



ICT Call 4 - ICT for Energy Efficiency
ICT services and software tools enhanced with energy features

FIT4Green

Federated IT for a sustainable environment impact

Project N° 249020

Quality Assurance guidelines

D1.2

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I. INTRODUCTION

I.1. Purpose

This document is the Quality Assurance Management Plan for the FIT4Green project.

This plan has been generated according to the general GFI procedures, since GFI is the entity coordinating the projects, which have been adapted to the necessities of FIT4Green. It summarises the implementation of GFI Quality Assurance Policies, customising the GFI QMS procedures and methodology (which are a compliment to ISO 9001:2008 standard) on this project.

The main purposes of this plan are:

- Define the means of satisfying the objectives for the quality assurance process, and to establish the activities and resources (human organisation, methods and tools) to carry out them, and
- To provide for monitoring all related activities to assure that the project will meet its specified requirements and will be fit-for-use.

This Plan defines the activities and resources necessary to ensure that the quality requirements of the project are met. It defines quality standards (based on ISO9000:2008 principles), quality requirements, quality assurance methods, quality assurance activities and configuration management. It also defines policies for identifying threats on the project and for implementing corrective actions.

I.2. Scope

This Plan is applicable to FIT4Green project from KOM milestone until end of project.

I.3. Definitions and Acronyms

I.3.1. Acronyms

Acronym	Description
DoW	Description of Work document – Technical annex of the Grant Agreement
IPR	Intellectual Property Rights
ISO	International Organization for Standardization
KOM	Kick-Off Meeting
MC	Management Committee
PM	Project Manager
PMB	Project Management Board
QA	Quality Assurance
QAP	Quality Assurance Management Plan
QMS	Quality Management System
SW	Software
V&V	Verification and Validation
WPL	Work Package Leader
WPLC	Work Package Leader Committee

1.3.2. Definitions

1.3.3.

Definition	Description
Acceptance	The act of an authorized representative of the customer by which the customer assumes for itself, or as an agent of another party, ownership of existing and specified products tendered, or confirms satisfactory performance of specific services, as partial or complete performance of the contract on the part of the supplier.
Quality Record	Document (written or stored on any data medium) which provides objective evidence of activities performed or results achieved.
Validation	Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. (In design and development, validation concerns the process of examining a product to determine conformity with user needs)
Verification	Confirmation by examination and provision of objective evidence that specified requirements have been fulfilled. (In design and development, verification concerns the process of examining the result of a given activity to determine conformity with the stated requirements for that activity).

II. MANAGEMENT

II.1. Human Resources

II.1.1. Organization

Total project organisation and details about the responsibility can be found in the FIT4Green Description of Work Section B.2.1.

The following figure illustrates the structure of the project management organisation:

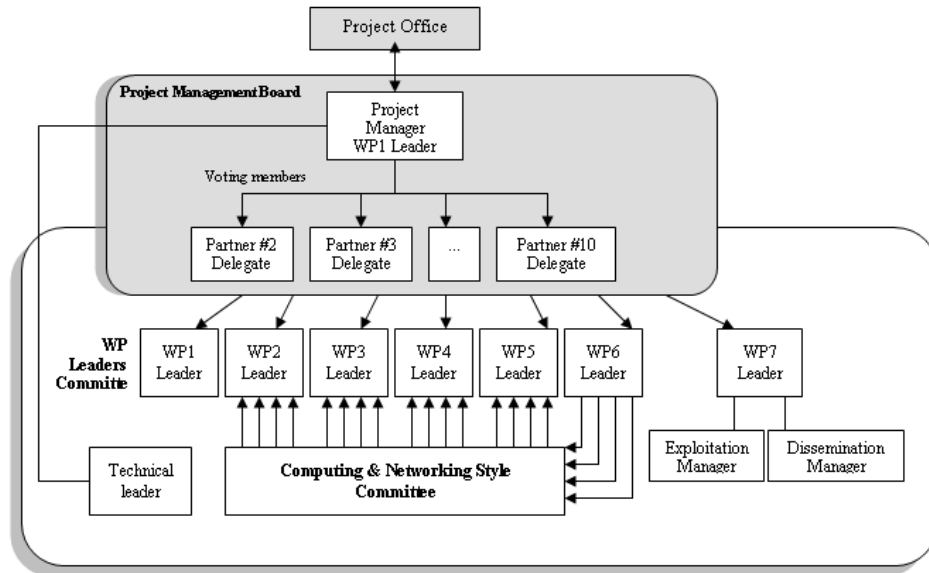


Figure 1 - FIT4Green Management Structure

II.1.2. Roles

The **Project Manager (PM, GFI)** will be the Quality Assurance responsible of the project.

The PMB will have the overall responsibility for ensuring the quality of project results.

The **WPL** will have the responsibility for ensuring the quality of the Work Package they are leading.

II.2. Tasks

The activities related to Quality Assurance last all the project life cycle.

The internal reviews mark the start and end of each phase.

II.2.1. Activities for the deliverables

The control of the deliverables processes will be done by the **PM** by means of the following actions to ensure that the quality level for the whole project will be maintained:

- Fortnightly meetings with the total consortium in order to:
 - Review the general state of the project regarding the delivery dates for the deliverables.
 - Solve internal issues/disputes scaled by each WPL.
 - Ensure all the contributors are participating.

- Reporting for the meetings referencing new possible risks detected and including the risk owner.
- To review each final deliverable confirmed by the WPL in order to ensure that all the requirements are met before to be sent to the EC.
- To review the reports sent every six-month by the WPL to be assured that each work package is progressing according to plan.

The activities related with the deliverables regarding the WPL are:

- Periodical meetings (Timing stated by each WPL) with the rest of contributors of the WP.
- Reporting for each meeting including:
 - New risk detected and the risk owner.
 - WP plan update if needed.
- Periodic Management Report every 6 months.

II.2.2. Activities for the Software

The control of SW processes and data is done by means of the following planned and systematic actions to provide adequate confidence that the product conforms to its requirements:

- Produce and maintain this QAP and check that is being followed.
- Review all plans for consistency, completeness and adherence to standards.
- Review significant samples of technical documents (test specifications, test procedures and tests reports) to ensure that approved standards, methods and tools are used.
- Verify consistency of baseline definition.
- Ensure that traceability is maintained.
- Monitor project risk management by reviewing the periodic project progress reports.
- Check of phase output data (especially by means of reviews based on random samples of each software life cycle data). The results of each checking will be recorded, in accordance with internal procedures
- Support the project in QA topics.
- Report on QA activities.
- Co-ordination with customer quality assurance responsible.
- Production of Quality Records. As a result of QA activities done inside the project (not only by QA responsible) quality records will be produced.

II.2.3. Conflict resolution

As described in the document Annex I – Description of work (B.2.1.2) there will be attempts of arbitration in increasing order of authority:

WPL->WPLC->PMB->PM->EC Project Officer

A register with the following information will be created:

- Conflict description
- Date of the conflict start
- People involved
- Solution
- Date for the solution

II.3. Quality Reporting

The QA responsible informs of the performance of his activities in the periodic meetings. Contents of quality reports required by customer QA requirements will be:

- Quality assurance and Control activities performed during the period
- Planned QA activities for next period
- Summary of non-conformances, deviations, waivers status
- Major problems and open points
- QA organisation status
- Metrics analysis

II.4. Reporting to the EC

Reporting will be ensured by the Project Manager and will adhere to the practices of the ICT Office for the 7th Framework Programme. For the time being, the consortium based its estimation of workload and costs on the following assumptions:

- Half-yearly status reports to the Project Officer via email or letter,
- Annual Periodic management reports including cost statements and audit certificates,
- Annual review meetings.

II.5. Responsibilities

It is worth to discriminate here, the difference among QA control vs. V&V control that shall be applied in the project.

In general terms, QA target is to verify the software life cycle data and implemented processes are compliant with Quality requirements. This verification is based on random samples that provide the objective proofs to demonstrate that approved plans and applicable standards and Quality requirements are being followed properly.

The V&V target is to verify all software life cycle data applying in a systematic way.

II.6. Project communication mechanisms

The information flow will rely on the following mechanisms:

- For daily work and exchange of documents, the basic communication means will be electronic mail and Skype conferences.
- A Web server, for the Internal Portal description, will be set-up, with private access for consortium members to offer:
 - A project's library that contains all deliverables and documents relating to the project.
 - Forums and news.
 - A simple project management application allowing all participants to report online.
- A public Web server is being set up to present the project and to publish on-line all public deliverables and relevant publications.
<http://www.fit4green.eu/>
- All deliverables shall be presented in documentary form and will be a valid representation of the outcome of the work in the project and provide tangible evidence of the achievement of the objectives of the project. They will be subject to quality control before being communicated to the European Commission as explained at point II.2.1

III. STANDARDS, PRACTICES AND CONVENTIONS

III.1. Documentation

III.1.1. Documentation distribution procedures

- Authorisation for the distribution and provision of project documents and results must be controlled.
- Distribution lists of any project material (including documentation) will be kept and controlled.

III.1.2. Documentation Standards

- All documentation generated in project, will be distributed among partners in Microsoft Office (version 2003 for compatibility)
- Public documentation will be distributed in PDF format
- This project uses as document templates the FIT4Green ones for all deliverables
- Following extensions, will be considered:

Ext	Functionality
.doc	Word Processor
.xls	Spreadsheet
.ppt	Presentations
.pdf	Documents for distribution
.zip	Compressed documents

- FIT4Green naming conventions shall be used

III.1.3. Documentation Naming Conventions

III.1.3.a. Deliverables

All deliverables will use following naming conventions:

DX.Y-DELIVERABLENAME_vZ.W.EXT

Where:

- DX.Y, indicates deliverable number where X is the name of the work package that the deliverable belongs to and Y is the number of the deliverable within the work package. This reference will be indicated as “Document Reference”, using {Keywords from Properties} at document
- DELIVERABLENAME is the name of deliverable indicated in the DoW and will be indicated as “Title” at document. In case of an excessive length, an abbreviation will be considered.
- vZ.W is the document version; Z will be indicated by document editor who will be the document responsible, as W will identified other contributors. This information will be indicated as “Version”, at document
- EXT, is the file extension, and only indicated values will be considered.

III.1.3.b. Other Documents

Rest of documents will use following notation:

TYPE CONTEXT DOCUMENTNAME_DATE_vZ.W.EXT

Where:

- TYPE, indicates document character. Following values will be considered:

Value	Type
<i>Minute</i>	<i>For Minutes</i>
<i>Agenda</i>	<i>For agendas</i>
<i>Report</i>	<i>For reports</i>
<i>Presentation</i>	<i>For presentations</i>
<i>Template</i>	<i>For document templates</i>
<i>Internal</i>	<i>For Internal documentation</i>

- CONTEXT, informs about information context. Following values will be considered:

Value	Context
<i>WPx</i>	<i>For WorkPackages</i>
<i>Tx.y</i>	<i>For Tasks</i>
<i>PhC</i>	<i>For Conference Call</i>
<i>Meeting</i>	<i>For meetings</i>

- DOCUMENTNAME, is the name of document (if needed)
- DATE - when strictly necessary - will indicate date information in YYYYMMDD format
- vZ.W is the document version; Z will be indicated by document editor who will be the document responsible, as W will identified other contributors.
- EXT, is the file extension, and only indicated values will be considered.

III.1.4. Templates

Document templates will be elaborated, and distributed among partners.

III.2. Information Management

III.2.1. Deliverables Process Review

To ensure the highest quality of the deliverables the following Quality assurance procedure will be implemented:

- Each deliverable has an owner (a partner), who is responsible towards the *FIT4Green* Project Management Board. The owner is appointed by the leader of the work package to which the deliverable belongs. The owner of the deliverable is formally announced to the *FIT4Green* mailing list at least two weeks before the Table of Content (ToC) draft should be created by the owner.
- The deliverable process review will be performed following these steps:
 - Review by the partners with efforts in the work package.

- Preliminary approval by the technical leader.
- Final approval by the project manager.
- Once the deliverable is ready for submission, the Project Manager will send it to the EC Project Officer via email in pdf format.

Documentation Review

All documents shall be produced and reviewed internally within the Consortium partnership.

One or several of the following reviews criteria will be used in an internal document review:

- Consistency,
- Understand-ability,
- Uniform typing format,
- Trace-ability,
- Appropriate analysis, design and coding techniques used,
- Checking algorithms suitability and correctness,
- Appropriate allocation of sizing and timing resources,
- Adequate test coverage of requirements,
- Testability of requirements,
- Adequacy of test cases and procedures
- Completeness of testing.

III.2.2. Repository

All project information will be hosted in a common repository with a login/password access per partner. The repository is hosted by the Project Manager.

The repository in use is Subversion.

The recommended client is TortoiseSVN 1.6.7, Build 18415 - 32 Bit.

III.3. Software Requirement Specification (SRS)

The external standard IEEE Std 830-1998 (IEEE recommended practice for software requirements specifications) to create software requirement document will be followed for each major module of the system. Each SRS will include a complete description of the behaviour of the module to be developed. It will include a set of use-cases (functional requirements) that describes all the interactions that the users will have with the software. In addition to use cases, it will contain non-functional (or supplementary) requirements.

The SRS will be included into the deliverables D.2.1 and D2.3.

III.4. Software Design Descriptions (SDD)

IEEE Std 1016-1998 (IEEE recommended practice for software design descriptions) will be used for each major module of the system, providing an overview of the module, a complete description of its design and its main sub-modules. It will also include a comprehensive description of the module's interaction points with the other modules and the testbed. SDDs will be "live documents" and will be updated upon completion of design iteration of each of the three testbed experimentation phases.

The SDD will be the deliverables D.2.2 and D2.4.

III.5. Design Standards

The **design specifications** will include protocols, system and sequence diagrams, user interface sketches & mock-ups, where necessary, as well integration and testing procedures. The overall design language used will be the UML (Unified Modelling Language) as specified by the MC.

The documents will be organized following a common template:

- An initial section covering a unifying view of the specific subject of the document: This will serve the purpose of defining the common element that is shared across multiple work packages, with a horizontal view on the project.
- One section with the specifics related to the activities of each WP covered by the document.

III.6. Coding Standards

Open source software such as free and Java language will be used whenever possible.

A program/tool (e.g. Maven) to help Java programmers adhere to standards and good coding practices should be used.

III.7. Testing Standards and Practices

Test Description (TD) templates for each major module of the system, which will be included in the testing and evaluation specifications and guidelines.

IV. METRICS

IV.1. Management Project Metrics

IV.1.1. Cost Precision

Indicator/Target	<p>The project shall have at least a 90% of project planning budget precision.</p> <p><i>From M1 to M30:</i></p> $(1 - (\text{Monthly actual cost} - \text{Monthly planned cost}) / \text{Monthly planned cost}) * 100$
Follow-up	Project progress reports
Responsible	Project Management Officer (PM)
Data	Project Survey reports and manual calculation by means of Excel sheets/graphs (charts)

IV.1.2. Delivery Precision

Indicator/Target	<p>The project shall have a 90% of project planning delivery precision.</p> <p><i>From M1 to M30:</i></p> $(1 - (\text{Actual duration} - \text{Planned duration}) / \text{Planned duration}) * 100$
Follow-up	Project progress reports
Responsible	Project Management (PM)

V. RISKS MANAGEMENT

V.1.1. General

Risk management is a systematic and iterative process for optimizing resources in accordance with the project’s risk management policy. It is integrated through defined roles and responsibilities into the day-to-day activities in all project domains and at all project levels. Risk management assists managers and engineers by including risk aspects in management and engineering practices and judgements throughout the project life cycle, including the preparation of project requirements documents. It is performed in an integrated, holistic way, maximizing the overall benefits in areas such as:

- design, manufacturing, testing, operation, maintenance, and disposal, together with their interfaces;
- control over risk consequences;
- management, cost, and schedule.

Within the risk management process, available risk information is produced and structured, facilitating risk communication and management decision making. The results of risk assessment and reduction and the residual risks are communicated to the project team for information and follow-up.

V.1.2. Principles

Risks will be ranked from **1 (high)** to **5 (low)**, the ranking is based on impact on the project and likelihood of occurrence. All risks will be managed actively: *Rank 1* risks must be evaluated continuously and reported to the coordinator.

The responsible WP leader must evaluate and report the risks quarterly. For all identified risks, efficient contingency plans (resource reallocation, fall-back, contingency measures) will be implemented immediately.

The preliminary list of risk can be review in the DoW section B.1.3.11.

V.1.3. Risk monitoring and reporting

The risk monitoring will be performed in the periodic meetings. When a risk is identified the identifier partner needs to report the risk without any delay 1) to the WP leader to which the risk belongs and 2) to the project manager. A register with the following information will be created for the risk:

- Risk description.
- Risk owner.
- Risk response.
- Risk response owner.

The template to report a risk is the following:

Risk ID¹:		Related Project	
		Related Project Activity	
Date Identified:		Originator²:	
Risk Statement:			

¹ In the form Ri.j where i=WP number and j=1, n. Example R3.1 is Risk Nr 1 for WP3.

² Name, organisation

Actual / Potential Impact on the Project:					
Effect (Level of Impact)³		Probability⁴		Risk exposure⁵	
Proposed solution / Mitigation strategy					
Status⁶			Status Date:		
Actions performed to decrease and/or eliminate Risk		New Impact	New probability	New Exposure	Status Date
Comments:					
Closing date⁷:			Approval⁸:		

³ 4—uncontrollable, 3—critical, 2—marginal, 1—negligible

⁴ 3— high, 2— medium, 1— low

⁵ High, Medium, Low

⁶ Identified, Monitored, Contained

⁷ Date when related activity is completed

⁸ WP Leader

VI. REVIEWS AND AUDITS

VI.1. Reviews

Review term is understood here as synonym of contractual or formal review. It serves to provide a qualitative assessment of product correctness and to assure that Project life cycle processes are performed in compliance with approved plans.

For the project the Formal Reviews are:

Review	Timing, month	Planned venue of review	Comments , if any
1	After month: 15	EC premises in Brussels (TBC)	
2	After month: 24	EC premises in Brussels (TBC)	
3	After month: 30	HPIS Italy (TBC)	Presentation, real environment

List and schedule of Milestones:

MS no.	Milestone name	WPs involved	Expected date	Means of verification
M1	Definition of energy-consumption models and energy policies for Intra data centres, energy control plug-in for single Data centre	WP3, WP4, WP5	M12	D3.1, D4.1, D5.1
M2	First tests results	WP3-WP4-WP5-WP6	M14	D6.2
M3	Energy-consumption models, policies for Inter data centres, energy control plug-in for single Data centre (enhanced) and control desk for Federated Data centres	WP3-WP4-WP5	M22	D3.2, D4.2, D5.2
M4	Second tests results	WP3-WP4-WP5-WP6	M24	D6.3
M5	Full-featured federated energy-consumption models, enhanced control plug-in and control desk - Final test report	WP3-WP4-WP5	M27	D3.3, D5.3
M6	Full-featured federated energy-consumption models, enhanced control plug-in and control desk	WP6	M30	D6.4

VI.2. Audits

According the financial guide, section 2 there is an audit foreseen for those partners exceeding 375,000€ of European Contribution for the whole project duration. In any case the EC has the right to perform audits at its convenience.

GFI Quality department can also perform independent audits following an internal audit plan. Such audits are performed on a project according to an internal procedure. In the progress reports the internal audits will be reported, with the summary of their results. This procedure describes the internal audit preparation and execution in the frame of a software project as well as the production and distribution of the audit report and the follow-up actions to amend the cause of recorded observations.

VIII. PROBLEM REPORTING AND CORRECTIVE ACTIONS

VIII.1. Problem reports

The objective of problem reporting, tracking and corrective action is to record process non-compliance with project plans and standards, to record deficiencies of outputs of project life cycle processes, to record anomalous behaviour of products, and to ensure resolution of these problems.

Problem Reports are used to record problems on Project life cycle data or on processes. Problem Reports may be raised against received or generated data.

General term **problem report** can be applied generically to documentation, code or processes. GFI uses different terms to distinguish among its types.

The non-conformance (problem report) detection is followed by its classification: the non-conformance falls under the category of major (e.g. contractual requirement) or minors.

VIII.2. Software problem reports (SPRs)

FIT4GREEN shall use the **SPR** to report about anomalies on code. Major problems are always sent to the approval authority. A joint Configuration Control Board decides about the implementation of suggested solutions only for problems encountered during acceptance testing.

Formal code change procedure shall be applied to terminal software as described in the following paragraphs. For generated code, Problem Reports are raised for problems discovered after a product enters into system tests.

Summary of SPRs control procedure steps is the following:

1. Detection

For each problem detected in the software module already in system tests or the delivered configuration Item a SPR shall be generated, giving information about the symptoms and the operating environment. Evidence, such as listing of results, may be attached. When anyone detects the problem, it is reported in a SPR form. (Originator of SPRs during acceptance usually is the approval authority).

2. Analysis

The problem is analysed in order to find a solution that is recommended in the same problem report. In addition, an assessment of the change cost and its schedule impact may also be included in order to identify its gravity (major, minor) and criticality (urgent, routine...).

3. Review and decision

The Management Committee (MC) periodically reviews the input forms (normally at formal reviews).

The MC classify/confirm the SPR criticality (it may take values depending on its priority (critical, urgent and routine) and its contractual impact (major, minor)).

4. Closure

SPR formal closure is responsibility of MC (or person designed by him) from SPR originator. It is necessary to have completed and signed by change verification authority the associated SMR (Software Modification Report) in order to be able to close any SPR, when MC decided "corrective action".

Each software modification is documented in a SMR, complete with items such as: Source code changes identifying affected modules with its version, Test Execution Reports, any other verification details, and documents to be updated and reviewed (if necessary).

Fulfilled SMRs are analysed by corresponding Configuration Control Board. CCB resolution shall be taken:

- Open (rework)
- Closed (agreed on change implementation).

Changes to the software shall be indicated in the module header with reference to the SPR and SMR related with the problem that provoked the modification. **SPRs** and **SMRs** are managed by the MC by the Project Manager.

IX. RECORDS, COLLECTION, MAINTENANCE AND RETENTION

List of quality records (any “objective evidence” of quality activities, different of the major document are actually quality records):

- Internal reviews records (IRR)
- Audit reports
- Project Progress reports
- Change Requests
- Test execution records
- Minutes of meeting

The **retention period** for the quality records in this project is established until the customer final acceptance, therefore, the end of the contract.

