Generation Scheduling and Unit Commitment Training Course: Cost, Reserve and Security Decisions

1 – 12 August 2027
Manama

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Programme Summary

Generation scheduling and unit commitment are the subject of this two-week training course for power system operations, generation planning and market directors, ending in a scheduling decision pack for one power system. Choices on which units to start, how to load them and how much reserve to hold decide fuel cost and supply security every day, yet they are often left to solver output that leaders cannot question. The programme moves from cost curves and unit limits to dispatch, reserve, optimisation methods, network security, storage, renewables and market prices. Mars Training Centre UK delivers this programme on generation scheduling and unit commitment to mixed-organisation cohorts.

The Business Case

Utilities, independent producers and large industrial generators carry fuel and start-up costs that depend on scheduling decisions made hours ahead under uncertain demand. Leaders who can read how a commitment plan was built, and which constraint drove it, challenge poor schedules early and set clearer rules for the control room, planners and traders.

- Fuel and Start-Up Cost: Falls when commitment decisions are tested against unit limits and a stated cost baseline.
- Supply Security: Improves when reserve and contingency assumptions are set deliberately rather than inherited.
- Decision Transparency: Rises when solver results are reviewed against a fixed checklist and recorded.

Principles and Evidence Base

- Merit-Order Dispatch: Loading units in rising order of incremental cost, applied in Session 3 to set a least-cost loading.
- Mixed-Integer Programming: The optimisation form behind most commitment solvers, applied in Session 5 to review what a solver result means.
- Security-Constrained Unit Commitment: Commitment that respects network and contingency limits, applied in Session 6 to stress-test a plan.
- Locational Marginal Pricing: A market price form that reflects congestion and losses, applied in Session 9 to read settlement effects.

Intended Participants

- Operations directors who own the day-ahead and real-time scheduling process.
- Generation planning leaders who set unit availability, fuel and maintenance windows.
- Market and trading directors who submit offers and manage settlement exposure.
- Engineering managers who review solver models, constraints and study assumptions.
- Asset and portfolio leaders who weigh start-up, reserve and storage decisions.

Typical settings include national utilities, independent power producers, industrial power plants and renewable-heavy systems.

Learning Outcomes

1. Participants will be able to construct a cost baseline from unit cost curves and operating limits.
2. Participants will be able to evaluate a merit-order dispatch against incremental cost and loss allowance.
3. Participants will be able to justify a spinning reserve requirement for a given system.
4. Participants will be able to diagnose which constraint drives a unit commitment solver result.
5. Participants will be able to prioritise scheduling actions under renewable forecast uncertainty and storage options.
6. Participants will be able to assess the market and settlement effect of a commitment plan.

Programme Structure

Day 1: Generation Scheduling Foundations

Which decisions does generation scheduling have to settle each day?

- Demand Forecast Review
- Generator Cost Curves
- Incremental Cost Method
- Scheduling Decision Calendar
- Cost-to-Serve Baseline Sheet

Day 2: Unit Limits and Start-Up Costs

What stops a unit from being started, stopped or moved freely?

- Ramp Rate Limits
- Minimum Up and Down Times
- Start-Up Cost Curves
- Unit Availability Register
- Operating Envelope Table

Day 3: Merit-Order Economic Dispatch

How is demand shared across running units at least cost?

- Merit-Order Dispatch
- Lambda Iteration
- Transmission Loss Allowance
- Fuel Limit Treatment
- Dispatch Cost Sheet

Day 4: Spinning Reserve and Frequency Support

How much reserve is enough, and who pays for it?

- Spinning Reserve Requirements
- Largest Unit Loss Sizing
- Reserve Cost Allocation
- Frequency Response Check
- Reserve Shortfall Register

Day 5: Unit Commitment Solution Methods

How do commitment solvers reach a plan, and what do they assume?

- Priority List Method
- Dynamic Programming
- Lagrangian Relaxation
- Mixed-Integer Programming
- Solver Result Review Checklist

Day 6: Network Security in Unit Commitment

How do network limits and contingencies change the commitment plan?

- Security-Constrained Unit Commitment
- Contingency Screening
- Network Constraint Handling
- Congestion Cost Reading
- Commitment Plan Stress Test

Day 7: Hydro, Thermal and Storage Coordination

How are energy-limited resources scheduled alongside thermal units?

- Hydro-Thermal Coordination
- Water Value Estimate
- Battery Storage Scheduling
- Fuel Supply Limits
- Energy-Limited Unit Table

Day 8: Renewable Variability in Scheduling

How should a schedule respond when wind and solar output is uncertain?

- Renewable Forecast Uncertainty
- Net Load Ramp Profile
- Scenario-Based Commitment
- Reserve Adjustment Rule
- Re-Commitment Trigger Table

Day 9: Market Prices and Scheduling Governance

How do prices, offers and oversight shape scheduling decisions?

- Locational Marginal Pricing
- Offer and Bid Review
- Settlement Impact Table
- Scheduling Governance Model
- Solver Audit Trail

Day 10: Scheduling Decision Pack for One System

Do the findings join into a defensible schedule and review routine?

- Applying the Session 1 Cost-to-Serve Baseline
- Testing the Session 6 Commitment Plan Stress Test
- Applying the Session 8 Re-Commitment Trigger Table
- Comparing the Session 9 Settlement Impact Table
- Completing the Scheduling Decision Pack

Methodology

The programme is a data workshop built on a prepared case of a mixed thermal, hydro and renewable system. Participants build cost curves, test dispatch and commitment results, adjust reserve and defend their choices to peers acting as a system operations board.

- Suggested activity: Ranking ten units by incremental cost and loading them to meet a load curve.
- Suggested activity: Reading a solver result to identify the binding constraint.
- Suggested activity: Re-planning a morning commitment after a wind forecast error.

Capstone Output

Each participant completes a scheduling decision pack for one power system. It holds a cost baseline, a dispatch sheet, a reserve rationale, a stress-tested commitment plan, a re-commitment trigger table and a short recommendation. At work it goes to the operations board and sets the review routine for later scheduling cycles.

Frequently Asked Questions

Is unit commitment and generation scheduling training suitable for directors who are not power engineers?

Yes. Unit commitment and generation scheduling are taught through prepared cases and templates. You need responsibility for operations, planning or market results, but no earlier modelling experience.

Which methods does unit commitment and generation scheduling rest on in this training?

Unit commitment and generation scheduling rest on merit-order dispatch, mixed-integer programming, security-constrained unit commitment and locational marginal pricing, compared on one decision pack.

How is the decision pack from unit commitment and generation scheduling training used at work?

You present the decision pack to your operations board, use its stress test to justify the chosen plan, and keep its sheets as the review routine for later scheduling cycles.

How does unit commitment differ from a programme on power market trading?

Unit commitment concentrates on which units run and how they are loaded, while a programme on power market trading concentrates on bidding, hedging and portfolio positions.