Electricity grid could become a type of Internet

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In the future everyone who is connected to the electricity grid will be able to upload and download packages of electricity to and from this network. At least, that is one of the transformations the electricity grid could undergo. Dutch researcher Jos Meeuwsen (Technical University Eindhoven) developed three scenarios for the Dutch electricity supply in the year 2050. The starting point is that in this year, 50% of the consumption will originate from sustainable sources.

Due to the security of supply and the connection with the European market, electricity networks will always be necessary says Meeuwsen. Further, due to an increasing demand for electricity it is important to include all possible energy options (including coal and nuclear energy) in the scenario development. The exact form of future networks will largely depend on the primary energy mix chosen.

In all cases engineers face new and considerable challenges in the areas of network and system integration and the development and implementation of new technology. Moreover, in all scenarios the total network capacity must increase. Small-scale networks will adapt characteristics from the current large-scale networks, such as the possibility of 'two-way traffic' and the responsibility to maintain a stable system.

In particular, the number of ways in which the total electricity supply system can be held in balance in the future will need to be expanded as more electricity is generated from sustainable sources. This might even

mean a paradigm shift from the current 'permanently matching supply to demand' to 'continuously matching demand to supply'. Meeuwsen foresees a step-by-step integration of energy technology, ICT and power electronics that might result in an electricity system that exhibits many similarities with the Internet. Everyone connected to the system could then, within certain limits, upload and download packages of 'electrical energy' whenever they want. An important condition is, however, the technical feasibility of the centralised and/or decentralised storage of large amounts of electricity.

Meeuwsen's three different scenarios for the future of the electricity grid mainly differ in the size of the electricity generation facilities. The scenario 'super networks' consists of large-scale production locations, transportation via high voltages, a considerable import of sustainable energy (in the form of biomass) and energy from offshore wind farms. The 'hybrid networks' scenario also includes large plants with high voltages that originate from offshore wind parks and large biomass stations. Additionally, small-scale generation takes place in and around cities and villages (wind, biomass and solar energy). Finally, in the 'local' scenario the number of local generators (in the form of micro-cogeneration units, solar energy panels, small-scale biomass plants at neighbourhood level and land-based wind turbines) is the greatest, yet large industrial processes and small consumers still make partly use of electricity from large-scale production resources.

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