

## Lecture 1:

### Smart Energy for Sustainability

#### Abstract:

This lecture covers a few important topics from smart energy such as microgrid control & management, health, and standards development. To achieve net-zero emissions by 2050/2060, preserve biodiversity and mitigate global warming, people need to promote sustainability and adopt renewables. Smart energy network control, operation, management, and planning will play a key role in a carbon-neutral society. Major environmental, economic, and technological challenges such as climate change, economic restructuring, pressure on public finances, cyber security, digitalization of the retail and entertainment industries, and growth of urban and ageing populations have generated huge interest for cities to be run differently and smartly. Some current international research and development activities will be reported, the importance of standards development and future directions will be discussed.

## Lecture 2:

### Data Analytics and Computational Intelligence in Cyber Physical Energy Systems

#### Abstract:

Cyber Physical Energy Systems are characterised by new components or elements with a high-level of uncertainties from either such as the intermittent renewable resources, latency imposed by the communication networks, or integration of electric vehicles. The risk and complexity involved in the interaction between the energy and information networks have resulted in difficulties in system control and operation. With the advancement in data analytics and computation intelligence techniques, for example, deep learning technologies, new approaches for renewable generation prediction, load estimation and energy market opportunities are possible. In general, low-carbon infrastructure investments are concentrated on generation rather than energy storage technologies. European countries in 2018 have invested in low-carbon energy with over 80% of the investment in wind and solar technologies, but energy storage investments are at least an order of magnitude smaller. In this lecture, some key challenges and opportunities will be reported and discussed. Case studies based on real-life data will be presented. To demonstrate the importance of the topics to society, some industry, national and international standards will also be included.