



Sep 15th, 4:00 PM - 4:20 PM

Too many data – too little data. How data reporting needs to change to reliably calculate electricity-related virtual water in Europe

Mario Roidt

Technische Universität Berlin, Einstein Center Digital Future, Berlin, Dorsch International Consultants GmbH

Follow this and additional works at: <https://scholarsarchive.byu.edu/iemssconference>

Roidt, Mario, "Too many data – too little data. How data reporting needs to change to reliably calculate electricity-related virtual water in Europe" (2020). *International Congress on Environmental Modelling and Software*. 6.

<https://scholarsarchive.byu.edu/iemssconference/2020/B4/6>

This Oral Presentation (in session) is brought to you for free and open access by the Civil and Environmental Engineering at BYU ScholarsArchive. It has been accepted for inclusion in International Congress on Environmental Modelling and Software by an authorized administrator of BYU ScholarsArchive. For more information, please contact ellen_amatangelo@byu.edu.

Too many data – too little data. How data reporting needs to change to reliably calculate electricity-related virtual water in Europe

Mario Roidt^{a,b}, Christopher M. Chini^c, Ashlynn S. Stillwell^d, Andrea Cominola^a

^aChair of Smart Water Networks, Technische Universität Berlin - Einstein Center Digital Future, Berlin, Germany (andrea.cominola@tu-berlin.de)

^bDorsch International Consultants GmbH, International Cooperation Division (mario.roidt@dorsch.de)

^cAir Force Institute of Technology, Department of Systems Engineering and Management
(christopher.chini@afit.edu)

^dUniversity of Illinois at Urbana-Champaign, Department of Civil and Environmental Engineering
(ashlynn@illinois.edu)

Abstract: In 2018, a total 435 TWh of electricity was traded among European countries, creating an active network of virtual water trade. Virtual water of international electricity trade can support multi-scale water resources management strategies, similar to how virtual water embedded in food has revealed the water resources impacts of the food industry. Estimates of electricity-related virtual water transfers are reported in the literature, yet with high uncertainties, primarily due to insufficient or limited data. Recently, ENTSO-E – the European Network of Transmission System Operators – publicly released a large amount of electricity generation, load, and trade data at a high temporal scale (15 min or 1 hour) and the EU's Joint Research Centre (JRC) released a database with power plant-scale information and cooling water requirements. While such new data open opportunities for better calculation of electricity-related virtual water modelling, several challenges still limit a detailed and Europe-wide analysis of virtual water due to electricity generation. For instance, electricity data with high temporal scale are incomplete, while more reliable electricity data are only available on an annual basis. Also, while electricity generation can be calculated at the sub basin scale, electricity trade can only be calculated at the country scale. The objectives of this work are two-fold. First, we showcase the potential of high-resolution data to support the calculation of electricity's virtual water, by analysing the most reliable data at three scales: (i) we analyse energy generation and trade and their variation on a high temporal scale; (ii) we calculate virtual water at sub-basin scale, and (iii) we show virtual water trade at the country scale. The current data availability, however, does not allow combining these scales for more reliable results. Second, we identify data requirements and priorities to improve the existing datasets and data reporting regulations to reliably calculate virtual water trade in Europe.

Keywords: Water-Energy Nexus; Virtual Water; ENTSO-E; Multi-scale analysis