VeraSol

Quality Assurance for Productive Use of Energy (PUE) Technologies in Market Development Interventions

Selecting a proportionate approach to technology risk mitigation through categorization of PUE appliances and systems

EXECUTIVE SUMMARY

Effective quality assurance for PUE is not about requiring certification for every technology. It is about applying appropriate, proportionate measures to manage risks to users, programs, and markets.

WHY QUALITY ASSURANCE MATTERS

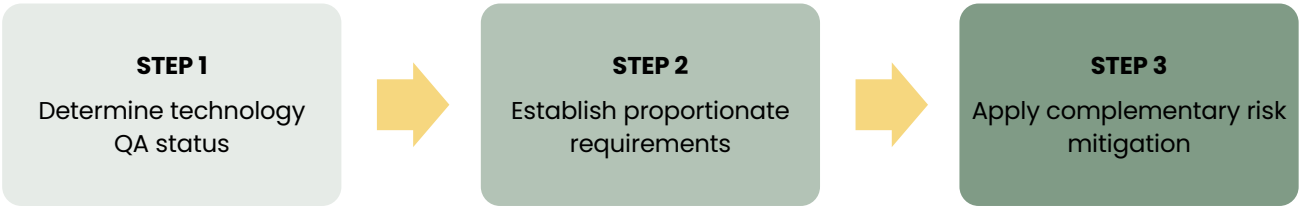
Results-based financing (RBF) programs and other market development interventions are increasingly supporting a diverse range of productive use of energy (PUE) appliances and systems. Ensuring that these technologies are safe, durable, reliable, and perform as intended is essential to protecting end users, safeguarding program investments, and building sustainable PUE markets.

Quality assurance (QA) frameworks typically rely on standardized test methods, requirements for product safety, quality and performance, independent laboratory testing, and certification. Such frameworks are well established for certain technologies, including solar energy kits (SEKs), for which VeraSol certification has provided RBF programs with a harmonized and practical means of verifying product quality.

However, the diversity and rapid evolution of PUE technologies mean that appropriate product-specific standards, test methods, and certification mechanisms are not always available. **A single approach to quality assurance is therefore neither feasible nor appropriate for all PUE technologies.** Programs need flexible, risk-based approaches that leverage existing QA mechanisms while introducing complementary safeguards where gaps remain.

A PRACTICAL FRAMEWORK FOR SELECTING PROPORTIONATE APPROACHES FOR PUE QUALITY ASSURANCE

VeraSol proposes a framework that enables program designers and implementers to identify appropriate QA requirements and risk mitigation measures based on the maturity of available QA frameworks and the configuration of PUE products and systems.



The first step is to categorize technologies according to their "QA status". Five categories are proposed, each associated with a different approach to evaluating and mitigating technical risks. These categories provide a starting point for establishing QA requirements, rather than prescribing a uniform set of conditions for every program.

QA Category	Title	Description and examples	Recommended QA approach
A	**Established technologies with QA frameworks supported by VeraSol certification**	Internationally recognized test methods and quality and safety requirements exist, supported by VeraSol certification. *Example: solar energy kits.*	Require VeraSol certification and verify warranty and after-sales service arrangements.
B	**Established technologies with QA frameworks <u>not</u> part of VeraSol's certification program**	Established international test methods and quality and safety requirements exist, but VeraSol does not provide certification. *Examples: commercial refrigeration equipment, air conditioners, heat pumps.*	Require conformity with applicable international standards, supported by accredited laboratory test reports and certification where applicable.
C	**Emerging technologies supported by VeraSol's testing program**	VeraSol has developed test methods, but internationally recognized product-specific quality requirements are not established. *Examples: solar water pumps, off-grid refrigerators, walk-in cold rooms, egg incubators.*	Require testing using VeraSol methods, assess performance against program-defined benchmarks, and verify applicable safety requirements.
D	**Emerging technologies without QA frameworks**	Product-specific test methods and quality requirements are not established. *Examples: selected emerging agricultural processing appliances.*	Apply technical screening, documentation review, applicable safety requirements, and risk assessments, supported by additional safeguards.
E	**Custom-designed systems**[1]	Component-based systems designed and installed for specific applications. *Examples: solar irrigation and milk chilling systems.*	Assess component conformity, system design, installation, supplier competence, and arrangements for operation, maintenance and after-sales support.

[1] All PUE categories except for Type E "Custom-designed systems" are standalone products or pre-designed kits.

INTEGRATING QA INTO PROGRAM DESIGN AND IMPLEMENTATION

Once the QA status of a technology has been determined, programs can establish proportionate requirements for product and company eligibility, supporting documentation, and qualification processes.

A comprehensive approach extends beyond product testing and certification. Depending on the technology and application, programs should consider:

- **Product and system requirements:** Evidence of compliance with applicable safety, quality and performance requirements, supported by testing, certification, benchmarking or technical assessments.
- **Company qualifications:** Demonstrated capacity to supply suitable products and, where relevant, design, install, commission and maintain systems.
- **Warranty and after-sales service:** Adequate warranty coverage, accessible technical support, and arrangements to address product failures and ensure sustained service.
- **Additional risk mitigation:** Enhanced due diligence, rapid product screening, field evaluations, monitoring and verification, and RBF disbursement schedules linked to demonstrated product or system performance.

The extent of these measures should reflect the technical risks associated with the technology, its application, and the program's operating context. For technologies without established QA frameworks, risk assessments can inform product acceptance decisions and identify additional conditions for participation.

Importantly, **the absence of established test methods or standards need not exclude promising PUE technologies from market development programs**. Alternative safeguards can help manage risks while enabling innovation and market growth.

ENABLING EFFECTIVE IMPLEMENTATION

Designing and implementing proportionate QA frameworks may require technical expertise and resources beyond the existing capacities of RBF programs and participating companies.

Programs may need support to identify applicable standards, establish performance benchmarks, evaluate technical documentation, assess company capabilities, and develop risk assessment and verification procedures. Participating companies may also benefit from guidance on technical requirements, access to testing and certification services, preliminary documentation reviews, and assistance in addressing gaps that prevent program qualification.

Where necessary, programs can incorporate these activities into their design or leverage support from specialized technical organizations like VeraSol. Early planning is particularly important where product testing, technical assessments, or the development of eligibility procedures may affect program launch timelines.

KEY TAKEAWAY

By combining existing standards and testing frameworks with practical complementary safeguards, RBF programs and other market development interventions can expand access to diverse PUE technologies while promoting quality, protecting end users, and supporting sustainable market development.

The accompanying technical guidance document *provides detailed recommendations for each QA category, including product and company eligibility requirements, supporting documentation, qualification processes, and complementary technical assistance.*

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VeraSol Quality Assurance

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