

ICT: the crucial factor for future Smart Grids



◀ The supply chain visualised symbolically by the presentation of the strategic research agenda (SRA) of the IIP Duurzame ICT at the An Innovative Truth III conference with from left to right Roel Croes (secretary IIP Duurzame ICT), Nicole Kroon (director ICT Beleid & Toepassing Ministry of EL&I), Peter Molengraaf (CEO Alliander), Paul Timmers (director ICT addressing Societal Challenges European Committee, Baptist Coopmans (member of the board of management KPN) en prof. Ton Koonen (chairman IIP Duurzame ICT).

Electricity supply chains will change into bi-directional information and power chains. For the transformation to these Smart Grids, ICT-related Research & Development is crucial.

The electricity supply chain will change drastically in the coming decades. It has been designed decades ago and is completely demand driven. This will change into a bi-directional (information and power) chain, a smart grid. In the future the consumption side of the supply chain might cooperate with and/or react on the generation side. Smart grids intelligently integrate the behavior and actions of all units connected to the electricity supply chain - generators, consumers and those that do both – in order to match the demand and the supply of electricity in an efficient, sustainable, economic and secure way.

It is expected that the electricity demand will rise and will become more fluctuating for example due to electrification of energy distribution and large scale introduction of electrical cars. On the other hand, it is most likely electricity generation will be increasingly based on renewable sources. These renewable resources are mainly 'fueled' by very fluctuating and uncontrollable sun-, water- and wind power. For grid stability, production and consumption must always be in balance. Therefore, the peaks in renewable generation should be lower than the electricity consumption or alternatively energy should be stored somewhere.

The trends mentioned above result in peaks in generation and transmission, which define the requirements for the supply chain. Moreover, when electricity demand becomes more fluctuating, the efficiency of conventional power plants drops and large investments in grid infrastructure are required.

These trends and changes result in challenges to maintain a reliable and stable supply, but they also open opportunities. The increasing fluctuations in distributed electricity demand and in distributed electricity generation inevitably asks for ICT (i.e. intelligence and communication) solutions to closely coordinate and match in real time the demand and supply of electricity. This is even more urgent in view of the lack of efficient solutions for mass storage of electricity.

It is generally acknowledged that ICT is the key enabling technology in the future energy supply chain to challenge above mentioned trends. Besides technical topics also a set of non-technical research questions needs to be addressed such as regulatory issues, pricing systems, user psychology and privacy.

One can conclude that smart grids do not only supply power (bidirectionally) but also



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information and intelligence. This results in numerous ICT challenges. The "smartness" is manifested in making use of ICT to optimise existing electricity grids, to control renewable generation, to control smart appliances and to enable new energy services and increased energy efficiency. For the transformation to future Smart Grids, ICT-related Research & Development is crucial.

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