



Henrik Lund, Denmark

Resilient and Fully Decarbonized Smart Renewable Energy Systems

This presentation focuses on how societies can design and achieve resilient and fully decarbonization energy systems based on renewable energy. The presentation addresses a set of methods and criteria to design Smart Energy Systems while considering the context of 100% renewable energy on a national level. Countries should handle locally what concerns local demands and, at the same time, acknowledge the international context when discussing resources and industrial and transport demands. Following such an approach will also lead to a resilient energy solution. To illustrate the method, it is applied to the cases of Denmark, and European within the context of a global fully decarbonized energy system.

The goals of the Danish Government, supported by the Danish Parliament, are to reduce Greenhouse gas emissions by 70% in 2030 and to achieve a net zero-emission society by 2050. Moreover, due to the war in Ukraine, there is also a strong wish for a resilient energy supply. This presentation includes a list of theoretical and methodological considerations and a concrete proposal for implementing such targets. It is highlighted that one must now think beyond 2030 to prepare for the next step to achieve full decarbonization by 2040 or 2050. It is also highlighted that a country such as Denmark must consider including its share of international shipping and aviation and how to design a solution with Denmark's share of sustainable biomass resources.

Moreover, the presentation includes the results of detailed hourly modelling of the EU "A Clean Planet" scenarios for a fully decarbonized Europe in 2050 and compares it to a "smart energy systems" alternative. The case illustrates how focusing on a fully sector-coupling, as expressed in a smart energy systems approach, will lead to higher energy efficiency and the identification of a more affordable green transition in Europe.
