D4.3 PILOT PROJECT APPLICATION REPORT CZECH REPUBLIC

PILOT 2 – CZECH TECHNICAL UNIVRSITY

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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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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 PROJECT

2.1 Pilot project factsheet

Project details:

- EPC contract with the Czech Technical University in Prague was signed in August 2019, while the installation of some energy-saving measures began in December 2019 (especially lighting and windows replacement). Currently design for some buildings is being finalized. All measures shall be installed until December 2020 and measurement will start in January 2021.
- Energy savings to be achieved by building modifications, repair or replacement of windows and roof insulation and other technical measures.

dormitory building complexes of Czech Technical University in Prague

GHG savings: 4,223 tCO2/year

Primary energy savings: 14,321,847 kWh/year

Table 1 Energy Consumption Data

Energy Consumption BEFORE intervention (actual) kWh/a	Energy Consumption AFTER intervention (actual) kWh/a	Value of planned EE investment EUR
55,328,286	41,006,439	8,600,000

Business case description/economic parameters

- Contract duration: 11 years
- Business model: EPC
- Expected investment: 8.6 mil. EUR; if subsidy from State Environmental Fund will be received it will cover up to 30% of eligible costs

Stakeholders /companies involved

Client: The Service Facilities Administration of the Czech Technical University in Prague;

ESCO: ENESA Ltd.

Facilitator: SEVEn – The Energy Efficiency Center, z.u.

2.2 Technical aspects

The Czech Technical University is the oldest technical university in the Czech Republic and is based in the capital city Prague. The dormitories and cafeterias belonging to this university are in ten different locations in the city. **A total of 35 buildings spread over nine locations were selected for the EPC project.**

All the selected buildings are protected monuments. They are either directly protected as monuments or are located in a monument zone. This means that construction measures that may change the appearance of the building must be approved by the National Monuments Institute (NPÚ). Therefore, the expert advisor of the contracting authority (project facilitator) prepared in advance an analysis of possible energy saving measures, which was discussed in advance with the NPÚ. The analysis subsequently became part of the tender documentation.

While technological measures could mostly be proposed without restrictions, construction measures were severely limited by the decision of the NPÚ. For example, thermal insulation systems on the front façades of buildings were not allowed anywhere. The NPÚ only allowed the insulation of ceilings and roofs, as long as these measures were not very visible and did not change the appearance of the building. The replacement of the existing dilapidated windows could usually only be carried out on the condition that the new windows resembled the original windows as closely as possible and in some cases it was not allowed to insert insulating double glazing into the new windows. Some buildings date from the turn of the 19th and 20th centuries, others from the period between the two world wars and some from the second half of the last century. Examples are shown in the figures 1 - 3 below.

Table 1 Consumption before and after the intervention

	Final consumption		Primary energy sources			
	Energy Consumption BEFORE intervention (actual) kWh/a	Predicted Energy Consumption AFTER intervention kWh/a	Energy Consumption BEFORE intervention (actual) kWh/a	Predicted Energy Consumption AFTER intervention kWh/a	Annual primary energy savings, kWh/year	Annual CO2 emissions savings CO2 t/year
heating kWh/a	5,033,056	3,559,722	5,536,361.11	3,915,694.44	1,620,667	578
electricity kWh/a	9,148,000	6,840,300	27,444,000.00	20,520,900.00	6,923,100	2,467
natural gas kWh/a	19,607,000	14,549,200	21,567,700.00	16,004,120.00	5,563,580	1,102
water m3/a	260,075	188,575	780,225.00	565,725.00	214,500	76
Total	**34,048,131**	**25,137,797**	**55,328,286**	**41,006,439**	**14,321,847**	**4,223**

Figure 1 The historically protected Hlávka dormitory in the centre of Prague has 15 different types of windows, which will be made to order when replaced

Figure 2 The Sinkul dormitory dates from the interwar period. The proposed new windows must meet the requirements of the NPÚ

Figure 3 This student building built at the end of the last century serves mainly as a cafeteria and the NPÚ places only minimal requirements on its reconstruction

The heating of the buildings in question was provided in only two ways: by their own natural gas boiler room, or by connection to a district heating system. However, the quality of energy equipment, their age and the method of operation differed in individual buildings. Some facilities have been recently renovated; others were on the edge of their lifespan. From the beginning, it was clear that each building would have to be examined in detail and the proposed solutions will be "tailor-made" in each building separately.

The project was launched at the beginning of 2018. Extensive tender documentation was prepared within a few months. In May 2018, the documentation was published and a tender was opened in the form of a competitive procedure with negotiation. The qualification requirements were successfully met by three ESCO companies, which were invited to submit preliminary tenders in July. During the months of August and September, tours of the buildings took place, which were jointly attended by professional teams of all three tenderers. Despite the detailed tender documentation, after the inspections the tenderers requested additional information on the equipment and operation of the individual buildings. The submission of the first version of the preliminary tenders was scheduled for November 2018.

The tenderers were invited to the first round of negotiated procedures in February 2019. Negotiations were held with each tenderer separately and, based on the conclusions, requests for new preliminary bids were prepared. After the third round of negotiations, tenderers were invited to submit final tenders. The evaluation committee selected the winning tender according to four criteria set out in the tender documentation: the amount of cost savings achieved, the total price, the quality of the technical design and the percentage by which the minimum required amount of energy savings was exceeded. The quality of the technical design included several sub-criteria. Other qualitative requirements were already included in the tender documentation and were also negotiated during the negotiated procedure. The award criteria and technical specifications reflected and tested the criteria from the QualitEE Guidelines to European Technical Quality Criteria for EES.

The winning tender guaranteed the contracting authority a reduction in the annual energy consumption of the entire set of buildings from the original 34 GWh to almost 25 GWh, i.e. a reduction in consumption by 26%. The total cost of the project was more than EUR 8 million and the repayment period of this investment was set at 11 years. The contracting authority also applied for a subsidy from the Operational Programme Environment, which can support energy saving projects and uses EU funds. The maximum achievable amount of this support is 30% of the investment costs. The rest of the investment will be paid for from the achieved cost savings.

In addition to the above-mentioned construction measures, where the replacement of windows mostly prevailed, the winning tenderer proposed dozens of energy-saving measures on building technologies. The most common include:

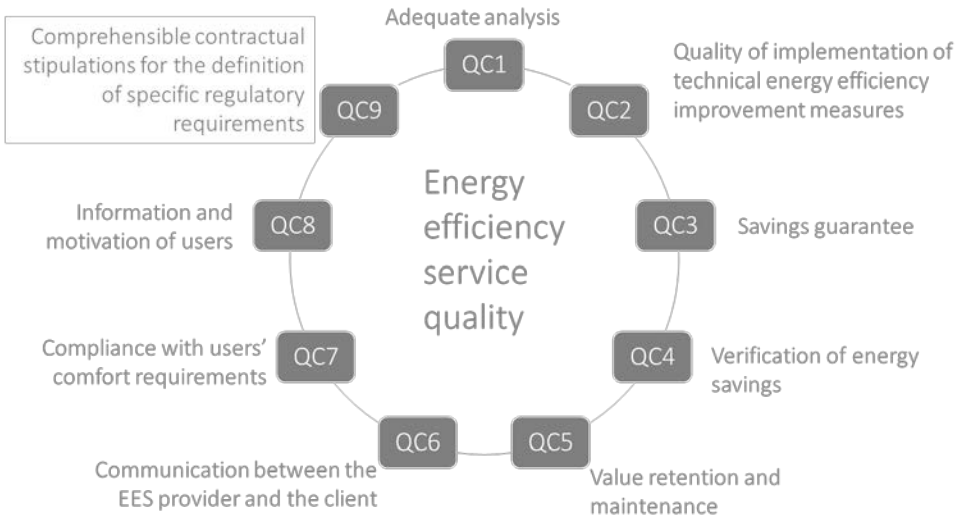
- reconstruction of energy sources with installation of condensing boilers in buildings with their own boiler room;
- reconstruction of exchanger stations at buildings connected to central heat supply;
- installation of a new control system and introduction of energy management;
- replacement of pumps with new ones with speed control;
- installation or replacement of thermoregulation valves;
- installation of IRC (Individual Room Control) systems;
- replacement of mixing valves;
- lighting modernisation: installation of LED luminaires;
- reduction of water consumption by installing energy-saving fittings.

An EPC contract was signed with the winning tenderer in August 2019. In the following months, a detailed verification of all data was carried out and detailed project documentation was prepared for each building. Based on detailed projects and conclusive statements of the NPÚ, some of the proposed measures were further specified and these specifications were attached to the original contract in the form of an addendum. Only after the end of this phase was the installation of energy saving measures in individual buildings started. The implementation of the project should be completed by the end of December 2020 and from 1 January 2021 the last phase will begin – the fulfilment of guaranteed savings and their regular evaluation.

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 Figure 2 below.

Figure 2. 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?
5. How many criteria have been used in the project?

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

4.1 Importance of the criterion

Respondents were asked to identify the three most important criteria:

Client:

- QC3.3
- QC4.2
- QC5.2

Provider:

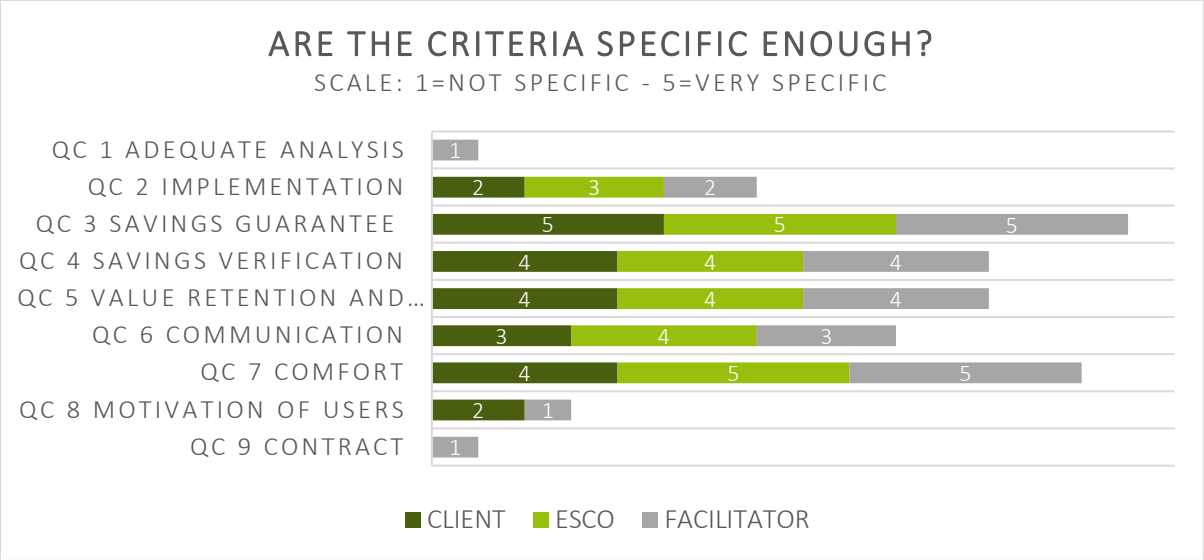
- QC3.1
- QC3.2
- QC3.3

Facilitator:

- QC3.1
- QC3.3
- QC4.1

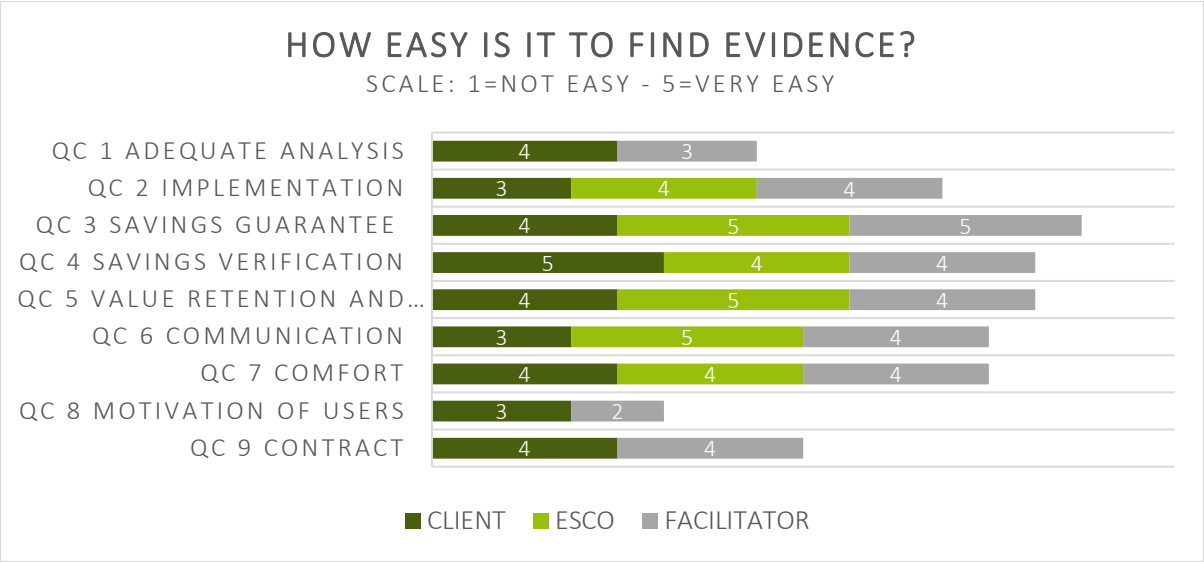
4.2 Are the criteria specific enough?

Participants were asked to evaluate each impact category by rating them from not specific (1) to very specific (5). Answers have been summarised in the figure below.



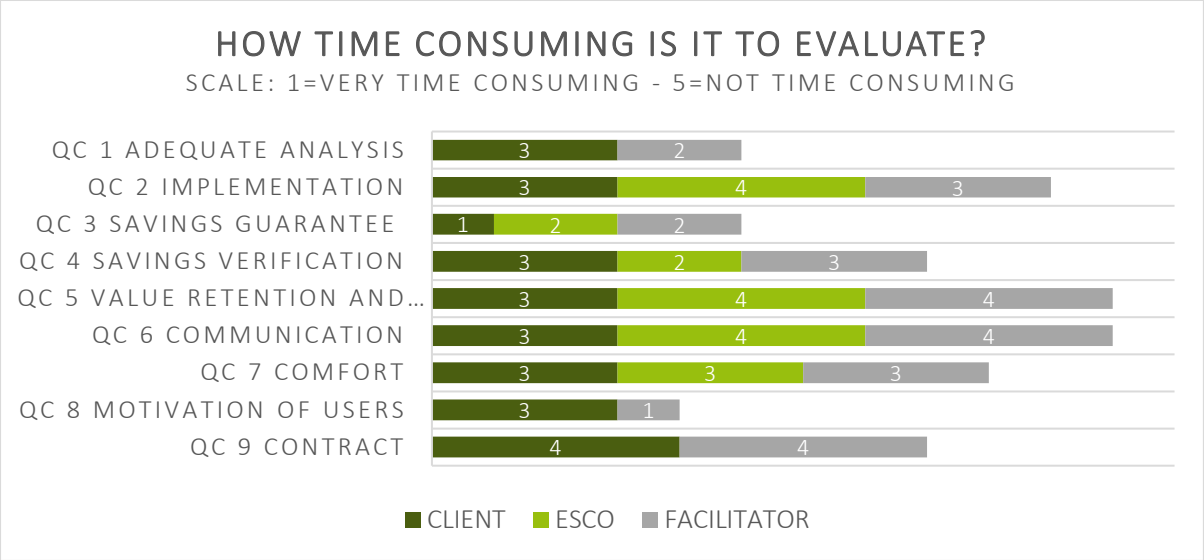
4.3 How easy is it to provide evidence?

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 summarised in the figure below.



4.4 How time consuming is the assessment of the criteria?

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



4.5 Barriers and success factors for the application of criteria

The criteria have been used during the project development, procurement and contracting phase.

Criteria were found the most useful by the client in understanding what they should expect from a good quality EPC projects and what should be evaluated when selecting the best offer during the procurement process.

On the other hand, the barriers identified on the client side were complexity and large extent of the criteria. Also the formulations, which were done carefully to fit the case of all EES are less specific and harder to grasp for the client in comparison to the case where the criteria would be formulated only to fit EPC projects.

The use of QualitEE criteria is described in the table below.

4.6 Lessons learned from consultations and pilot projects

4.6.1 Importance of criteria

The set of quality criteria supports the client and the facilitator to ask the key questions related to quality of projects. The client was satisfied with evaluation of the tenders and believes application of criteria has led to selection of the best tender for the client.

Client saw the process as well organized and leading to the best conditions for them. The set of quality criteria supports the client and the facilitator to ask the key questions related to quality of projects and discuss in detail the key issues (e.g. organizational issues).

QC 6-4 Organisation measures for committing internal operating personal helped the client to discuss in detail the organizational issues. The management of the technical University CVUT expected, that students would remove and/or regulate IRC vents (e.g. to increase the temperature). The solution was found in installing vandal proof vents instead.

The client evaluation committee had ten representatives, out of which two were replaced in the process by new members. For all the representatives it was the first experience with EPC. The lesson learned is that the list of QCs can bring better orientation for the client representatives what to expect from EPC, what questions they should ask and how to read the initial tenders.

4.6.2 Criteria to become optional or removed

Most of the criteria were relevant to the project except of the criteria listed in the table below. The table also summarises the feedback on these criteria and reasons for its removal.

Table 2 Criteria not applied in the EPC project

AC	Assessment Criterion	Justification for skipping the criterion in the EPC project	
		by the provider	by the facilitator
2-4	Induction of users or operating personnel	The client is responsible for induction of users.	Induction of users was not used as a special criterion because it is the usual part of the energy management. Induction of users was conducted in the project during installation of measures. Induction of operating personnel was included in criterion 6.4.
4-2	Selection of the most appropriate approach to the verification of energy savings	The evaluation of this criteria is very subjective.	There was not a need to justify the selection of the standardised method of the energy savings verification by the provider as this was a role of the facilitator.
7-3	Assessment of users' satisfaction	The evaluation of this criteria is very subjective.	It was not necessary to include in the contract stipulations as the achievement of energy savings is reviewed with the client during annual meetings between the client and provider. Annual meeting is required to be organised by the contract.
8-1	Development of a concept for the motivation of users		There was not a need to develop a concept as this is implicitly included in the contract in the list of duties for the client to achieve the savings.
8-2	Establishment of a suggestion scheme for clients to improve energy efficiency		Instead of suggestion scheme, achieved savings and energy efficiency improvement are discussed between the provider and the client during the regular annual meetings.
8-3	Provision of action-oriented information on the subject of energy efficiency		There was not a need that availability of information on specific energy saving actions that can be implemented by different target groups is guaranteed in the contract because it is inevitable part of energy management.

Based on the experience with testing the criteria in the pilot project and the feedback received the some changes have been proposed in the criteria: 2.5, 3.1, 3.2, 3.3 and 5.1. All of these proposed additions and amendments were reflected in the final version of the Guidelines of European technical criteria for EES.

Table 3 Criteria where additions and/or amendments were proposed

AC	Assessment criterion	Proof (new text added is underlined)
2-5	Ensuring the functionality of newly installed facilities at the end of the Contract	According to the contract, provider shall ensure that all the technology installed is in full operational status at the end of the contract. The following actions shall be taken by the end of the contract: • Disclosure of maintenance requirements and agreements between the EES provider and the client regarding the execution of maintenance • Provide information about the availability of spare parts and the required software Stipulation of warranty periods and contacts in warranty cases if any.
3-2	Amount of contracted guaranteed savings	When comparing more tenders: • Rank the tenders according to the amount of contracted guaranteed savings (from the highest to the lowest amount). When assessing only 1 tender or more detailed analysis is needed: • Break down the savings according to measures and compare with expert calculation done in preliminary analysis according to 1.3. criterion and /or provide detailed calculation of savings per each individual measure
3-3	Guaranteed savings achieved (only applicable to saving guarantee type 1)	Achieved savings are not lower than guaranteed savings. The following levels of deviations are applicable:

		• Minor deviation: achieved savings are lower than 100% of guaranteed savings and higher or equal to 95% • Moderate deviation: achieved savings are lower than 95% of guaranteed savings and higher or equal to 80% • Serious deviation: achieved savings are lower than 80% of guaranteed savings and higher or equal to 80% Unacceptable deviation: achieved savings are lower than 80% of guaranteed savings
5-1	Compliance with the required system availability	Recording of operating times and downtimes Specification of system availability for highly sensitive areas according to the technology type and client needs.

In addition, one following criterion have been newly designed under criteria group 3 devoted to guaranteed savings and became part of the technical criteria to be used to evaluate EPC projects in the Czech Republic:

Table 4 Criteria where additions and/or amendments were proposed

Assessment criterion	Proof	Verification
Installation and functionality assurance of saving measures and equipment according to the contract	Saving measures and equipment have been installed as specified in the contract	Checking the actual installation of selected key saving measures and equipment and their functionality on site (including random checks of the remaining measures)

5 CONCLUSIONS

A piloting exercise was carried out to evaluate the draft European technical quality criteria for Energy Efficiency Services in a real-world Energy Performance Contracting project between Academy of Arts in Prague, the client, and their selected EPC provider – ENESA Ltd. The purpose of the piloting exercise was to provide critical feedback to feed into the adaptation of the criteria for the Czech context, and to use the criteria to provide a level of quality assurance of the project in progress.

For most of the criteria categories, it was found that the criteria were sufficiently specific with the following exceptions: QC 1 Adequate Analysis, QC 2 Implementation, QC 8 Motivation of Users and

QC 9 Contract. Generally, it was found that the criteria were relatively easy to evidence with exception of QC 8 Motivation of Users. It was highlighted that many criteria are likely to be time consuming to evaluate, especially QC1 Adequate Analysis, QC3 Savings Guarantee, QC 4 Savings Verification, QC 7 Comfort, and QC8 Motivation of Users.

Based on the experience with testing the criteria in the pilot project and the feedback received the some changes have been proposed in the criteria: 2.5, 3.1, 3.2, 3.3 and 5.1. All of these proposed additions and amendments were reflected in the final version of the Guidelines of European technical criteria for EES.

Most of the criteria were relevant to the project except of the criteria2.4, 4.2, 7.3, 8.1, 8.2 and 8.3, which were proposed to be removed for EPC projects implemented in the Czech Republic.

Client saw the process as well organized and leading to the best conditions for them. The set of quality criteria supports the client and the facilitator to ask the key questions related to quality of projects and discuss in detail the key issues (e.g. organizational issues).

QC 6-4 Organisation measures for committing internal operating personal helped the client to discuss in detail the organizational issues. The management of the technical University CVUT expected, that students would remove and/or regulate IRC vents (e.g. to increase the temperature). The solution was found in installing vandal proof vents instead.

The client evaluation committee had ten representatives, out of which two of them were replaced during the evaluation process. For all the representatives it was the first experience with EPC. The lesson learned is that the list of QCs can bring better orientation for the client representatives what to expect from EPC, what questions they should ask and how to read the initial tenders.

6 ANNEX MEETINGS

Quality management meeting date	Feedback from meetings		
	Main feedback in few bullet points: - how criteria could be used in the pilot (procurement, evaluation of offers, contracts..) - please indicate main discussed points, decisions made, suggestions for usage of criteria. - what was the response form clients, ESCO's, FI or other stakeholders involved?	How important is this criterion in assessing quality of this project? Is the criterion specific enough?	Are there any other criteria that should be added? Are there any criteria that should be removed?
12/01/2018 30/01/2019 02/05/2019 14/08/2019 24/10/2019	The criteria have been used during the project development, procurement and contracting phase. Client saw the process as well organized and leading to the best conditions for them. The set of quality criteria supports the client and the facilitator to ask the key questions related to quality of projects and discuss in detail the key issues (e.g. organizational issues). The client evaluation committee had ten representatives, out of which two of them were replaced in the process. For all the representatives it was the first experience with EPC. The lesson learned is that the list of QCs can bring better orientation for the client	QC 6-4 Organisation measures for committing internal operating personal helped the client to discuss in detail the organizational issues. The management of the technical University CVUT expected, that students would remove and/or regulate IRC vents (e.g. to increase the temperature). The solution was found in stalling vandal proof vents instead. For most of the criteria categories, it was found that the criteria were sufficiently specific with the following exceptions: QC 1 Adequate Analysis, QC 2 Implementation, QC 8 Motivation of Users and QC 9 Contract.	Based on the experience with testing the criteria in the pilot project and the feedback received the some changes have been proposed in the criteria: 2.5, 3.1 , 3.2, 3.3 and 5.1. All of these proposed additions and amendments were reflected in the final version of the Guidelines of European technical criteria for EES. Most of the criteria were relevant to the project except of the criteria 2.4, 4.2 and 7.3, 8.1, 8.2 and 8.3.

	representatives what to expect from EPC, what questions they should ask and how to read the initial tenders.		