



Smart Grid Integration and Modelling

Course: ADMS, DER Hosting Capacity and Interoperability



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Introduction:

Smart grid integration and modelling is a 5-day course for utility engineers, network planners, IT/OT integration staff and grid modernisation teams that produces a Smart Grid Modernisation Roadmap with a Hosting Capacity Case. Many utilities connect rooftop solar, batteries and EV chargers faster than their control systems, data models and communication networks can absorb, so voltage complaints, curtailment and stranded pilot projects multiply. Nominees already work on network engineering, control systems or utility IT, and the course is taught through modelling builds on a case feeder. CoreConcept Training Center delivers this smart grid integration course.

Course Objectives:

- Describe smart grid architecture layers and position AMI, ADMS, DER and communications within a utility's modernisation scope
- Specify interoperability between substation, control centre and enterprise systems using IEC 61850 and the CIM model exchange
- Assess DER hosting capacity on distribution feeders and set inverter, volt-var and storage settings that raise it
- Build time-series feeder simulations of solar, storage and EV charging scenarios and interpret their voltage and loading results
- Evaluate integration risks from reverse power flow, inverter ride-through and OT cyber exposure and select controls for each
- Prepare a smart grid business case and phased modernisation roadmap that sponsors can approve and fund

Target Audience:

- Distribution and protection engineers responsible for connecting DER and keeping feeders within voltage and thermal limits
 - Network planners responsible for hosting capacity studies, DER connection offers and grid reinforcement choices
 - IT/OT integration staff responsible for control centre systems, data models and communication networks
 - Grid modernisation and smart grid programme staff responsible for pilots, business cases and deployment roadmaps
 - Regulatory, finance and strategy staff responsible for tariffs, investment cases and policy input who need a working grasp of smart grid concepts
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Course Outline:

Day 1: Smart Grid Foundations, Architecture Layers and Utility Readiness

- Smart Grid Definition with Two-Way Power and Data Flows
- Smart Grid Architecture Layers from Field Devices to Enterprise
- Smart Grid Primer Module for Non-Engineering Managers and Staff
- AMI System-Level Role as a Grid Sensing Layer
- Grid Modernisation Maturity Assessment of a Case Utility

Day 2: Interoperability Standards, Communication Networks and ADMS Architecture

- IEC 61850 Data Models, GOOSE Messaging and SCL Files
- CIM IEC 61970 and IEC 61968 Network Model Exchange
- Field Area Network Choices Across Fibre, Cellular and Powerline
- ADMS Application Stack Linking SCADA, DMS, OMS and DERMS
- IEEE C37.118 Synchrophasor Data Feeds for Grid Visibility

Day 3: DER Integration, Hosting Capacity and Flexibility Resources

- IEEE 1547 Interconnection Requirements and Smart Inverter Functions
- Hosting Capacity Analysis for Voltage Rise and Thermal Limits
- Volt-Var Optimisation Settings Coordinated with Inverter Reactive Power
- OpenADR Demand Response Signals and Flexibility Service Design
- Battery Storage Dispatch Modes for Peak Shaving and Backfeed

Day 4: Grid Modelling, Integration Risks and OT Cybersecurity

- Quasi-Static Time-Series Feeder Simulation of DER Scenarios
- EV Charging Cluster Impact Modelling on Transformer Loading
- Grid Code Ride-Through Requirements for Inverter-Based Resources Overview
- FLISR Behaviour Under Reverse Power Flow and DER Infeed
- OT Cybersecurity Zoning for ADMS, DERMS and Inverter Fleets

Day 5: Modelling Build of a Smart Grid Modernisation Roadmap

- Case Feeder Hosting Capacity Model Build and Scenario Runs
 - Integration Architecture Blueprint Mapping IEC 61850 and CIM Interfaces
 - Smart Grid Business Case with Avoided Reinforcement Benefits
 - Phased Deployment Sequencing of ADMS, DERMS and Communications
 - Smart Grid Modernisation Roadmap and Hosting Capacity Case Completion
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Skills You Will Gain:

- Smart Grid Architecture Mapping
- Substation and Control Centre Interoperability
- DER Hosting Capacity Analysis
- Volt-Var and Inverter Setting Coordination
- Time-Series Feeder Simulation
- Demand Flexibility Design
- OT Cyber Risk Zoning
- Grid Modernisation Investment Appraisal

Why Attend This Course:

- Deliver a Smart Grid Modernisation Roadmap with a Hosting Capacity Case to the network director and the grid modernisation steering group
- Decide which feeders can accept more solar, storage and EV charging and which inverter or volt-var settings unlock extra capacity
- Avoid curtailment disputes, costly reinforcement and stalled pilots caused by systems that cannot exchange data or see DER output
- Brief engineering, IT, finance and regulatory colleagues on smart grid architecture, standards and investment priorities in common terms

Conclusion:

Once participants return, the network director and the grid modernisation steering group can use the Smart Grid Modernisation Roadmap and its Hosting Capacity Case to approve which feeders open to more DER, which ADMS, DERMS and communication investments come first, and how IEC 61850 and CIM interfaces are specified in tenders. Planning and IT teams can reuse the feeder model and integration blueprint on further areas. After the first deployment phase, the unit should compare measured voltage, curtailment and connection lead times with the modelled values and update the roadmap.

Frequently Asked Questions FAQ:

What should participants know before a smart grid integration and modelling course?

Participants should understand basic distribution networks, feeders and substations, or work alongside engineers who do. Spreadsheet skills help in the modelling build. Non-engineering staff join the primer module on the first day, and anonymised feeder or DER connection data from their own utility adds value to the case work.

How does smart grid integration and modelling differ from a distribution operation or distribution planning course?

It concentrates on making DER, ADMS, communications and data standards work together and on modelling DER scenarios. Control room switching and outage handling, and long-term load forecasting and capital planning, belong to neighbouring courses and appear here only where they touch integration.

Why does hosting capacity matter in smart grid integration and modelling?

Hosting capacity shows how much solar, storage or EV load a feeder can take before voltage or thermal limits are breached. It turns connection decisions into evidence, shows where smart inverter settings or flexibility avoid reinforcement, and anchors the business case for grid modernisation.

What do participants take back from the smart grid integration and modelling course?

Participants take back a Smart Grid Modernisation Roadmap with a Hosting Capacity Case, covering a case feeder model and scenario results, an integration architecture blueprint, a business case with avoided reinforcement benefits and a phased deployment sequence for ADMS, DERMS and communications.
