large pipes will be constructed just before the inlet to the Damhusåen WWTP with the primary purpose to reduce CSO to cope with new regulations. These 2 pipes can contain a volume corresponding to one day of dry weather flow and would nicely fit the concept developed in this paper and in the paper by R. Halvgaard et al.

R. Halvgaard, L. Vezaro, P. S. Mikkelsen, M. Grum, T. Munk-Nielsen, P. Tychsen, H. Madsen: Integrated Model Predictive Control of Wastewater Treatment Plants and Sewer Systems in a Smart Grid (In Review Process).

Please find appended to this reply our point to point responses to the received comments displayed as a Table in pdf format. We will make changes to the paper that accommodate the technical comments by the reviewers, including careful proofreading.

We would like to express our sincere thanks to the reviewers for their constructive comments and identification of areas in the manuscript which needed clarification.

On behalf of all the authors,

Vianney Courdent

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/hess-2016-522/hess-2016-522-AC1-supplement.pdf>

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-522, 2016.

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