

# The integration costs of wind and solar power

## 1 – Introduction

- 1 Learning objectives of the course
- 2 Introduction of the course
- 3 Purpose and definition of the concept of integration cost

## 2 – Grid costs

- 1 Definition of grid cost
- 2 Differences in grid costs between renewable and other technologies and between different renewable technologies
- 3 Methods to quantify grid costs
- 4 Estimates from case studies and reasons for observed wide variation
- 5 Options for limiting grid costs

## 3 – Balancing power costs

- 1 Definition of balancing costs and differences between technologies
- 2 Estimates from case studies and reasons for observed wide variation
- 3 Options for limiting balancing costs

## 4 – Effects on existing power plant utilisation

- 1 Overview – Impact of adding new wind and solar power plants on existing conventional plants
- 2 The concept of the load duration curve
- 3 Technical effects on existing power plant utilisation
- 4 Determinants influencing the magnitude of technical effects
- 5 Economic effects of adding new VRE power generation
- 6 The short-term perspective – capital cost as a driver of cost estimations of reduced utilisation
- 7 The long-term perspective – cost-optimal mix of conventional generation capacity

- 8 Shifting from baseload to mid-merit and peak load – total costs
- 9 Estimates from case studies
- 10 Effects in real power generation systems

## 5 – Total system cost approach

- 1 The total system cost approach as an alternative approach to comparing integration costs
- 2 The total system cost approach – discussion

## 6 – Summary

- 1 Summary
- 2 References
- 3 Further Reading
- 4 Abbreviations

