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COURSE BROCHURE

# Advanced Unit Commitment and Economic Dispatch Scheduling Training Course

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Registered in the United Kingdom and Saudi Arabia

# Advanced Unit Commitment and Economic Dispatch Scheduling Training Course

**Ref:** 2591_98570 **Date:** 15 – 26 March 2027 **Location:** Amsterdam **Fees:** 11100 GBP

Unit Commitment and Economic Dispatch Scheduling is a 2-week advanced training course for generation scheduling and system operations engineers, built around a day-ahead scheduling case covering start-up decisions, reserves and ramp limits. Variable wind and solar output, tighter fuel budgets and older thermal fleets now force operators to reschedule more often and with less margin. Jupiter Prime Training presents unit commitment and economic dispatch scheduling as a disciplined optimisation craft.

## Why Unit Commitment and Economic Dispatch Scheduling Matters Now

Several forces reshape how generating units are committed and loaded. Wind and solar plants add forecast error that thermal units must absorb within hours. Ageing boilers and turbines suffer from frequent cycling, so every extra start carries a maintenance cost. A system operator that schedules well keeps reserves adequate at lower production cost and avoids emergency purchases; one that schedules badly pays for idle spinning capacity or risks shortfalls at evening peaks. The course rests on mixed-integer linear programming, Lagrangian relaxation and scenario-based stochastic scheduling, each explained from first principles.

## Who Gains Most from Unit Commitment and Economic Dispatch Scheduling

- Engineers who prepare day-ahead and intraday generation schedules
- Specialists who maintain the cost curves, start-up costs and technical limits of each unit
- Analysts who size spinning, non-spinning and regulating reserves against forecast error
- Planners who test how new storage, peaking or renewable plants change the commitment pattern
- Plant performance engineers who supply heat-rate and ramp data to the scheduling desk

A control-room scheduling desk gains most when its schedulers and reserve analysts attend together.

## Unit Commitment and Economic Dispatch Scheduling Capabilities

Participants learn to rebuild and defend the commitment decisions behind a schedule.

- Formulate a unit commitment model with binary on/off states, minimum up and down times and start-up costs — for the scheduling desk lead
- Calculate economic dispatch with incremental cost curves, transmission losses and unit limits — for real-time dispatchers
- Specify spinning and non-spinning reserve targets against probable forecast error — for the system security engineer
- Test ramp-rate and minimum stable generation limits against net-load swings — for plant operations managers
- Weigh deterministic and stochastic schedules under wind and solar forecast scenarios — for the head of operations planning
- Communicate schedule costs, risks and assumptions — for control-centre management

## Key Unit Commitment and Economic Dispatch Scheduling Terms

- Unit commitment — the decision on which generating units are switched on or off in each hour of the scheduling horizon.
- Economic dispatch — the split of demand among running units so that total fuel cost is lowest within their limits.
- Incremental cost — the extra fuel cost of producing one more megawatt-hour from a unit at its present output.
- Spinning reserve — unloaded capacity on synchronised units that can raise output within minutes after a disturbance.
- Ramp rate — the fastest rate, in megawatts per minute, at which a unit can raise or lower its output.
- Net load — system demand minus wind and solar output, the quantity that dispatchable units must follow.

## Unit Commitment and Economic Dispatch Scheduling Day by Day

## Day 1: Forces Reshaping Generation Scheduling

- Net-Load Duck Curves — Where Thermal Units Must Now Follow Demand
- Scheduling Horizons From Week-Ahead to Real Time — Which Decision Belongs Where
- Cost of Cycling Thermal Units — Maintenance Penalty Behind Each Extra Start
- Fuel and Emissions Limits — How Contracts Shape the Feasible Schedule
- Control-Centre Roles and Hand-Offs — Who Owns Each Scheduling Decision

## Day 2: Unit Data and Cost Curves

- Heat-Rate Curves and Quadratic Fits — Accuracy of Unit Fuel Cost Inputs
- Hot, Warm and Cold Start-Up Costs — Pricing Restarts After Different Off Times
- Minimum Stable Generation and Maximum Output — Real Unit Operating Envelopes
- Must-Run and Combined Heat Duties — Units Committed for Reasons Beyond Cost
- Unit Data Audit Sheets — Trust in the Numbers Feeding the Model

## Day 3: Economic Dispatch Methods

- Equal Incremental Cost Criterion — Loading Order of Running Units
- Lambda Iteration Method — Solving Dispatch With Upper and Lower Limits
- Transmission Loss Penalty Factors — Adjusting Dispatch for Distant Plants
- Valve-Point Effects and Prohibited Zones — Where Smooth Curves Mislead
- Dispatch With Hydro and Energy-Limited Units — Valuing Stored Water and Fuel

## Day 4: Classical Unit Commitment Formulations

- Priority List Commitment — Fast Heuristics and Their Hidden Costs
- Dynamic Programming Commitment — State Spaces for Small Unit Fleets
- Lagrangian Relaxation — Decomposing Commitment by Unit With Demand Prices
- Minimum Up and Down Time Logic — Preventing Infeasible On-Off Patterns
- Duality Gap Interpretation — How Far a Relaxed Schedule Is From Optimal

## Day 5: Mixed-Integer Linear Programming Models

- Binary Status, Start-Up and Shut-Down Variables — Tight Model Formulation Choices
- Piecewise Linear Cost Segments — Representing Curved Costs in Solvers
- Optimality Gap and Solver Tolerances — Balancing Run Time Against Schedule Cost
- Network-Constrained Commitment With Line Limits — Congestion Effects on Unit Choice
- Model Validation Against Historical Days — Confidence Before Operational Use

## Day 6: Reserve Requirements and Ancillary Duties

- Largest Contingency Reserve Rule — Sizing Spinning Reserve for Unit Trips
- Probabilistic Reserve Sizing — Linking Reserves to Forecast Error Spread
- Regulating, Spinning and Replacement Reserves — Different Response Times and Providers
- Reserve Deliverability Across Zones — Whether Held Capacity Can Reach Load
- Co-Optimising Energy and Reserves — Joint Cost of Output and Headroom

## Day 7: Ramping and Flexibility Constraints

- Ramp-Up and Ramp-Down Constraints — Following Steep Morning and Evening Swings
- Start-Up and Shut-Down Trajectories — Output Profiles During Synchronisation
- Flexible Ramping Products — Holding Capacity for Expected Net-Load Movement
- Battery Storage Charge and Discharge Scheduling — State-of-Charge Limits in Commitment
- Fast-Start Peaking Units — When Quick Plants Beat Holding Reserves

## Day 8: Wind and Solar Forecast Uncertainty

- Forecast Error Distributions by Horizon — Quantiles Instead of Point Values
- Scenario Generation and Reduction — Keeping Stochastic Models Solvable
- Two-Stage Stochastic Commitment — Day-Ahead Decisions With Intraday Recourse
- Robust and Interval Commitment — Protecting Against Worst Credible Outcomes
- Curtailment and Load-Shedding Penalties — Pricing Unserved Energy in the Model

## Day 9: Schedule Decisions and Trade-Offs

- Deterministic Versus Stochastic Schedule Costs — Expected Savings Against Complexity
- Intraday Recommitment Triggers — When to Revise the Day-Ahead Schedule
- Sensitivity Runs on Fuel Price and Demand — Stress Points in the Schedule
- Schedule Performance Indicators — Production Cost, Reserve Shortfall and Start Counts
- Decision Notes for Control-Centre Management — Explaining Commitment Choices Clearly

## Day 10: Practising the Day-Ahead Scheduling Case

- Unit Data Set Assembly — Applying Cost Curves and Technical Limits
- Commitment Model Build — Applying Mixed-Integer Formulation and Reserve Rules
- Ramping and Storage Checks — Applying Flexibility Limits to the Schedule
- Forecast Scenario Runs — Applying Stochastic Methods to Wind and Solar
- Day-Ahead Scheduling Case — Final Schedule, Costs and Risk Note

## Applying Unit Commitment and Economic Dispatch Scheduling After the Course

- Rerun one recent operating day through a mixed-integer commitment model and compare its cost with the schedule used.
- Replace a fixed spinning reserve target with a probabilistic rule based on observed forecast error.

## Unit Commitment and Economic Dispatch Scheduling Questions FAQ

### What is unit commitment and economic dispatch scheduling, and why does it matter now?

It is the process of deciding which generating units run each hour and how much each produces at lowest cost. It matters now because variable renewable output, cycling costs and fuel limits make schedules harder to get right and costlier to get wrong.

### Which roles gain most from unit commitment and economic dispatch scheduling skills?

Generation schedulers and system operations engineers gain most. Reserve analysts and plant performance engineers also benefit, because their inputs shape commitment costs.

## How does a unit commitment and economic dispatch scheduling course differ from a power system protection course?

It concentrates on the economics and timing of running generators, not on relays and fault clearing. It decides which plants are online, at what output and with what reserve.

## What do you bring back from unit commitment and economic dispatch scheduling training?

You bring back a working day-ahead schedule built on your own unit data, with reserve and ramp checks, forecast scenarios and a decision note. It can be rerun against real operating days.

## Unit Commitment and Economic Dispatch Scheduling: The Way Forward

The day-ahead scheduling case gives the scheduling desk a tested model of its own fleet. Its first use is to decide whether current reserve targets are too high or too low for today's forecast error. Schedulers, reserve analysts and operations managers share it. After the first season, revisit the cycling cost assumptions, because measured wear often changes which units deserve to stay online overnight.