

Keynote by Henrik Lund, Aalborg University, Denmark

Smart Energy Systems and the Danish Plans for Renewable Energy

ABSTRACT

This lecture presents the learning of a series of studies that analyze the problems and perspectives of converting the present energy system into a 100 percent renewable energy system using a smart energy systems approach. As opposed to, for instance, the *smart grid* concept, which takes a sole focus on the electricity sector, *smart energy systems* include the entire energy system in its approach to identifying suitable energy infrastructure designs and operation strategies including transportation and aviation. The typical *smart grid* sole focus on the electricity sector often leads to the definition of transmission lines, flexible electricity demands and electricity storage as the primary means to deal with the integration of fluctuating renewable sources. However, the nature of wind power and similar sources has the consequence that these measures are neither very effective nor cost-efficient. The most effective and least-cost solutions are to be found when the electricity sector is combined with the heating sector and/or the transportation sector. Moreover, the combination of electricity and gas infrastructures may play an important role in the design of future renewable energy systems. This presentation illustrates why electricity smart grids should be seen as part of overall smart energy systems and with the case of Denmark illustrate how to design such future energy system.

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- Former head of department and head of several European and Danish research projects including the 4DH (Strategic Research Centre for 4th Generation District Heating Technologies and Systems) financed by the Danish Council for Strategic Research involving 32 university and industrial partners in Denmark, Sweden, Croatia and China. 2012-2017. www.4DH.dk, the Strategic Research Project CEESA (Coherent Energy and Environmental System Analysis, 2007-2011) www.CEESA.dk and the EU 6th framework program DESIRE (Dissemination Strategy on Electricity Balancing for Large Scale Integration of Renewable Energy). 2005-2007. www.project-desire.org