
Maintenance Choices Under Uncertainty: Expected Value, Risk and Option Scoring Training Course

19 – 23 September 2027
Zoom





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Programme Summary

Maintenance choices under uncertainty, covering expected value, risk and option scoring, are the subject of this five-day training course for operations, maintenance and reliability managers, ending in a decision file for one asset. Repair, renew, defer and outsource decisions are often made on habit or urgency, with the reasoning left unrecorded. The programme moves from principles, through diagnosis of the decision, to design of a scored comparison, then to application on one live case. Mars Training Centre UK delivers this programme on maintenance choices under uncertainty.

The Business Case

When maintenance choices are made without a structured method, organisations repair assets that should be renewed, defer work whose risk is higher than assumed and outsource tasks without comparing whole costs. Managers who frame the decision, weigh uncertain outcomes and score the options against agreed criteria can defend their choices to finance and operations colleagues and revisit them as evidence changes.

- **Cost Control:** Improves as options are compared on lifecycle cost and not on the immediate invoice.
- **Risk Exposure:** Falls as deferral decisions are tested against the probability and consequence of failure.
- **Decision Speed:** Rises as a repeatable method replaces ad hoc debate.

Principles and Evidence Base

- **Decision trees and expected value:** They structure the uncertain outcomes of each option in Session 2.
- **Multi-criteria decision analysis:** It guides the weighted option scoring built in Session 3.
- **Cost-benefit analysis and lifecycle costing:** They frame the comparison of repair, renew and outsource options in Session 3.
- **Sensitivity analysis:** It shapes the stress tests applied in Session 4.

Intended Participants

- Maintenance managers who decide whether an ageing asset is repaired, renewed or deferred.
- Reliability engineers who estimate failure likelihood and consequence for decisions.
- Operations managers who balance production needs against maintenance windows and cost.
- Engineering managers who prepare investment and outsourcing proposals for review.

The programme serves oil and gas operators, power utilities, manufacturing plants and facilities organisations, and suits mixed groups where operations, maintenance and finance colleagues share one decision.



Learning Outcomes

1. Participants will be able to frame a maintenance decision with clear options, objectives and constraints.
2. Participants will be able to construct a decision tree and calculate the expected value of each option.
3. Participants will be able to evaluate failure risk and uncertainty for repair, renew and defer choices.
4. Participants will be able to prioritise options with a weighted multi-criteria scoring model.
5. Participants will be able to test a recommendation with sensitivity analysis and adverse scenarios.
6. Participants will be able to justify a maintenance decision in a written record for senior reviewers.

Programme Structure

Day 1: Maintenance Choices Under Uncertainty Principles

What makes a maintenance decision hard, and how is it framed?

- Repair, Renew, Defer and Outsource Option Set
- Decision Objectives and Constraints Statement
- Types of Uncertainty in Asset Decisions
- Decision Bias Checklist
- Decision Framing Template

Day 2: Diagnosing Risk and Expected Value

How are uncertain outcomes quantified and compared?

- Failure Probability and Consequence Estimates
- Decision Tree Construction
- Expected Value Calculation
- Risk Matrix for Option Outcomes
- Expert Judgement Elicitation Sheet

Day 3: Designing the Option Scoring Model

How are cost, risk and operational factors weighed together?

- Lifecycle Cost Build-Up
- Cost-Benefit Comparison Table
- Criteria and Weighting Workshop
- Weighted Scoring Matrix
- Outsourcing Versus In-House Comparison



Day 4: Testing and Documenting the Decision

How robust is the preferred option, and how is it recorded?

- Sensitivity Testing of Weights and Estimates
- Adverse Scenario Cases
- Break-Even Analysis
- Decision Record Format
- Stakeholder Briefing Outline

Day 5: Applying Maintenance Decision Analysis to One Asset

Is the recommendation ready for a review panel?

- Applying the Session 1 Framing Template to the Chosen Asset
- Building the Session 2 Decision Tree with Site Estimates
- Scoring Options with the Session 3 Matrix
- Stress Testing the Result Using Session 4 Methods
- Completing the Maintenance Decision File

Methodology

The programme uses a decision workshop built on anonymised asset records, failure histories and cost schedules from process, power and manufacturing settings. Participants work in small teams as maintenance, operations and finance leads, carry one case from framing to recommendation, challenge each estimate as a group and record which evidence would change the decision.

- Suggested activity: Building a decision tree for a pump repair or renewal choice.
- Suggested activity: Agreeing criteria weights for an outsourcing decision.
- Suggested activity: Defending a deferral decision to a panel acting as finance.

Capstone Output

Each participant completes a maintenance decision file for one asset. It holds a framed option set, a decision tree with expected values, a weighted scoring matrix, sensitivity results and a written recommendation. The file is used to brief senior reviewers, support a budget request and return to the choice when conditions change, so that the reasoning remains open to review.



Frequently Asked Questions

Are maintenance choices under uncertainty suitable for managers without a statistics background?

Yes. Maintenance choices under uncertainty are taught with worked examples and templates for operations, maintenance and reliability managers, assuming familiarity with asset costs and failure records but no advanced mathematics.

Which methods do maintenance choices under uncertainty rest on in this training?

Maintenance choices under uncertainty rest on decision trees and expected value, multi-criteria decision analysis, lifecycle costing and sensitivity analysis.

How is the decision file from maintenance choices under uncertainty used at work?

You use the decision file to brief senior reviewers, support a budget request and revisit the maintenance choice when assumptions or costs change.

How do maintenance choices under uncertainty differ from a reliability engineering programme?

Maintenance choices under uncertainty centre on comparing and scoring repair, renew, defer and outsource options, while a reliability programme centres on analysing why assets fail.