



IECRE OPERATIONAL DOCUMENT

IEC System for Certification to Standards Relating to Equipment for Use in Renewable Energy Applications (IECRE System)

ME Certification Scheme: Conformity statement for new technology through Technology Qualification



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1 Scope of the Operational Document

Technology Qualification (TQ) is a process of providing evidence and arguments to support claims that the technology under assessment will function reliably in a target operating environment within specific limits and with an acceptable level of confidence (*IEC/TS 62600-4, Clause 3.5*).

The objective of a TQ process is to facilitate a marine energy product achieve certification. The scope of this Operational Document (OD) is to explain how a product can achieve certification through the practice of *IEC/TS 62600-4* and other product certification processes. In accordance with the IECRE, a successful completion of a product certification process leads to the award of a Conformity Statement. The various Marine Energy (ME) product certifications available are as follows:

1. Component certificates (OD320 – once published)
2. Prototype certificates (OD330 – once published)
3. Type certificates (OD340 – once published)
4. Project certificates (OD350 – once published)

This OD applies to ME technologies when assessed by an IECRE accepted Renewable Energy Certification Body (RECB) with a scope in TQ. At the outset of a certification process, the technology developer shall require to outline the product certification sought, so that an RECB can inform them about the relevant rules and procedures for a selected scheme and how that can be achieved through the TQ process.

The practice of TQ in accordance with *IEC/TS 62600-4* leads to the award of a Feasibility Statement through a two-stage process. Both stages are covered in *IEC/TS 62600-4* and illustrated in Figure 1.

Stage 01: This stage involves a comprehensive technology appraisal concluding with the issuance of the Technology Appraisal Report (scope covered by *OD 310-4, Sections 5.1 – 5.6*).

Stage 02: This stage includes the preparation of a Technology Qualification Plan, which upon approval, results in the award of a Feasibility Statement by the RECB (scope covered by *OD 310-4, Sections 5.7 – 5.8*).

Beyond the scope of *IEC/TS 62600-4*, a Conformity Statement (or product certification through one of the above-mentioned schemes) is achieved by pursuing “Other Certification Activities” as illustrated in Figure 1 (scope covered by *OD 310-4, Sections 6.1 – 6.2*). Details of these activities are not covered by *IEC/TS 62400-4* but follows the TQ process.

2 Abbreviations

See *IEC/TS 62600-4, Clause 3.6* for a list of abbreviations used.

3 Terms and definitions

See *IEC/TS 62600-4, Clause 3* for a list of terms and references used.

4 Required documents

See *IEC/TS 62600-4, Clause 6.8* for a list of documents required for Technology Qualification.

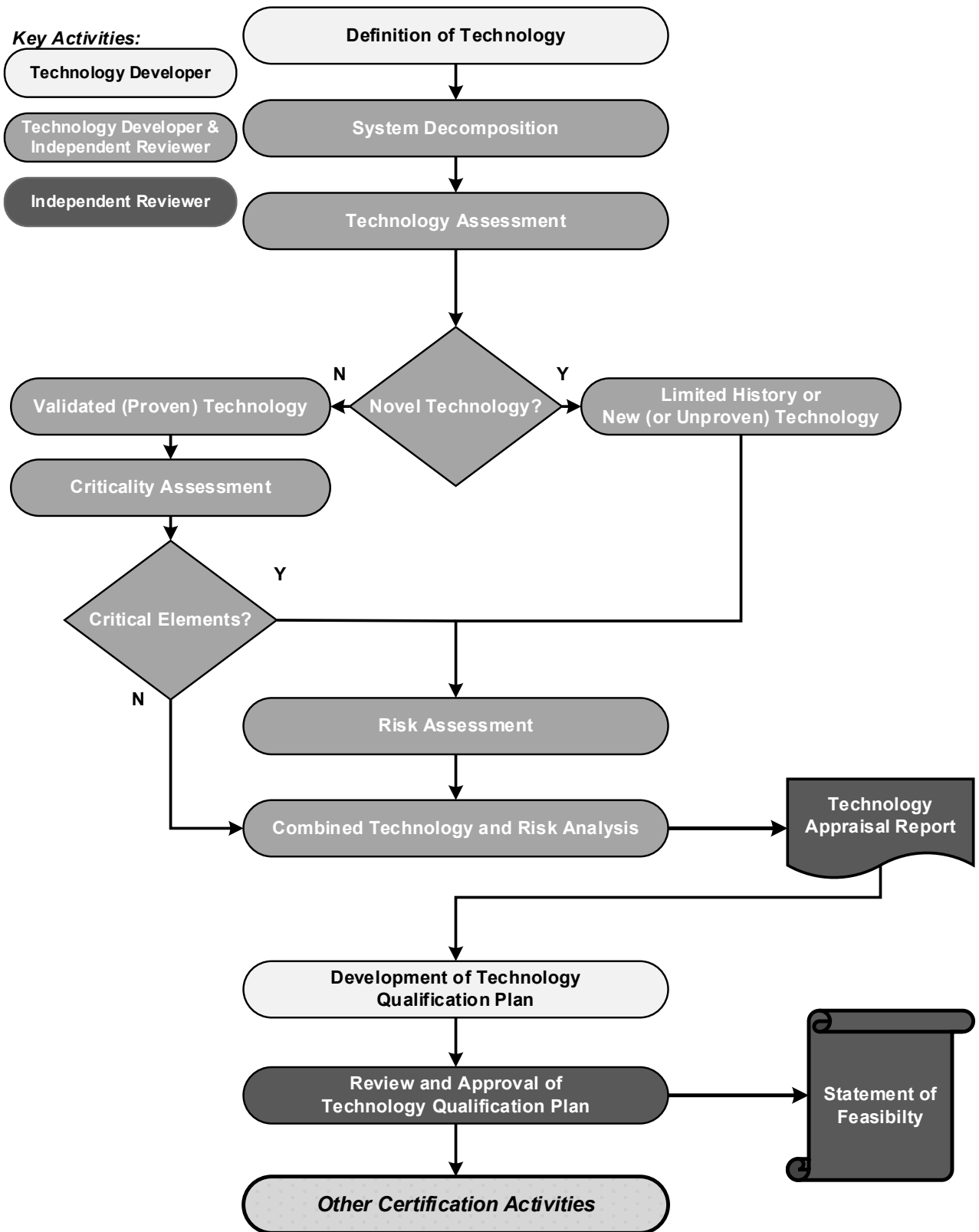


Figure 1: Technology Qualification process
(Reprinted from IEC/TS 62600-4 Ed. 1, Figure 1)

5 Technology Qualification process

5.1 Application for Technology Qualification under IECRE

The entry point into the IECRE certification process is through an application for Technology Qualification (TQ). This application process is outside of the scope of the IECRE system and this request should be made directly to an RECB by a technology developer. A list of RECB with a scope for providing marine energy Technology Qualification services in accordance with IEC 62600-4 is available on the IECRE website.

The role of an RECB is to lead an independent review of a technology by overseeing the various technology appraisal activities defined in *IEC/TS 62600-4* and issue the deliverables at the outcome of each stage of the Technology Qualification process (see stages 01 and 02 below). Beyond the scope covered by *IEC/TS 62600-4*, the RECB shall also be involved with certification activities and issue a Conformity Statement upon completion of the process.

OD310 -4 Annex A offers guidance of what an RECB should request as part of the application being made. As part of the application and in consultation with the RECB, the technology developer should indicate what they expect to receive from the process. Upon acceptance of an application, a commercial contract should be negotiated between the RECB and the developer, and the necessary logistical arrangements (e.g. venue, dates, duration, etc.) for a Technology Qualification Workshop, finalised.

5.2 Preparation for Technology Appraisal

The evaluation of a technology should undergo several pre-workshop activities to prepare the technology developer as well as other participants for the proceedings in a Technology Qualification workshop. Following the conclusion of these pre-workshop activities and by adopting *IEC/TS 62600-4*, a formal evaluation of the technology shall commence in the context of a Technology Qualification Workshop. The RECB shall lead the workshop and may be supported by external technical specialists, as required.

The outcomes from pre-workshop activities should form the key inputs to the workshop to establish a definition of the technology. See *IEC/TS 62600-4, Clause 6.3* for the aspects that are required to be covered as part of the definition. Additionally, aspects mentioned in *IEC/TS 62600-4, Clause 6.8* should also be considered to provide support for an assessment of the technology.

5.3 System decomposition

During the Technology Qualification Workshop, a logical process of system decomposition shall be conducted to determine the various components/subsystems of the technology that need to be analysed. See *IEC/TS 62600-4, Clause 6.4* for the elements that should be considered during this stage of the process. The outcome of this stage shall deliver a confirmed list of components/subsystems that make up the overall technology.

5.4 Technology assessment

Following a process of system decomposition (see *OD 310-4 Section 5.3*), the identified components/subsystems shall be evaluated through a technology assessment process to establish the technology class for each element identified. By adopting a sequence of assessment activities, such as the ones suggested below, the technology class for each of the identified components/subsystems can be established.

- a. Assign a Technology Readiness Level (TRL) of each component/subsystem identified during the system decomposition process (see *IEC/TS 62600-4, Annex B*).
- b. Assign an Integration Readiness Level (IRL) characterising the maturity of integration between various components/subsystems of the technology, and other technologies they interface with (see *IEC/TS 62600-4, Annex C*).

- c. Determine the modified Technology Readiness Level (*mTRL*) of each component/subsystem. This is derived by revising the TRL of a component/subsystem based upon the IRL between its interfaces (see *IEC/TS 62600-4, Annex D*).
- d. Upon determining the *mTRL* for each component/subsystem and in accordance with previous experience of having applied it in the intended Marine Energy environment, the respective component/subsystem should be classed in terms of their degrees of novelty (see *IEC/TS 62600-4, Clause 5*).

The resultant classification obtained at the outcome of this process shall influence the intensity of further qualification activities, as required.

5.5 Risk and Criticality assessment

The outcome from the technology assessment stage (see *OD 310-4 Section 5.4*), informs the type of risk assessment techniques that should be implemented for the technology being reviewed. See *IEC/TS 62600-4, Clauses 6.8 and 6.10* for the elements that should be considered during this stage of the process.

To gain an in-depth understanding of the cause of failures, its associated failure modes and possible mitigation methods, a recognised risk assessment technique shall be adopted. *IEC/TS 62600-4, Annex A* provides more information on the development of a risk-ranking, if used. Additionally, other risk assessment techniques may also be adopted, as appropriate.

5.6 Issuance of Technology Appraisal Report

Following the satisfactory completion of the above Technology and Risk assessments (see *OD 310-4 Sections 5.4 and 5.5 respectively*), the results shall be captured in a document referred to as a Technology Appraisal Report. *IEC/TS 62600-4, Clause 7.1* provides the elements that shall be included in the Technology Appraisal Report. Following consultation with all workshop participants, this report shall be issued by the RECB. This Technology Appraisal Report then becomes the formal terms of reference for the remainder of the certification process and the basis of the Technology Qualification Plan, which shall be produced by the technology developer.

5.7 Development of Technology Qualification Plan

The Technology Qualification Plan shall be guided by the type of certification being sought and should be developed in accordance *IEC/TS 62600-4, Clauses 6.11, 6.12, 7.2 and Annex E*. All elements specified in the Technology Appraisal Report (see *OD 310-4 Section 5.6*), especially the findings from the Technology Qualification Workshop, shall require to be considered when preparing this document.

As an independent reviewer, the RECB or other external discipline specialists assessing the technology shall not be involved in the preparation of the Technology Qualification Plan. However, the technology developer may engage any third-party entity in the support of its development or to provide details concerning intended Technology Qualification activities. *OD 310-4 Annex B* offers a template consisting of the minimum requirements for the assessment of a Technology Qualification Plan, which can be shared with the technology developer.

Upon completion, the Technology Qualification Plan shall be submitted to the RECB for review and approval.

5.8 Technology Qualification Plan review and Issue of Feasibility Statement

The review of the Technology Qualification Plan shall ensure that it is developed in accordance with the type of certification being sought. The document shall require that all recommendations highlighted in the Technology Appraisal Report be included. Further, it shall also be confirmed that there are clear links between the definition of the technology (see *OD 310-4 Section 5.2*), the technology and risk assessments (see *OD 310-4 Section 5.4 and 5.5 respectively*) and the acceptance criteria for the TQ activities contained in the Technology Qualification Plan. If any of these are unclear, the technology developer should be notified and requested that the document be updated to demonstrate the above.

However, upon review, if the RECB is satisfied that the identified issues of concern can be addressed during the implementation of the Technology Qualification Plan, and the upon successful completion of the various qualification activities, the technology can meet the requirements for the intended certification, the document can be approved.

Approval for the Technology Qualification Plan is granted in the form of a document, known as a Feasibility Statement. A template for a Feasibility Statement is provided in *-OD 310-T01*. Upon issuing this document, the RECB confirms that the final version of the Technology Qualification Plan received has been reviewed and accepted. Following the issuance of a Feasibility Statement, the technology developer may proceed to implement the TQ activities as stated in the Technology Qualification Plan.

6 Conformity Statement process

6.1 Implementation of certification activities

This section concerns “Other Certification Activities” as illustrated in Figure 1 and referenced in *OD310-4 Section 1*. Certification activities refer to several qualification activities that require to be implemented in support of the certification being sought. These activities along with their associated acceptance criteria shall be included in the approved Technology Qualification Plan. Some of these activities may consist of witnessing key tests by the RECB, if identified in the Technology Qualification Plan. Additionally, test reports from accredited Renewable Energy Test Laboratories (RETL) shall also be accepted for qualification activities. Any test report submitted in support of an identified qualification activity shall be based upon an independent verification of that test. The RECB shall also inform the technology developer of the requirement to maintain detailed records to all tests (and results), as these will be required for the performance review stage of the process (see *OD 310-4 Section 6.2*).

While various tests as identified in a Technology Qualification Plan form the bulk of qualification activities, a performance review (see *OD310-4, Section 6.2*) extends beyond the assessment of test results. Validation involves an assessment of test-results against acceptance criteria for each test. Performance review involves a validation that the component/subsystem as unit will function reliably in the intended environment under defined conditions when integrated with other systems/technologies. The Conformity Statement issued at the end of the certification stage will be in accordance with the validated status of the component/subsystem in relation to its stage of development (e.g. prototype scale)

As lessons learned through the course of testing are valuable to the wider Marine Energy sector and can help in improving the quality of Standards being developed, if a test fails, the test report shall indicate this along with possible reasons for the failure. A test can be repeated as often as needed to ensure the results meet or exceed the acceptance criteria as stated in the approved Technology Qualification Plan. However, no modification to any approved Technology Qualification activity, their acceptance criteria or variation in test procedure, shall be accepted without the approval of the RECB. Equally, the approved version of the Technology Qualification Plan shall not be revised to reflect any modification to test procedures or acceptance criteria, without the consent of the RECB.

6.2 Performance review and issue of a Conformity Statement

Prior to issuing a Conformity Statement, the RECB shall conduct a comprehensive review of the technology for the certification being sought. The performance review shall be in accordance with *IEC/TS 62600-4* and the relevant OD for the product certification being pursued. The review shall include all test results alongside the respective acceptance criteria for each of the tests followed by a performance review. Additionally, other key documents produced during the implementation of the Technology Qualification Plan (e.g. a power performance report) shall also require to be reviewed. The checklist provided in *OD310-4 Annex C* can assist with this task. Following a review of the aforementioned documents, the RECB shall conduct a final oversight of the assessed technology, to ensure no TQ activity remains incomplete and the results from the performance review are accepted.

Upon satisfaction that the above requirements have been achieved, the RECB shall issue a Conformity Statement. The template provided in *OD 310-T01* shall be used for the issuance of this document.

6.3 **Validity of a Conformity Statement**

Upon issuance, a Conformity Statement is valid for a five-year period from the date of issue. This document confirms that an assessment of the technology was undertaken in accordance with the IEC/TS 62600-4 (and any other applicable standards or ODs), and that it conforms to the requirements of the acceptance criteria as stated in the attached Technology Qualification Plan, unless any limitations have been identified during the performance review process.

Additionally, the Statement is awarded on the assumption that no variation to the final design submitted for testing and approval will be made to the technology, and that the technology will not be deployed out with the approved area of application.

A Conformity Statement ceases to be valid and can be revoked if any of the abovementioned conditions are breached without the consent of the awarding RECB.

Annexes

- A. Application form for Technology Qualification [Informative]
- B. Template for a Technology Qualification Plan [Informative]
- C. Checklist when conducting a Performance Review [Informative]

Annex A: Application for Product Certification through Technology Qualification [Informative]

The purpose of this application form is for an RECB to initiate a technical and commercial discussion with the technology developer (also known as the Applicant) to understand more details about a proposed project before any contract is negotiated.

While each RECB might determine their own structure for an application form, the items below should be included in the application form, as a minimum. This application is made by a technology developer seeking either a Feasibility Statement, a Conformity Statement, or both, from an approved RECB with a scope in Technology Qualification.

| | | | | |
|---|-------|---------------------------|---------------|-------|
| Technology Developer / Business Entity: | | | | |
| | | | | |
| Postal Address: | | | | |
| | | | | |
| Contact telephone:(primary) | | Email address:(primary) | | |
| Landline: | | | | |
| Mobile: | | Name: | | |
| Contact telephone:(secondary) | | Email address:(secondary) | | |
| Landline: | | | | |
| Mobile: | | Name: | | |
| Title of Technology: | | | | |
| | | | | |
| Brief synopsis of the Technology: | | | | |
| | | | | |
| Claims of the technology: <i>(what would be the benefits of deploying this technology)</i> | | | | |
| | | | | |
| Type of device: <i>(cross-out what does not apply. If Other, please provide more details)</i> | | | | |
| Wave | Tidal | River Current | Ocean Thermal | Other |
| Other <i>(please provide more details)</i> : | | | | |
| | | | | |
| Conformance / Functional specifications: <i>(this will later become the basis for the Definition of the Technology and the terms of reference throughout)</i> | | | | |
| | | | | |

| | |
|--|----------------------|
| Type of Product Certification requested: <i>(cross-out what does not apply) Please provide more details, as appropriate)</i> | |
| Product Certificate | Details |
| Component | |
| Prototype | |
| Type | |
| Project | |
| <i>Other</i> | |
| Additional details <i>(not covered above)</i> : | |
| | |
| | |
| Signature: | Business Stamp: |
| | |
| | |
| Full name of authorised signatory: | Date of application: |
| | |
| | |
| <p><i>Please note: Following the acceptance of the application, the RECB may request several detailed technical documents from the technology developer to inform their decision concerning a commercial contract. If this is the case, the technology developer could seek to arrange for a mutual confidentiality agreement (or a non-disclosure agreement) before submitting the documents requested.</i></p> | |

Annex B: Template for a Technology Qualification Plan [Informative]

The Technology Qualification Plan should contain the following items at a minimum. All items in Section A should be completed only once. All items from Section B should be repeated for each Technology Qualification activity.

Section A:

The following template applies to all qualification activities and should not be replicated.

| |
|--|
| A.1. Title of Marine Energy Technology: |
| |
| A.2. Name of Technology Developer: |
| |
| A.3. Project Reference no: |
| |
| A.4. Technology Appraisal Report no: <i>(include version no. and Date of Issue)</i> |
| |
| A.5. Scope the Technology Qualification Plan: |
| |
| A.6. Referenced Documents: <i>(e.g. Workshop Report, Basis of design, etc.)</i> |
| |
| A.7. Definition of the Technology / Functional Specification: <i>(as stated in the Technology Appraisal Report)</i> |
| |
| A.8. Risks indicated in Technology Qualification Plan |
| |
| A.9. Summary of Technology Assessment <i>(as stated in the Technology Appraisal Report)</i> |
| |
| A.10. Summary of Risk Assessment <i>(as stated in the Technology Appraisal Report)</i> |
| |
| A.11. List and contact details of External Specialists, Consultants, etc. involved with the development of the technology <i>(include any vendor packages too)</i> |
| |
| A.12. Referenced bibliography: <i>(e.g. Research papers, technical data manuals, etc.)</i> |
| |

Section B:

The following template should be replicated for each Technology Qualification activity conducted to address and mitigate one or more issues of concern identified in the Technology Appraisal Report.

| |
|---|
| B.1. Brief description of Technology Qualification activity: |
| |
| B.2. Impacted Components/Subsystems |
| |
| B.3. Which goal does it target/address (<i>see Section A.7</i>) |
| |
| B.4. Details of the Technology Qualification activity procedure required to meet acceptance criteria |
| |
| B.5. Documentation to be produced prior to the test (<i>e.g. Procedures, User manuals, Simulation software, etc.</i>) |
| |
| B.6. Details of Acceptance Criteria (<i>what is considered a PASS/FAIL</i>) |
| |
| B.7 Documentation to be provided after the test (<i>e.g. Test report, etc.</i>) |
| |
| Other information: |
| <ul style="list-style-type: none"> - Who is Responsible, Accountable, Consulted and Informed (RACI) for the activity, - Timeline/ Schedule when test will be performed, - Proposed venue for test (<i>e.g. Test Laboratory location</i>), - Documentation to be produced following the test (<i>e.g. test report, graphs, etc.</i>) |

Annex C: Checklist when conducting a Performance Review [Informative]

Prior to issuing a Conformity Statement, The RECB shall ensure that, at a minimum, the items on the checklist below have been reviewed and their respective contents considered to be satisfactory in accordance with IEC/TS 62600-4 and this OD. The items on this checklist are non-exclusive and an RECB should augment this list depending upon the content of the Technology Qualification Plan and any supporting Technology Qualification activities required beyond the approved Technology Qualification Plan.

Note: Item 4 should be replicated for each qualification activity as stated in the approved Technology Qualification Plan

| No | Task | Requirement | Yes | No |
|----|--|---|-----|----|
| 1 | General | Have the following items been submitted and archived? | | |
| | | i. Technology Appraisal Report (issued by RECB) | | |
| | | ii. Technology Qualification Plan (approved by RECB) | | |
| | | iii. Feasibility Statement (issued by RECB) | | |
| 2 | Project review | Have the following activities been completed? | | |
| | | i. All qualification activities identified in the Technology Qualification Plan | | |
| | | ii. Insertion of tests reports into the relevant sections of the qualification activities identified in Technology Qualification Plan | | |
| 3 | Technology Device and operational-personnel information | Have the following documents been submitted? | | |
| | | i. Device operation manuals, if appropriate | | |
| | | ii. Competency requirements for device operators | | |
| | | iii. Commissioning and Maintenance details | | |
| | | iv. Health and Safety requirements, as related to the device and operational personnel | | |
| 4 | Review of Qualification Activity-01 <i><replicate this item for each qualification activity identified in the Technology Qualification Plan and update the activity number accordingly></i> | Have the following been received and reviewed for the qualification activity <i><insert details here></i> : | | |
| | | i. Was the test conducted using the approved procedure in the Technology Qualification Plan | | |
| | | ii. Have the test results been correctly recorded and archived | | |
| | | iii. Has the results of the qualification activity been signed, dated and | | |

| | | | | |
|---|--|---|--|--|
| | | stamped by an authorized (and competent) test engineer | | |
| | | iv. Has the test-report expressly stated that results of the qualification activity have met or exceeded the approved acceptance criteria | | |
| Additional Documents reviewed (e.g. <i>Power Performance Report</i>) | | | | |
| | | | | |
| Final Remarks/Comments, if any: | | | | |
| | | | | |
| Signature: | | | | |
| Final reviewed conducted by (Name): | | | | |
| Date: | | yyyy-mm-dd | | |

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