



## 1 – Introduction

- 1 Introduction to battery energy storage systems
- 2 BESS advantages for ancillary services
- 3 BESS use in ancillary service
- 4 BESS as a leverage to reduce thermal must-run power stations
- 5 System structure
- 6 Inclusion of BESS in a hybrid power plant (HPP) or virtual power plant (VPP)

## 2 – BESS sizing for ancillary services

- 1 BESS project phases
- 2 Method for sizing of a BESS for ancillary services
- 3 Identification of requirements
- 4 Pre-assessment of BESS viability
- 5 Time-series simulation principles
- 6 Time-series simulation for BESS
- 7 Simulation environment and modelling
- 8 Running the simulation
- 9 Verification of the simulation results
- 10 Carrying out a new iteration
- 11 Common mistakes in modelling and simulation
- 12 Converting the simulation results to a BESS sizing
- 13 Common mistakes in BESS sizing

## 3 – BESS economics in ancillary services

- 1 BESS capital expenditure for ancillary services
- 2 BESS operational expenditure
- 3 Levelised cost of storage: calculation
- 4 Levelised cost of capacity: calculation and example
- 5 Evaluation of business cases
- 6 Common mistakes in calculating the economics of BESS
- 7 Business case improvement: CapEx reduction

## 4 – BESS performance

- 1 BESS standards
- 2 BESS performance evaluation and standards
- 3 Outlook for sizing methodology
- 4 Outlook for BESS economics

## 5 – Summary of the course