



## D4.3 PILOT PROJECT APPLICATION REPORT GERMANY



## QualitEE Project

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The QualitEE consortium comprises 12 partner organisations covering 18 European countries, an expert advisory board, including the European standards body CEN/CENELEC, and 59 supporters from major financial institutions, government bodies, trade associations and certification bodies.

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## Disclaimer

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# 1 INTRODUCTION

During the project activities, quality criteria have been applied for new projects. Technical quality criteria and Financial Guidelines have been applied in new pilot projects. Partners have provided support to clients or ESPs from the procurement phase until the first measurement and verification phase if possible. Report follows the pilot project implementation in quantitative and qualitative manner and extract lessons learned.

During this report pilot projects are described and description how and which technical and financial criteria had been used. Feedback on the application has been collected with the aim to refine and improve operationalised technical quality criteria and financial guidelines and to provide real-world insights and advice on the establishment of national certification frameworks.

## 2 DESCRIPTION OF THE PILOT PROJECTS

### 2.1 Pilot project factsheets

#### 2.1.1 Overview

Project	Investment (EUR)	Annual Energy Savings (total kWh)	Annual Primary Energy savings (kw/h year)	Annual Energy Savings (%)	Annual carbon savings (tCO2)	Annual Savings (EUR)
Project 1	31.500	19.400	34.920	54	8.,67	4.000
Project 2	21.500	10.000	18.000	71	4,2	2.500
Project 3	109.385	270.472	486.850	67	113,869	22.000 – 49.000
Project 4	316.990	754.202	1,357.564	58	317,519	6.000 – 123.000
Project 5	46.300	80.572	145.030	75	33,921	5.000 – 18.400
<b>Overall</b>	<b>525.675</b>	<b>1,134.646</b>	<b>2,042.364</b>	<b>Ø 65</b>	<b>477,676</b>	<b>39.500</b> – <b>196.900</b>

*Table 1 – Data about pilot projects*

## 2.1.2 Pilot project No.1 - ESWE Light Service

### Project details:

- ✔ Office building and warehouse in Mainz-Kastel
- ✔ Company with 30 employees
- ✔ Complex of 2.000 m<sup>2</sup>
- ✔ Renovation of the lighting system
- ✔ Project stage – implemented

### Stakeholders involved

- ✔ Client
- ✔ Municipal Utility ESWE

### Economic parameters

- ✔ Contract duration: 4 years
- ✔ Service provided: lighting contracting
- ✔ Investment: 31.500 €

**Project start:**  
April 2019

**This project saves:**  
4.000 € / year

**Annual energy savings:**  
19.400 kWh/year (54 % energy savings)

**Annual carbon savings:**  
8.167 tCO<sub>2</sub> emissions per year

## 2.1.3 Pilot Project No.2 – ESWE Light Service

### Project details:

- ✔ Office building in Wiesbaden
- ✔ Administration building of a company with 20 employees
- ✔ Complex of 400 m<sup>2</sup>
- ✔ Renovation of the lighting system
- ✔ Project stage - implemented

### Stakeholders involved

- ✔ Client
- ✔ Municipal Utility ESWE

### Economic parameters

- ✔ Contract duration: 4 years
- ✔ Service provided: lighting contracting
- ✔ Investment: 21.500 €

**Project start:**  
February 2019

**This project saves:**  
2.500 € / year

**Annual energy savings:**  
10.000 kWh/year (71 % energy savings)

**Annual carbon savings:**  
4.2 tCO<sub>2</sub> emissions per year

**Annual primary energy savings:**  
18.000 kWh/year

## 2.1.4 Pilot Project No.3 – LED-Package

### Project details:

- ✔ Factory building (metal working) in Bochum
- ✔ Industry with 140 employees
- ✔ Complex of 3.500 m<sup>2</sup>
- ✔ Renovation of the lighting system
- ✔ Project stage – implemented

### Stakeholders involved

- ✔ Client
- ✔ Municipal Utility Bochum

### Economic parameters

- ✔ Contract duration: 4 years
- ✔ Service provided: lighting contracting
- ✔ Investment: 109.385 €

**Project start:**  
July 2018

**This project saves:**  
22.000 € / year 1-4  
49.000 € / year > 4

**Annual energy savings:**  
270.472 kWh/year (67 %  
energy savings)

**Annual carbon savings:**  
113.869 tCO<sub>2</sub> emissions per  
year

**Annual primary energy  
savings:**  
486.850 kWh/year



## 2.1.5 Pilot Project No.4 – LED-Package

### Project details:

- ✔ Factory building (metal working) in Bochum
- ✔ Industry with 200 employees
- ✔ Complex of 6.200 m<sup>2</sup>
- ✔ Renovation of the lighting system
- ✔ Project stage – implementation process

### Stakeholders involved

- ✔ Client
- ✔ Municipal Utility Bochum

### Economic parameters

- ✔ Contract duration: 4 years
- ✔ Service provided: lighting contracting
- ✔ Investment: 316.990 €

**Project start:**  
November 2018

### This project saves:

6.000 € / year 1-4  
123.000 € / year > 4

### Annual energy savings:

754.202 kWh/year (58 %  
energy savings)

### Annual carbon savings:

1,357.564 tCO<sub>2</sub> emissions per  
year

### Annual primary energy savings:

486.850 kWh/year

## 2.1.6 Pilot Project No.5 – LED-Package

### Project details:

- ✔ Furniture industry in Bochum
- ✔ Administration building with 15 employees
- ✔ Complex of 550 m<sup>2</sup>
- ✔ Renovation of the lighting system
- ✔ Project stage – implemented

### Stakeholders involved

- ✔ Client
- ✔ Municipal Utility Bochum

### Economic parameters

- ✔ Contract duration: 5 years
- ✔ Service provided: lighting contracting
- ✔ Investment: 46.300 €

**Project start:**  
April 2018

### This project saves:

5.000 € / year 1-4  
18.400 € / year > 4

### Annual energy savings:

80.572 kWh/year (75 % energy savings)

### Annual carbon savings:

33.921 tCO<sub>2</sub> emissions per year

### Annual primary energy savings:

145.030 kWh/year

## 2.2 Technical aspects

### Before building renovation

Concerning the pilot projects 1 and 2 – the office buildings in Mainz-Kastel and Wiesbaden – old fluorescent tubes were replaced via a new LED lighting system. In the pilot projects 3-5, HQL lamps with 250 - 400 Watts or light bands of fluorescent tubes were replaced.

### Renovation process

Before the projects are implemented, an initial consultation usually takes place at the customer's premises. During this consultation, not only the replacement of the old lighting system with new LED lamps is discussed, but a complete lighting concept is developed. This also includes an improvement of the overall lighting situation by means of intelligent lighting control and the possible installation of daylight or motion detectors. The concept development for the new lighting system includes of course also a measurement of the current consumption as a baseline determination of the energy consumption before the installation, based mainly on the current energy costs and the operating hours. After signing of the contracting contract, including an analysis of the quality criteria, implementation takes place. Here, old fluorescent tubes, or HQL lamps in the industrial projects, were replaced with LED systems. The exchange is carried out either by a cooperation partner of the contracting party or by a desired company preferred by the customer. The implementation of the projects took between a few weeks up to 2 months, depending on the scope. The investment sums for small projects in office buildings amounted to 20,000 - 30,000 €, while for industrial projects for the implementation of new lighting systems in some cases more than 300,000 € were invested. After the installation of the new lighting-systems, a verification process takes place.

### Results achieved

After the renovation, the following points have been successfully implemented:

- ✔ Replacement of the existing fluorescent lighting fixtures / HQR-lamps with new, LED lighting fixtures.
- ✔ Re-design of the lighting fixture allocation
- ✔ Installation of movement and natural lighting sensors and their wiring.
- ✔ Installation of new, low-voltage cabinets.
- ✔ Installation of metering devices for the measurement and verification of the energy savings.

The verification-process of the implemented measures has been carried out by the contracting party ex-ante.

The following results have been reached with the implemented projects:

**Overall investment within the projects:**

525.675 €

**Total of all annual energy savings:**

1,134.646 kWh / year

**Total annual primary energy savings:**

2,042.364 kWh / year

**Average annual energy savings:**

65 %

**Total annual carbon savings:**

477,676 tCO<sub>2</sub>

**Total annual savings in €:**

39.500 during the first 4 years - 196.900 after 4 years

### 3 FEEDBACK ON QUALITY CRITERIA

Feedback from pilot projects was collected in the form of a questionnaire. It contained identical questions for each quality categories and some open-ended questions to collect qualitative information. For closed questions a limited number of options were given, and respondents were asked to evaluate quality criterion category separately. All nine quality criteria impact categories have been analysed. The impact categories are given in the figure below.

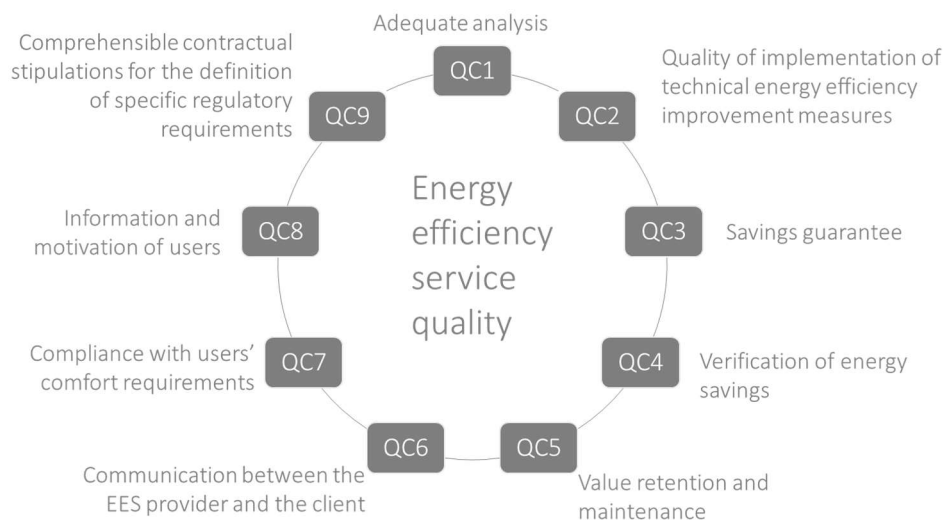


Figure 1: Categories of quality criteria

The main questions for each criterion are as follows:

1. How **important** is this criterion in assessing the quality of EES?
2. Is the criterion **specific** enough?
3. Is it possible to provide **evidence** (documents, references in contracts, measured data etc.) to assess the criterion?
4. How **time consuming** is the assessment of this criterion?

The first question was asked to evaluate how important the particular criterion is.

The following table shows the results of the questionnaires:

Criterion		Relevance	Specific	Evidence	Time
<b>QC 1 Adequate analysis</b>					
AC 1-1	Agreement on the energy analysis process pursuant to DIN EN 16247-1	●●●●●	●●●●	●●●●●	●●
AC 1-2	Adequate capturing of energy data and energy analysis	●●●●●●	●●●●	●●●●●	●
AC 1-3	Adequacy of derivation from action recommendations	●●●●●●	●●●●	●●●●●	●

QC 2 Rendering of services in the implementation of technical measures					
AC 2-1	Rendering of services in accordance with applicable standards, statutes and approval conditions	●●●●●	●●●●●	●●●●●	●●●●●
AC 2-2	Timeliness	●●●●●	●●●●●	●●●●●	●●
AC 2-3	Ascertainment of performance and documentation of service	●●●●●	●●●●●	●●●	●●
AC 2-4	Induction of users or operating personnel	●●●●●	●●●	●●●●●	●
AC 2-5	Ensuring the functionality of newly installed facilities after the end of the agreement	●●●●●	●●●	●●●●●	●●●●●
QC 3 Savings guarantee					
AC 3-1	Dependency of remuneration on adherence with the savings guarantee	●●●●●	●●●	●●●	●●●●●
AC 3-2	Guaranteed savings achieved (only applicable to saving guarantee type 1)	●●●●●	●●●●●	●●●●●	●●●●●
AC 3-3	Adequate intervals for the verification of compliance with guarantee promise	●●	●●●	●●●●●	●●●●●
QC 4 Verification of energy savings					
AC 4-1	Application of a standardized method of calculating energy savings	●●●●●	●●●●●	●●●●●	●●●
AC 4-2	Selection of an adequate approach to the calculation of energy saving	●●●●●	●●●	●●●	●●
AC 4-3	Clear definition of the baseline (reference consumption)	●●●●●	●●●●●	●●●	●●
AC 4-4	Clear definition of the basis of adjustment of the energy savings calculation	●●●●●	●●●●●	●●●	●●●
AC 4-5	Transparency and agreement of M&V processes and related responsibilities	●●●●●	●●	●●●	●●
QC 5 Value-retention and maintenance					
AC 5-1	Compliance with the required system availability	●●●●●	●●●	●●●	●●●●●
AC 5-2	Rapid troubleshooting in case of malfunctions of technical systems	●●●●●	●●●	●●●	●●●
AC 5-3	Functionality of facility at the end of the Contract	●●●●●	●●●	●●	●●●
AC 5-4	Clear definition of responsibilities of the service provider with respect to maintenance and repair	●●●●●	●●●●●	●●●●●	●●●●●
QC 6 Communication between the contractor and the client					
AC 6-1	Disclosure of contacts	●●	●●●	●●●	●●●●●
AC 6-2	Agreement on accessibility of data and data exchange (in both directions)	●●	●●	●●●	●●●●●
AC 6-3	Capturing and continual updating of all EEI measures taken by the EES provider	●	●●	●●●	●●●●●

AC 6-4	Organisational measures for committing internal operating personnel	●	●●	●●●	●●●●
<b>QC 7 Compliance with users' comfort</b>					
AC 7-1	Definition of users requirements (including regular review)	●●●●●	●●	●●	●●●
AC 7-2	Regular verification of compliance with physical comfort parameters	●●	●	●●	●●
AC 7-3	Assessment of users' satisfaction	●●●●●	●●	●●	●●
<b>QC 8 Information and motivation of users</b>					
AC 8-1	Development of a concept for the motivation of users	●●	●	●●	●●●●
AC 8-2	Establishment of a suggestion scheme for clients to improve energy efficiency	●●●	●	●●	●●●
AC 8-3	Provision of action-oriented information on the subject of energy efficiency	●●	●●	●●●	●●
<b>QC 9 Comprehensible contractual stipulations on contracting-specific regulatory requirements</b>					
AC 9-1	Ownership transfer	●●●●●●	●●●	●●●●	●●
AC 9-2	Handling of energy price risk	●●●●●●	●●	●●●	●●
AC 9-3	Insurances	●●●●●●	●●●●	●●●●●●	●●●
AC 9-4	Exit regulations	●●●●●●	●●●●●●	●●●●●●	●
AC 9-5	Legal succession	●●●●●●	●●●●	●●●●	●●
AC 9-6	Unhindered access rights and right of access	●●●	●●	●●●	●●●
AC 9-7	Permissibility of different types of financing (Cession, Leasing, Forfeiting)	●●●●	●●	●●●	●●●
AC 9-8	Regulation on intellectual property rights	●●●	●●	●●●	●●●

*Table 2 – Results of the evaluation of the criteria for the pilot projects*

### 3.1 Importance of the criterion

Respondents have been asked to evaluate which are the most important criteria? As most important criteria by client side have been considered:

1. Adequate analysis
2. Rendering of Services in the implementation of technical measures
3. Verification of energy savings
4. Value-retention and maintenance and
5. Comprehensible contractual stipulations on contracting-specific regulatory requirements

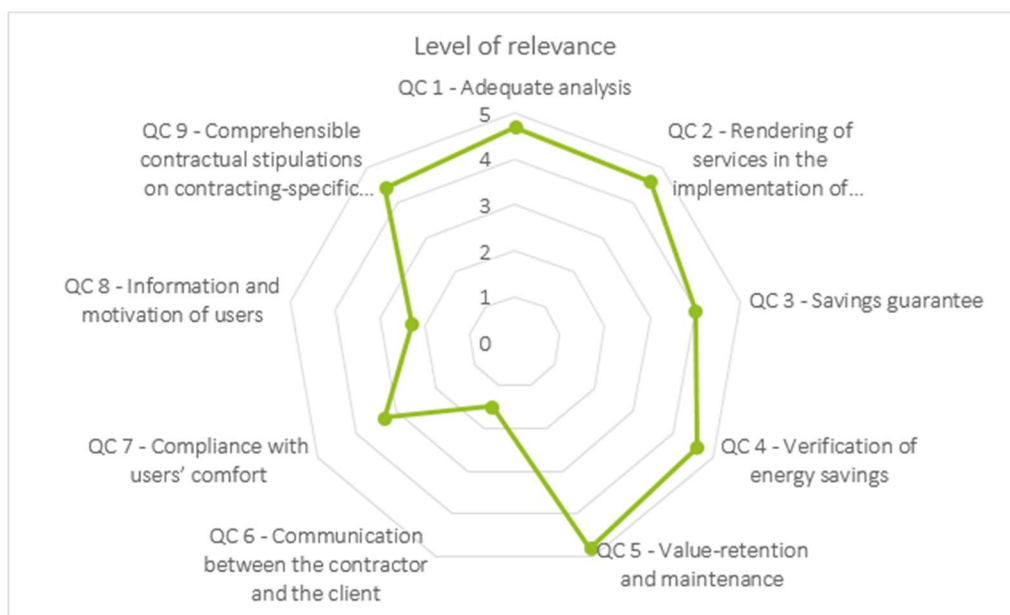


Figure 2. Importance of the criteria



## 3.2 Was the criterion specific enough?

Participants were asked to evaluate each impact category by rating them from not specific (1) to very specific (5). Answers have been summarized in Figure 3 below. As most specific criteria by client side have been considered:

1. Adequate analysis
2. Rendering of Services in the implementation of technical measures
3. Savings guarantee and
4. Verification of energy savings

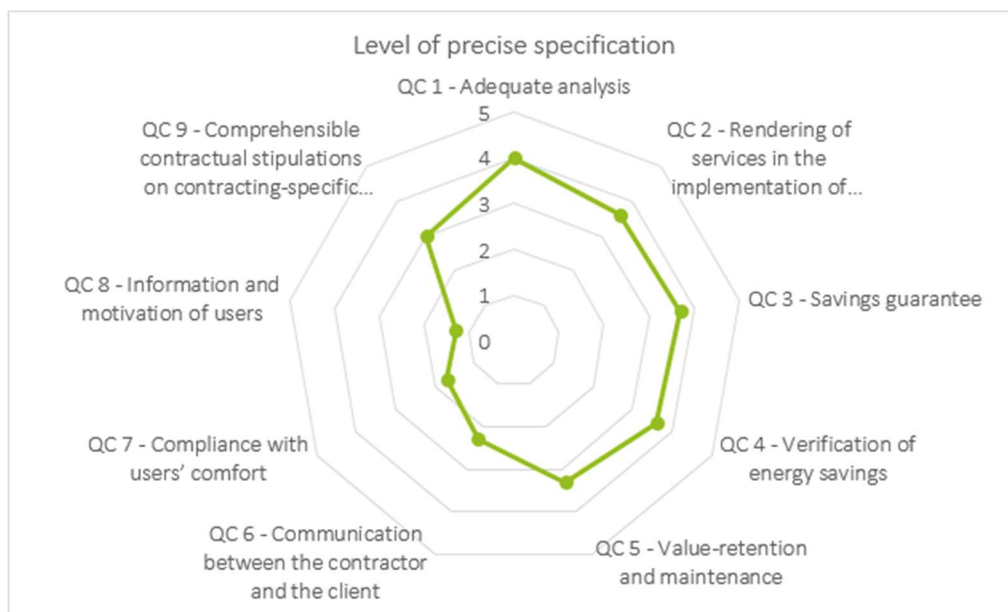


Figure 3. Specificity of criteria

### 3.3 How easy is it to provide evidence?

Feedback was also collected with the aim to evaluate the ease of availability of evidence – documents, references in the contract, measured data etc. – to assess a specific criterion. Respondents were asked to evaluate each impact categories and the possibility to provide evidence by rating each criterion from not possible at all (1) to easily possible (5). The answers have been summarized in Figure 4.

As criteria with easiest possibility of providing evidence by client side have been considered:

1. Adequate analysis
2. Rendering of Services in the implementation of technical measures
3. Savings guarantee and
4. Comprehensible contractual stipulations on contracting-specific regulatory requirements

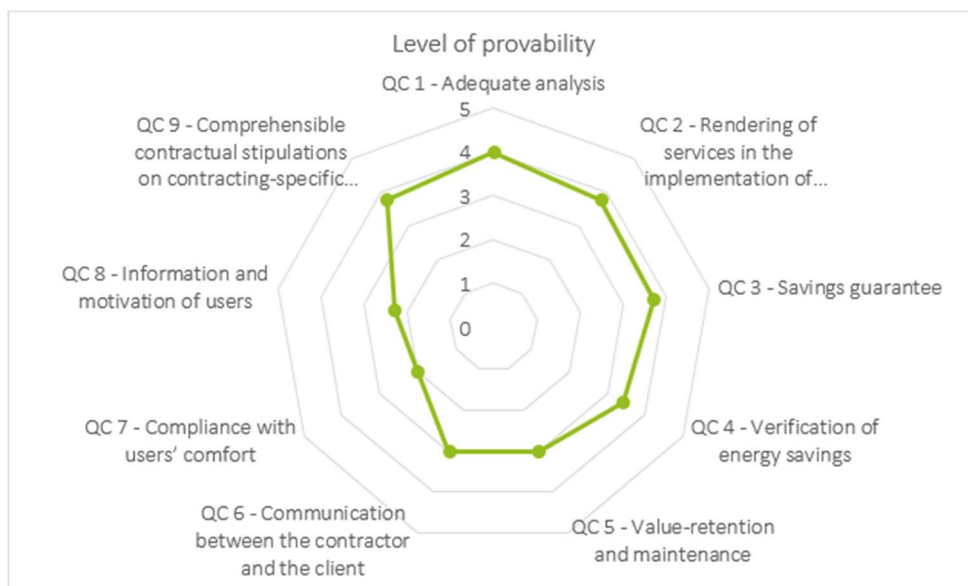


Figure 4. Availability of evidence

### 3.4 How time consuming is the assessment of the criterion?

Respondents rated each impact categories from very time consuming (5) to not time-consuming (1). Answers have been summarized in Figure 5 below.

As most time-consuming criteria by client side have been considered:

1. Adequate analysis
2. Verification of energy savings and
3. Compliance with users' comfort

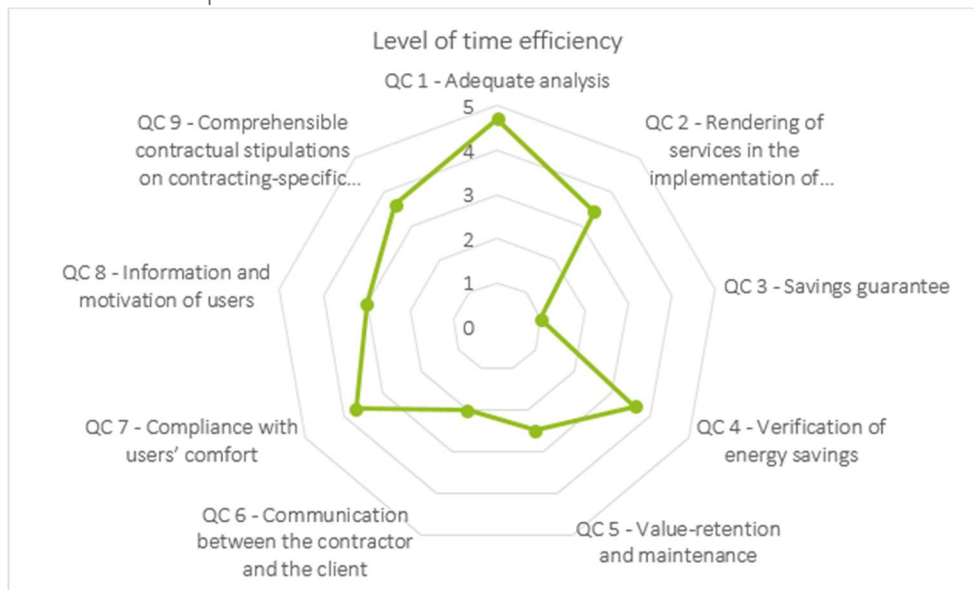


Figure 5 Time taken for evaluating criteria

### 3.5 Barriers and success factors for the application of criteria

The main barriers in applying the criteria when implementing the pilot projects were the following:

- ✔ Convincing the client: a significant difficulty for the application of the criteria was that of convincing the client of the need for the level of commitment and detail required for their implementation. The cost of energy for the clients is often of secondary importance and, therefore, the administration does not wish to spend excessive time on this subject. The specificity of the criteria and the time required to evaluate their conformity is also a considerable barrier.
- ✔ User reactions: Interestingly enough, the users are also often a barrier in the application of the criteria mainly due to their dissatisfaction at the comfort levels attained. The main problem is that, even though the comfort levels as foreseen by the EPC are attained, these are something that the users are not used to (e.g. lower internal lighting levels, lower internal temperatures etc.)

- ✔ Supplier and maintenance personnel – The dissatisfaction of the suppliers and maintenance personnel with which the client usually transacts can also be a problem. After the implementation of the project, the suppliers and maintenance personnel realize that they may be in a temporary disfavour with the client due to their past practices which have been highlighted by the project's results. Due to their past relationship and acquaintance with the client, which may also be of several years, they know very well how to smear the pilot project to the client.

The main success factors in applying the criteria when implementing the pilot projects were the following:

- ✔ **The energy audit**  
The thorough energy audit elaborated by the energy service company within the scope of the pilot project and based on EN 16247 is a powerful tool for the planning of future activities.
- ✔ **Performance-based contract**  
Payment based on performance can be a success factor for the client.
- ✔ **Monitoring and Verification of guaranteed energy savings**  
The monitoring and verification of the guaranteed energy savings based on a recognized methodology (i.e. IPMVP) is probably one of the most significant success factors.
- ✔ **Good quality of Energy Performance contract**  
The contract includes all control parameters and procedures that ensure the fulfillment of the quality criteria. In the implemented pilot projects, all relevant quality criteria were used and included in the EPC contract. Likewise, in all the pilot projects QC 7 and 8 were not used.

## 3.6 Lessons learned from consultations and pilot projects

The main lessons learned from the consultations with the clients and the energy service providers that implemented the five projects in Germany were the following:

The technical criteria developed were deemed by all the interested parties to be very specific and thorough and tackle all the necessary aspects of an Energy Performance Contract. Therefore, they do not recommend any further elaboration or addition of further technical criteria.

The client's main feedback was sometimes that the quality criteria are very technical, and it is very difficult for them to analyze them and to be able to evaluate the conformity of the EPC contracts offered them by the energy service providers. They did it for the sake of the pilot projects, but they would probably not undertake this task in future projects as they do not have either the time or necessary technical expertise.

Therefore, in the client's view, it makes absolutely sense that a reliable label is developed or that the ESCO registry certifies to them that the registered ESCO's conform to the requirements of the Qualitee technical criteria.

In addition to the other stakeholders like ESCOS and members of the NDP, also the clients agree about the fact that "soft criteria" are missing a bit in the checklist. Long term relationships with the energy provider, the way of communication and the trust which has been build over years count also a lot if it comes to the decision to implement a project.

## 4 CONCLUSIONS

The general conclusions from the implementation of the pilot projects in Germany are the following:

- ✔ The technical criteria developed within the framework of the QualitEE project are very thorough and specific and they fill the gap of the lack of technical criteria for the evaluation of EPC contracts. Currently, EPC contracts are not really evaluated, and every provider uses it's on contractual framework.
- ✔ According to all interested parties (i.e. energy service providers and clients), quality criteria 1-5 and 9 should be made mandatory in any future quality assurance scheme. On the other hand, quality criteria 6, 7 and 8 should be optional.
- ✔ In the client's view, it makes absolutely sense that a reliable label is developed or that the ESCO registry certifies to them that the registered ESCO's conform to the requirements of the QualitEE technical criteria.
- ✔ Following the institutionalization of the quality assurance scheme and its successful acceptance by the market players, steps for its certification by accredited certification bodies in the future should be made.