

SECAS Guidance Notes: Recommendations for the Use of AI in Testing

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1. Introduction

This Guidance Note is intended to provide readers with recommendations on the appropriate and effective use of Artificial Intelligence (AI) technologies in testing within the smart metering ecosystem for the Data Communications Company (DCC) and DCC Service Users; while ensuring that mitigations are proposed as appropriate. The key focus of this Guidance Note is testing of the DCC Total System and its interactions from the Communications Hub to the DCC User Gateway, referred to as 'DCC Systems testing'.

The recommendations outlined in this guidance note aim to provide helpful and practical advice to the DCC and SEC Parties (that are DCC Service Users but referred to as SEC Parties here after), and are informed by detailed research, risk analysis, and stakeholder engagement with the DCC and SEC Parties conducted between February and August 2025. Furthermore, they are intended to support the development of robust, future-proof testing practices.

2. Background

The integration of AI into testing processes within the DCC smart metering ecosystem presents both significant potential benefits and emerging risks. As this ecosystem evolves, the potential for AI to enhance the efficiency of testing processes, improve test coverage, and reduce costs has been identified as a key area of focus. However, alongside these benefits, there are concerns regarding the validity of testing inputs and outputs, governance structure, and commercial implications of AI-driven testing methodologies.

3. Context

SEC Governance places requirements on the DCC to consult the Testing Advisory Group (TAG) in the production of release or programme test approach and test completion documentation. While there are currently no explicit SEC obligations on the use of AI in testing, the expectation of the SEC Panel is that the TAG will be informed when AI is used by the introduction of relevant information in test approach documentation, including what steps have been taken to mitigate any known risks in the use of AI.

4. Recommendations

This guidance note is best read in conjunction with the corresponding research report titled 'Utilisation of Artificial Intelligence in Testing Final Report', which outlines the limitations of the application of AI within the testing lifecycle. The DCC and SEC Parties should consider evaluating this report prior to proceeding with implementing the use of AI in their testing processes.

The following sub-sections outline recommendations for the DCC and SEC Parties for the use of AI in specific stages in the testing lifecycle.

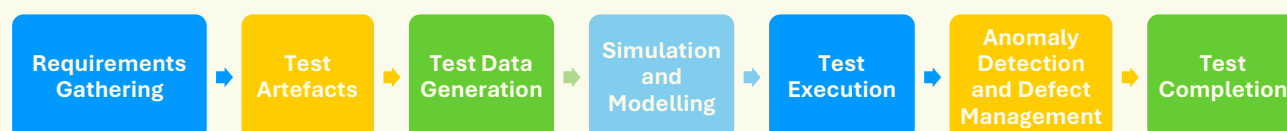


Table 1 - Summary of Use cases and applicability to DCC and SEC Parties

Use Case	Applicable to DCC	Applicable to SEC Parties
Requirements Extraction	✓	✓
Requirements Mapping	✓	✓
Test Artefacts Production	✓	✓
Test Case and Script generation	✓	✓
Test Case Prioritisation	✓	✓
Test Data Generation	✓	✓
Simulation and Modelling	✓	✓
Test Execution	✓	✓
Test Script Self-healing	✓	✓
Anomaly Detection and Defect Management	✓	✓
Test Completion	✓	✓

4.1 Requirements Gathering

4.1.1 Requirements Extraction

Natural Language Processing (NLP) models could be used to analyse, interpret, and extract requirements from detailed documentation such as the SEC and/or SMETS (Smart Metering Equipment Technical Specifications), GBCS (Great Britain Companion Specification), DUIS (DCC User Interface Specification), and MMC (Message Mapping Catalogue). These documents are extensive, with some written for a specific technical audience, or using detailed regulatory language, making manual analysis time-consuming for business and testing teams and could be prone to human interpretation errors.

Furthermore, when a new SEC Release or technical specification is introduced the AI model could be used to review, analyse, and identify new and amended requirements extracting these accordingly to be mapped against test cases.

The AI model could be used to summarise key sections of the documentation such as definitions and/or obligations from the SEC and technical specifications into a user-friendly and testable format. The model could be integrated with a Chat Bot feature, enabling the user to interact with the feature which could directly extract data from the SEC website, or pre-uploaded and indexed documentation, eliminating the need for resources to manually extract and index data requirements.

4.1.2 Requirements Mapping

Large Language Models (LLMs) could be used to analyse requirements and extract key information and map against potential test scenarios and relevant Service Request Variants (SRVs). This could prove to be useful to allow testing teams to focus on detailed technical testing responsibilities and use AI for mundane and/or repetitive tasks.

4.2 Test Artefacts

4.2.1 Test Artefacts Production

Test Artefacts Documentation (such as the test approach, test plan, etc.) could be produced using NLP and Machine Learning (ML) techniques to extract and interpret requirements from the SEC and other technical specifications and automatically generate a structured document in the template format utilised by the DCC or SEC Party. Furthermore, AI tools could be used

to analyse historical defect data raised by SEC Parties, DCC Incidents raised, energy consumer behaviour, and DCC system configurations, e.g., DSP Anomaly Detection Thresholds (ADT) to identify high-risk test scenarios and recommend targeted testing approaches.

4.2.2 Test Case and Script generation

Machine Learning algorithms and NLP techniques could be used by the DCC and SEC Parties to analyse changes to the DCC smart metering End-to-End system. By reviewing relevant design documentation and/or translating amended requirements from SEC and associated technical documentation, AI tools could generate detailed test cases/tests scripts and ensure the output adheres to the predefined structure and can be automatically uploaded to the chosen test tool automation framework.

AI tools could also reference source material, such as the DUIS and MMC to predict what fields should be returned in the test and inform whether the test is determined to be successful. This may speed up test creation but also ensure that the test cases are aligned with business requirements and are easily understandable by all team members. Additionally, the AI test tool could extract the test cases and create support documentation detailing test steps for the tester to follow as they execute a test script.

These tools could be used to produce a range of test cases suitable to the testing environments that the DCC and SEC Parties utilise, including Pre-Integration Testing (PIT) and Systems Integration Testing (SIT), where large regression test cases may be required, through to User Integration Testing (UIT) where focus could shift to key customer journeys such as Install and Commission (I&C), and finally Production Proving for automated pipe cleaning exercises using AI to check results are as expected. Test cases and scripts could also be tailored further to suit A-stream vs B-stream DCC deployments and major versus minor DCC Programme changes.

Furthermore, NLP could be used to support creating comprehensive and auditable test coverage records by automatically linking test cases to SEC regulatory and/or technical requirements from key specification documentation. AI tools could scan specifications, release notes, etc., to identify mandatory clauses, changed requirements, defect fixes, e.g., introduced by a SEC release or new firmware version and match them to relevant test scenarios/test cases. NLP could also allow non-technical stakeholders to contribute to test scripting process using plain language, with the AI converting the text to a technical test case/script.

AI could perform both static and dynamic analysis to identify high-risk areas within the codebase that require thorough testing (e.g., changes in GBCS that introduces new functionality, or changes to high impact existing functionality such as pre-payment).

To supplement this analysis, ML models could analyse historical test data utilised to train the AI testing models and defect trends to highlight under-tested areas of the code and improve coverage by suggesting additional test cases, e.g., edge test cases and test scripts focusing on meter-specific behaviours. Utilising this approach could help to ensure that test artefacts produced remain current, risk-focused, and align with evolving changes to the DCC smart metering ecosystem.

Table 2 - Summary of test case and script generation

Area	AI Use	Benefits
Test Case Generation	Translate requirements and design docs into structured test cases/scripts	Automates creation, ensures consistency, and integrates with test automation tools
Reference Material Analysis	Use DUIS/MMC to predict expected fields and validate test outcomes	Speeds up creation and ensures alignment with business needs
Environment-Specific Testing	Tailor test cases for PIT, SIT, UIT, and Production Proving	Supports varied testing needs from regression to customer journey validation
Deployment Adaptability	Customize for A-stream vs B-stream and major/minor programme changes	Enhances relevance and precision of test cases
Regulatory Linkage	Link test cases to SEC requirements using NLP	Creates auditable coverage and ensures compliance
Stakeholder Inclusion	Convert plain language input into technical test scripts	Enables non-technical contributions to test development
Risk Analysis	Perform static/dynamic analysis to identify high-risk code areas	Focuses testing on critical changes and high-impact functionality
Historical Data Utilisation	Analyse past test data and defect trends to suggest new test cases	Improves coverage, identifies under-tested areas, and adapts to evolving system changes

4.2.2.1 Test Case Prioritisation

AI powered test tools could support the DCC and SEC Parties to prioritise test cases for a new Programme, or release, by analysing historical defect data raised by SEC Parties, DCC gateway traffic, consumer usage patterns, and regulatory requirements to identify high-risk areas within the smart metering ecosystem. This could enable targeted testing of critical customer journeys such as moving a consumer from credit to pre-payment mode or changing an existing smart meter consumer tariff by testers, while reducing the effort spent on lower priority or redundant scenarios. The tool could also support prioritising whether test cases should form part of an automated regression pack or require more detailed human oversight.

4.2.3 Test Data Generation

Using AI for test data generation could be beneficial by automating the creation of diverse, and scalable datasets. By using critical documentation such as SMETS, GBCS, DUIS, MMC and the SEC as training inputs alongside knowledge from smart metering technical experts, the AI tools could generate high-quality and contextually relevant data aligned with operational conditions encountered in the DCC Production environment, e.g., interoperability challenges, improving test relevance and compliance with the SEC.

Furthermore, AI could be used to generate data tailored to specific testing environments (e.g., PIT, SIT, UIT) enabling a more demonstrative validation of various configurations and meter and Comms Hub types used, improving test coverage and scope as well as contributing to improving defect detection rates, reducing manual effort, accelerating test cycles and reducing the likelihood of critical issues entering Production. To maximise effectiveness, AI models should continuously be trained using feedback from DCC and SEC Parties Production incidents, defects raised by SEC Parties, new releases and SEC modifications documentation to generate up-to-date and relevant test data.

4.2.4 Simulation and Modelling

AI models could be used to simulate a wide range of scenarios faced by energy consumers in the DCC smart metering ecosystem such as prepayment top-ups or Change of Supplier (CoS) to support more comprehensive and representative testing. Predictive modelling could be used to simulate fault conditions (e.g. Loss of HAN, power outages, tampering and alerts) and edge cases, helping to identify potential vulnerabilities of a release before deployment into the Production environment.

AI could be used to simulate high-traffic scenarios across the DCC Gateway to ensure that Northbound and Southbound motorway perform well with differing volumes of traffic and that alerts are fed back in a timely manner. These simulations could be configured to align with SEC requirements, including but not limited to SEC Section G-Security and SEC Section I-Privacy and interoperability and allow testers to evaluate system performance, reliability, and compliance for a variety of day-to-day scenarios faced by energy consumers, that may be impractical or difficult to reproduce in existing test environments used. For example, AI could simulate emergency credit activation, peak usage periods or test the responsiveness of smart meters during tariff transitions.

4.2.5 Test Execution

An AI test tool could be used for test execution by automating repetitive and time-intensive tasks such as regression and performance testing, whilst enabling real-time reporting. The AI tools could be integrated with a data analytics platform and generate live test progress, coverage dashboards and analytics, allowing key stakeholders to monitor testing activities with greater efficiency.

Within the DCC smart metering ecosystem, AI could be used to execute test cases across the DCC A-stream and B-stream testing environments, while adapting to new releases and SEC modifications through the utilisation of high-quality test data.

By leveraging ML and predictive analytics, AI tools could prioritise high priority test scenarios to execute (e.g. change of mode, credit to pre-pay, prepayment top ups, setting and activation of emergency credit, Change of Tenancy (CoT), Tariff change, CoS, etc.), focus on testing areas previously identified as at risk due to DCC Production incidents raised or historical defect clusters, and detecting anomalies in real-time, thereby improving test accuracy and reducing critical defects being found in Production.

Using an AI tool for automation could also enable scalability and allow substantial numbers of test cases to be executed efficiently and filter out lower-priority tests and focusing on critical DCC customer journeys or business processes such as CoS. For AI automated test execution to work efficiently, it should be implemented with a robust governance process and continuous feedback loops into the test data used as noted above, to support enhanced test coverage, faster test execution, and a more agile and cost-effective testing lifecycle.

4.2.5.1 Test Script Self-healing

Using AI to support the self-healing functionality of test scripts in test automation could offer a proactive solution to maintaining test script reliability as the DCC smart metering End-to-End system continues to develop. When trained on diverse, context-rich datasets that have been guided by predefined business rules set by teams with smart metering business and technical expertise, AI tools could be used to automatically detect and adapt to changes in system behaviour or data structures, and update test scripts in real time. For example, updating device firmware versions, minimising the manual intervention required by testers in the DCC and SEC Parties, whilst reducing maintenance overhead for updating test scripts.

This functionality potentially could enable faster test execution by improving resilience to frequent release changes, e.g. firmware rollouts, whilst enhancing the scalability of testing frameworks. It may also allow testing teams to focus more on high priority or critical quality assurance activities, while routine script updates could be handled autonomously by the AI test tool, allowing overall efficiency and test coverage to be improved.

4.3 Anomaly Detection and Defect Management

Machine Learning models could be used to analyse large volumes of historical and real-time data across the DCC smart metering ecosystem to detect unusual patterns, such as unexpected spikes in response times, irregular meter readings, or system faults, that may indicate defects, tampering, or inefficiencies or underlying issues in the smart metering ecosystem.

This capability could enable earlier identification of issues, support targeted testing of defect fixes and/or high-risk components of the DCC architecture, improving overall test coverage. Using AI for anomaly detection can also support predictive analytics, facilitating the DCC and SEC Parties to anticipate defect-prone components of the smart metering ecosystem, reduce testing time and support optimising the allocation of testing resources (e.g., a process/area in the End-to-End smart metering ecosystem may be known to experience issues after a change has been made). The AI could highlight this anomaly to the relevant testing team, and they can ensure the AI training data is updated to guarantee more comprehensive and proactive testing cycles for this area. This proactive insight could help ensure that releases entering the DCC production environment are more robust and aligned with obligations under the SEC.

The DCC and SEC Parties could also look to integrate AI tools with existing testing workflows to reduce manual effort required by testers to spot anomalies, accelerate the defect triage and management process, and improve the reliability of test outcomes. To maximise effectiveness of the AI integration with existing testing workflows, the DCC and SEC Parties should ensure AI insights are validated by smart metering technical and business experts; and ensure models are trained on current and relevant data. The training datasets should be updated frequently to reflect recent changes, e.g., SEC modifications implemented into the DCC production environment, which would allow AI tools to spot anomalies and potential defects more efficiently.

4.4 Test Completion

The DCC and SEC Parties could improve and expedite their test completion activities through the use of AI. By automating the compiling and summarising of data inputs from a range of sources such as test execution results, defects, and coverage metrics, in conjunction with data visualisation and business intelligence tools, a test completion report could be created, this could help testers save the time and effort required in the past to compile and format documentation that comply with the DCC and SEC Parties reporting standards. As well as

enhancing consistency across documentation produced and reducing the risk of human error in data interpretation and potentially allowing resources to have more availability to support critical activities such as test design and stakeholder engagement.

In the DCC smart metering ecosystem, where testing spans multiple environments, AI could enable the faster production of an overall Test Report for a release to support Production go-live readiness assessments, by rapidly collating and formatting data from multiple artefacts from different test phases.

AI could support the DCC and SEC Parties verify that all necessary test artefacts have been completed and are accurately connected to testing results, during the closure of a test phase. This could lower the possibility of test case omissions and improve stakeholder confidence in the test assurance procedure. AI may also assist in aligning testing results with SEC regulatory requirements as the DCC smart metering ecosystem develops with new releases, promoting continuous improvement and operational effectiveness among SEC Parties.

5. Where AI should not be used?

The DCC and SEC Parties should consider that excessive reliance on AI to complete testing processes efficiently and accurately, may over time erode manual testing expertise by testers, which in turn leads to skill degradation and a reduction in tester's ability to validate the outputs from the AI test tool and intervene effectively when required.

Incorporating human oversight from smart metering Subject Matter Experts (SMEs) to review and validate AI testing inputs and outputs can help flag where poor test data has been used. The SMEs should have the appropriate business and technical knowledge of the smart metering ecosystem so they can assess results in depth and support identifying any areas requiring test data improvement before moving on to a later Test Phase or the Production environment.

There is no other particular area where the use of AI should be avoided, unless it is recommended by the Security Sub Committee.