I'm Eduard Oró, PhD researcher at Catalonia Institute for Energy Research. Our institute headquarters is located at Barcelona, where Marta Codina has done her master internship. If you need to contact me directly, here you have my email address: eoro@irec.cat.

With this letter I want to certificate that Marta Codina has done her master internship since September within our research group. Our research line is GreenIT so we are focused to study the benefit of the implementation of different energy efficiency strategies and renewables in the data centre industry. Moreover, our expertise is on developing dynamic models to optimize energy models. In particular we use TRNSYS but we are also open to other software's and own codes (i.e. Matlab, FORTRAN, c, etc.).

Data centre industry has recently put attention to numerical modelling in order to improve data centre efficiency. In the past, Computational Fluid Dynamics (CFD) analysis has been used for that purpose. However, CFD is time computational consuming and therefore it cannot be easily integrated in data centre monitoring systems or in numerical models for taking live decisions. A dynamic energy model can help improving the actual performance of the data centre. In particular, the cooling system efficiency can be enhanced by optimizing the operational temperature set points, the water flow rates, etc. TRNSYS has its own library, in particular those related to energy systems such as chillers, computer room air handling (CRAH) units, pipes, diverters, etc. For that reason Marta's internship was focused on developing a dynamic energy model for a data centre using TRNSYS and evaluating energy efficiency strategies. In particular, the implementation of thermal energy systems into the data centre portfolio with the aim to decrease the operational cost of the facility taking advantage of the night off-peak price of the electricity.

At the beginning of her internship, Marta introduces herself to the data centre industry and the implementation of different energy efficiency strategies by doing an extensive literature research. During this stage she found out more than 50 references and wrote down a complete state of the art review. Moreover, she started interacting with TRNSYS and developed two models to characterize the behaviour of a read data centre located at the UPC facilities in *Campus Nord*. One of the models incorporates a big thermal energy storage tank of water.

Since she aims to keep working with IREC by doing her thesis, we are thinking on studying much deeper this energy system and an optimization of the system will be done.

Finally I want to mention as well that we are going to publish a journal paper using mainly all of her work.

Best regards,

Eduard Oró