

Dutch research set to make electricity grids future-proof

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The rise of renewable energy calls for smart electricity networks (smart grids) that can align energy supply and demand. Researchers at the Centre for Telematics and Information Technology (CTIT) at the University of Twente have developed an ICT-based management and control methodology that is able to do exactly this. Research carried out by mathematician Maurice Bosman shows that this method is effective and capable of making existing electricity grids future-proof. Bosman defended his thesis on 5 July at the Faculty of Electrical Engineering, Mathematics and Computer Science.

Today's energy network delivers energy from different power plants to end users. This process makes it relatively easy to align electricity supply and demand. With the emergence of decentralized energy generated by wind turbines, cogeneration and solar panels, this task becomes much more complex.

Solar panels generate less energy on a cloudy day and wind turbines are dependent on how strong the wind is. Smart grids, that is to say, smart electricity networks, are the solution to matching supply and demand – especially when combined with smart devices and energy absorption. A smart grid must be capable of aligning decentralized power generation and temporary storage and consumption of energy in real time, in such a way that there is no inconvenience to the user.

Management and control methodology

Researchers from the University of Twente's CTIT Institute have developed TRIANA, a management and control [methodology](#) that matches supply to demand. This method makes use of forecasting, planning and continuous control. The system creates a schedule based on a forecast of energy demand, in which deviations from the forecast are taken into account using continuous control. At district or city level, this represents a formidable planning problem. With the aid of a virtual network, PhD candidate Maurice Bosman explored the possibility of solving this planning problem mathematically. The answer was yes. His research shows that TRIANA is indeed a suitable method for aligning the supply and demand of energy. "Using TRIANA we can make the electricity network future-proof." Doing this has many advantages, the researcher explains. "Network operators and energy supplies currently have to invest billions of euros to ensure that capacity is always up to standard. With clever planning and by aligning supply and demand more effectively, the need to build 'superfluous capacity' decreases."

More information: Bosman carried out his PhD research within the Discrete Mathematics and Mathematical Programming (DMMP) and Computer Architecture for Embedded Systems (CAES) groups, and the CTIT research institute.

Provided by University of Twente

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