PROJECT FINAL REPORT

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Project acronym: NEWBEE

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[1] Usually the contact person of the coordinator as specified in Art. 8.1. of the Grant Agreement.

[2] The home page of the website should contain the generic European flag and the FP7 logo which are available in electronic format at the Europa website (logo of the European flag: http://europa.eu/abc/symbols/emblem/index_en.htm logo of the 7th FP: http://ec.europa.eu/research/fp7/index_en.cfm?pg=logos). The area of activity of the project should also be mentioned.

4.1 Final publishable summary report

4.1.1 Executive Summary

The increasing cost of traditional energy sources and the availability of emerging building technologies in lighting, heating, ventilation, air conditioning, insulation, energy monitoring as well as integrated renewable energy technologies and Building Information Management (BIM) are expected to increase the global market for low carbon solutions. However, together with technological development new financial, organizational and social innovation enablers are required to leverage the transformation towards more sustainable buildings and cities. In particular, the introduction of new energy performance based business models can significantly accelerate stepping up the adoption of energy efficient solutions through the creation of cooperative and collaborative business networks. In the case of the construction sector, the challenge for a successful implementation of these business models can be considered closely linked with the involvement of the entire value chain. That is to say, there won't be a real adoption of these business models unless every stakeholder involved in the specific construction project commits to their adoption. This is a challenging task. While large companies and technology providers can relatively easily adopt the know-how and apply new innovative materials, this is not the case for the vast majority of small and medium enterprises. These enterprises have very specific knowledge in their field and they are not used to truly collaborative work with other SMEs. They focus on determined construction activities with low chances to apply innovative concepts or solutions.

The development of collaborative business networks allow an early involvement of all relevant value chain stakeholders (including building owners) in the retrofitting process supporting the development of new business models through the provision of highly advanced and systematic access to competitive knowledge related to the best available technologies, materials for retrofitting and win-win financial schemas. In this complex world of construction and retrofitting, the information flow is not optimally achieved between the different stakeholders taking a role in the process.

This is even more complex if a multidisciplinary approach is required although this is the real situation in most of the cases. For this reason, innovative methodological and software solutions, affordable for SMEs, which comprise the majority of Europe's building industry, are required to support new forms of business networks, enabling the development of new business models aimed at accelerating adoption of new energy-efficient solutions.

Shortly summarized, NewBEE provides solutions to the two key problems the SMEs in construction sector are confronted with:

1. SMEs need a promptly and ubiquitous **access to competitive knowledge** in order for them to adapt to the increasing requirements for knowledge based processes execution (including retrofitting) and also to accelerate the application of emerging technologies. The adaptation will ensure, on the one hand, higher satisfaction of building owners and, on the other hand, a reduction of energy consumption to comply with forthcoming local and regional environmental requirements.

2. The other key problem is to **establish new organizational and business models** within the construction sector as a seamless alliance of value chain stakeholders, in order to compete with big contactors, providing a turn-key solution to the end user (building owner).

4.1.2 NewBEE Context and Objectives

The objective of the project was to develop the NewBEE system enabling SMEs to generate performance based Business models for energy-efficient construction works with special incidence in buildings retrofitting.

The main targeted features of the NewBEE system were as follows:

- Support to identify the best retrofitting technology adapted to each retrofitting project.
- Support to identify a business opportunity.
- Upon a business opportunity detection/development, easy configuration / adaptation / implementation of new business models based on regional specificities (climate, legislation, etc.) and on building/district typology
- Calculate risk/value distribution across the value chain and promotion of win-win public and private financing models e.g. through White Certificates
- Advise to develop new business opportunities
- Store and re-use the apprehended knowledge.
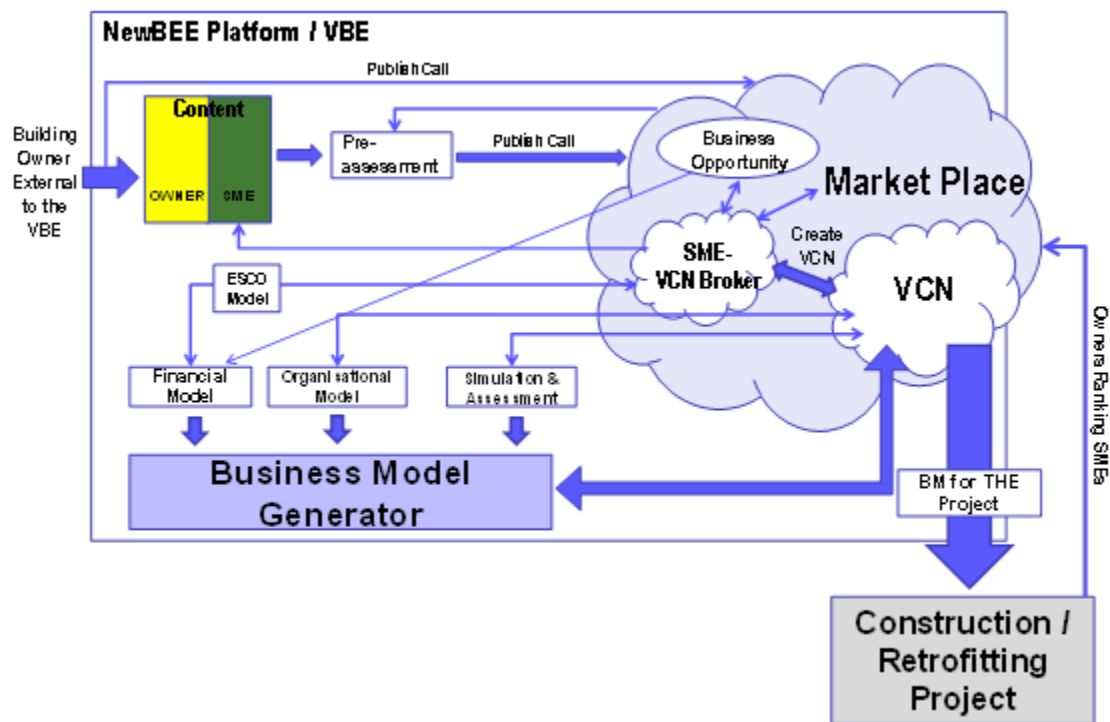
Following picture depicts the NewBEE Concept:

Figure 1: NewBEE Concept

NewBEE aimed at offering innovative results in the form of:

- **Methodology**, addressing organisational guidelines regarding the shift to the new virtual network oriented working paradigm, as well as a high-level overview of the processes involved in the operation of the ICT platform: joining the NewBEE Virtual Breeding community (also known as market place), answering to business opportunities, selecting the best retrofitting technologies, and deploying business models. The methodology should also comprise elaboration of an optimal business model based on technological and financial pre-assessments including among others also ESCOs best practices.

- **ICT platform**, including services for virtual networks (market place) set-up, collaborative knowledge management, selection of the optimal technology for energy efficient buildings retrofitting, pre-assessment of different technology/financing opportunities combinations from the point of view of the building owner and from the point of view of the SME (profitability), and business model generation; and comparison of the potential of different refurbishment technologies with the help of energy performance assessment tool. These services should provide support in the realisation of cost and energy efficient construction works in the specific area of the built stock refurbishment.

The NewBEE project's goal is to develop and validate an ICT solution enabling SMEs to generate new performance-based business models for cost and energy efficient construction works, with special emphasis on retrofitting.

NewBEE Methodology

As a basis for realisation of the NewBEE system, a methodology has been developed to address related RTD and industrial needs such as:

- Establishing of business networks within the construction sector as a seamless alliance of value chain stakeholders in the energy efficient retrofitting to complete projects which override resources of individual companies

- Advising and support to identify or develop new business opportunities

- Identifying and (easy) configuration/adaptation/implementation of new business models based on project regional specifics such as e.g. building/district typology, usually applied technologies, legislation, local/regional financial opportunities, etc.

- Development and setting-up of processes supporting the new business models

- Access to competitive knowledge in or for retrofitting SMEs to enable them to adapt to the increasing requirements for knowledge based process execution

The main users of the NewBEE methodology are retrofitting SMEs, including different expert companies and supporting RTD performers.

The topics dealt within the NewBEE methodology are:

- Collaborative Working Environment forms i.e. Virtual Networking forms – Virtual Breeding Environment (VBE, also called the market place), Virtual Collaborative Networks (VCN), their establishment, relationships among the participants and organisational/human and legislative issues within networks

- Functionalities provided at a VBE: Searching for partners appropriate for specific projects, publishing of calls for building renovation – building owner, identification of a business opportunity – construction industry SME

- Rough Pre-assessment procedure for quick estimation of the benefits from an energy efficient retrofitting project using basic building characteristics and available information on the financing opportunities. The pre-assessment comprise identification of the energy saving potential(s), by applying optimal retrofitting technologies, optimal financial models (performance based contract), construction/retrofitting processes (stages) according to the building type(s)

- Identification of business opportunities in terms of technical suitability, available resources and profitability

- Energy Efficient Services (EES), seen as services for supporting each of the processes (stages) of the work performed along the energy efficient buildings retrofitting, in the collaborative networks, where the detailed cost / benefit balance will be calculated for each of the selected retrofitting technology etc.

- Description/identification/development of New performance based Business Models, including stakeholders' network models description and financial models

- Methods for knowledge acquisition/collection, saving and structuring, for optimal operation of the networks using the NewBEE System. This knowledge should comprise retrofitting related methods, (e.g. energy auditing and efficiency assessment, methods for identifying building typologies, energy saving potentials) retrofitting technologies (for walls/facades, windows, lightning), retrofitting financing (grants, loans, ESCO), best practices collected from different sources, etc.

NewBEE ICT Platform

The NewBEE web-based ICT platform offers the users the following functionalities (user requirements):

1. Identifying (and/or creating) new business opportunities

2. Rough assessment of the technical feasibility and profitability of a retrofitting project

3. Setting up Virtual Collaborative Networks within a Virtual Breeding Environment (also called market place).

4. Easy configuring/adapting/implementing new business models based on regional specificities

5. Storing and reusing knowledge

6. Identifying most suitable methods/processes to assure an improved life-cycle energy efficiency

In order to address these functionalities, the NewBEE consortium developed a web-based ICT platform including the following services, which address the functionalities above mentioned:

- Network Setup Services

- Collaborative Knowledge Management Services

- Pre-assessment Tool

- Simulation & Assessment Tools

- Energy Efficiency Services

- Business Model Generation Services

Furthermore, a Common Knowledge Repository will be the underlying layer for managing the data in the system.

Following table shows the relation between the NewBEE functionalities (or user requirements) and the NewBEE ICT services developed:

Table1: Functionalities of the NewBEE ICT platform addressed by NewBEE services

NewBEE Services	Funct 1	Funct 2	Funct 3	Funct 4	Funct 5	Funct 6
Network Setup Services	X		X			
Collaborative KM Services					X	X
Pre-Assessment Tool		X				X
Energy Efficiency Services				X		X
Simulation & Assessment Tools		X				X
Business Model Generation Services		X		X		

4.1.3 S&T Results/Foregrounds

The main S&T objectives for the NewBEE project are the following:

- Provision of new SMEs centred business models for leveraging Energy Efficient building and district retrofitting

- Stakeholders' value chain management; early involvement of all actors from the very beginning of the energy retrofitting process

- Building performance management through sustainable retrofitting processes; energy performance and life cycle impact management through the retrofitting process

- A web-based ICT decision support tool for preliminary assessment of possible retrofitting solutions connected to different business models and operation models

- Inclusion of the knowledge, tools, and understanding of Energy Service Companies (ESCOs), which will be part of the decision support tool

- Involvement of public and private owners

- Best practices assessment from other European, national or regional projects from the sector and other industrial sectors

The NewBEE platform shows information about the aspects that are relevant to be considered in a retrofitting project. It is composed by the following six different tools:

- Pre-assessment tool

- Financial calculation tool

- Market Place tool

- Energy Performance Assessment tool (E-PASS)

- WIKI based Knowledge Repository

- Business Model Assessment tool

The NewBEE platform has two groups of users:

- **Building Owner** who owns a building where a problem exists (in terms of energy consumption), and wants to explore potential retrofitting technologies that may solve the problem, how to finance the project, to identify a Business Opportunity, to place a call for proposals (SMEs offers) and to find SMEs which can help to solve the problem.
- **SME** that is looking for the business opportunities created by the building owners, and create a response to that opportunity (an offer) either individually or creating collaboratively a joint team that will answer all the owner needs.

The following figure shows the NewBEE platform welcome page, the NewBEE entry point, where clearly classifies the potential users into the two groups above mentioned:
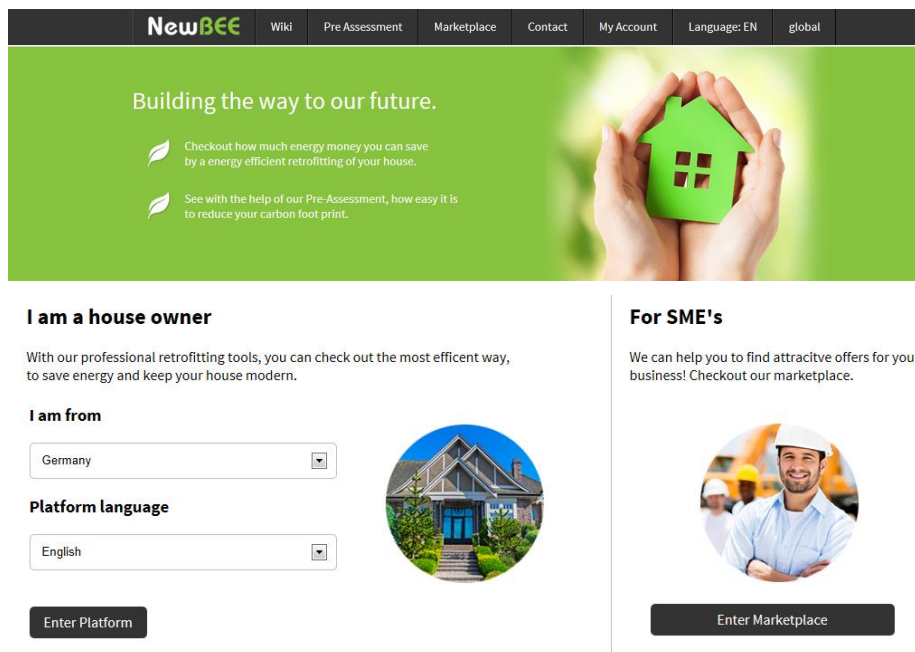
Figure 2: Two kinds of users for the NewBEE Platform

Pre-Assessment tool

Owner-user can use the pre-assessment tool to receive a first idea on retrofitting measures and to identify the most appropriate retrofitting technologies based on their requirements. It allows different technical scenarios that might be appropriate to address the building problem at hand. In result different scenarios can be chosen and analysed by costs and earnings by energy savings.

The NewBEE Pre-Assessment Tool provides a web-based user interface to support the following processes on behalf of the owner (additional remark: SMEs can go through the same process in order to understand the owner):

- Insert building data and current energy usage

- Choose from different available measures and create one or more scenarios

- Display, save and print favourite scenarios

- Place project (ask for a call for proposal) in the market place or contact energy consultant or go to financial tool

In the Pre-Assessment the owner-user has to complete three main steps before he can place his project into the marketplace:

- Step 1: Building Data (basic house information)

- Step 2: Action (choose measures)

- Step 3: Results and confirmation (overview, eco meter and payback period)

Financial Calculation tool

The financial calculation tool is a service for users who want to analyse the cash flow generated by a retrofitting project. The main purpose is to improve the owner´s level of awareness in the field of energy-economics.

The module let owners to simulate several ways on how to finance the project and provide schematic annual cash flows comprising expenses and savings generated by the intervention. Users can simulate effects on cash flow of several finance opportunities and different energy cost scenarios.

The graphical user interface (GUI) is designed to be used by a wide variety of people. Users are required to fill three main panels:

- general data information,

- financial opportunities selector, and

- energy saving estimations.

The purpose of the market place is to help SMEs to find Business Opportunities (BO) in refurbishment market and owners to find service providers.

Market Place tool

The market place enables building owners to:

- Register refurbishment projects publishing a call for proposal from scratch or with the help of the Pre-Assessment tool;

- Search for service providers;

- Receive refurbishment offers, i.e. the building owner can see all offers SMEs made according to his/her published business opportunities

The market place supports SME that provide disciplines and services for energy efficiency refurbishment by enabling:

- Registration in the platform

- Business opportunity (refurbishment project) search

- Partner search to create a joint offer with a team

- Send an offer to the building owner by first creating a team on the published retrofitting project

In order to get access to the all the Market place functionalities the user has to be registered and logged in the NewBEE platform as already described in the Login/register menu option. Once registered and logged in to the NewBEE platform, a SME-user as well as an owner-user can gather information about SMEs on the platform, which maintain a public company profile, with additional information like e.g. offered services and disciplines and reference projects. Through this search, SME-users can search for business partners or owner-users can get more details about SMEs which helps the owner-user to foster his decision of selecting SMEs for his/her refurbishment project.

One of the main functionalities for registered SMEs is to find Business Opportunities in the marketplace, i.e. to find refurbishment projects, which have been published by a building owner. SMEs can get detailed information about each business opportunity published. They can respond to such a Business Opportunity by proposing an offer through contacting directly the house owner or creating a team of SMEs to collaborate on a specific refurbishment project as a whole.

Another main functionality for registered private house owners-users is to publish a call for offers – so called business opportunities for refurbishment projects – on the marketplace to which in turn SMEs can apply with an offer. There are two possible ways to publish a Business Opportunity on the marketplace:

- Creation of a new Business Opportunity from scratch and without any Pre-Assessment
- Creation of a new Business Opportunity based on the data from the Pre-Assessment Tool

Energy Performance Assessment Tool

The SMEs and advanced owners can assess the potential energy, cost and carbon footprint savings from different refurbishment actions. The user of the tool can assess the energy performance and the saving potential. The saving potential is assessed in terms of:

- energy consumption (kWh/a)
- cost (e/a)
- GWP (kg CO2e/a).

The tool is available for exploitation by SMEs which do not have much resources of their own to develop and learn energy performance assessment tools but which need energy performance assessment tools in making consultancy, design, product development, marketing, and renovation project management. Typical users can be for example SMEs who offer:

- Consultancy for energy design and life cycle management
- Condition tests, surveys and monitoring
- Inspection
- Energy auditing
- Project planning
- Project management

- Architectural design, HVAC design/engineering

- Product solutions (structural and HVAC) for improved energy performance (exterior walls, roofs, ventilation systems, heating systems, electrical installation, sanitary engineering)

Most of the input data, that the calculation needs, is located in a knowledge database, from where it is collected during the first assessment. These intelligent assumptions and the knowledge database will be customized and fine-tuned for the selected European countries. The user has to know only few parameters of the building in the first phase of assessment; the complex simulation model is made with the help of default values stored in the databases. Tool makes "intelligent" assumptions for the refurbished building. Assumptions are based on the basic data of the building (location, building type etc.). The E-PASS will fetch all necessary details (the U-values, window-types, water consumptions, electricity consumptions, electric appliances etc.) from the database. The building and system details can be specified afterwards as needed.

The easy-to-use-principle is as follows:

- Only few input data needed

- Results are available in few seconds

- When assessing the change because of different refurbishment measures, the basic data can be changed rather easily.

In the starting point the required initial information is as follows:

- Building type

- Weather zone

- Construction year

- Room temperature (Heating set point and Cooling set point)

- Heating type

- Cooling type

- Building volume

- Floor height

- Number of floors

- Dimensions

- Number of occupants

- Number of apartments.

To assess the saving potential data about structures, windows, ventilation, hot water, electricity use, and heating type has to be handled.

WIKI-based Knowledge Repository

The NewBEE wiki gives building owners and SME-user access to information on refurbishment. Content that is provided in the wiki aims to support the main target of the NewBEE project: "strengthen collaboration in the retrofitting value network". The focus in this context is to support three specific situations that typically occur in a construction project or in strategic planning:

A) Support for owners looking for independent information on refurbishment.

B) Use of the wiki during the planning stage of a refurbishment project. Project managers can explain basic aspects of a retrofitting project to their clients by means of the information available in the NewBEE wiki. For instance project managers can use the knowledge repository to explain main retrofitting technologies to their customers.

C) Support for management stuff that strives to improve the business model of their company.

The main parts of information are as follows:

- Building typology

- Available technologies for energy refurbishment

- Financial models and opportunities

- Performance based business models

- Methods and standards for energy and cost saving calculation

- Potential savings

Business Model Assessment Tool

This tool is aimed to provide a short assessment to CEOs and management stuff of small companies that are interested to review their business model. The business model gives a first orientation concerning optimization potentials to them. Opposed to other tools such as pre-assessment tool or energy assessment tool, the business model assessment exclusively addresses the needs of small business and not the needs of building owners except the needs of large building owners acting as facility managers.

Concerning the overall methodology and objective of NewBEE to bridge the gap between small business and private house owners the business model assessment helps SMEs to prepare for the future. Due to the better integration between customer and the value chain (market place), transparency concerning technical retrofitting measures (e-pass tool) and initial guidance for the customer (pre-assessment) there is a need that future business models of SMEs in the retrofitting sector should be more tailored and more flexible.

The business model assessment supports this process of change. The business model assessment should be used before the other offerings for business model improvement on the NewBEE platform are used. It is recommended that after the review of the current business model in a second step the business model handbook in the wiki is used to improve the business and success stories as well as business model descriptions are used to get suggestions for a possible new orientation.

The tool is a guided questionnaire that gives users the opportunity to do a qualitative rating of their company performance concerning different aspects of their business model. Answers are multiple

choice – i.e. the users will tick the box with the answer that reflects the actual performance of his company concerning each aspect that is scrutinized in the questionnaire. Questions are aligned to the Osterwalder Business model framework. Therefore it is ensured that all building blocks of a business model are considered in the NewBEE assessment. The assessment covers the business model performance in general but also aspects that are related to the market (such as acquisition skills or competitive strategy), to the internal organisation (e.g. project management capabilities, resource availability) or networking aspect (such as relationships in the supply chain or network competency in general). The number of questions the user is asked are around 20.

DEMONSTRATORS

During the project four demonstrators have been developed to validate and demonstrate the energy saving measures and energy generation within buildings aiming to incentivize and accelerate the adoption of energy efficient solutions".

Spanish Business Case

In order to validate and demonstrate the energy saving measures, it has been planned four different scenarios for the Spanish business case; in each one of them it is presented the utilization of different NewBEE's tools in different situations. The comparison of the current retrofitting approach with NewBEE approach and evaluation of outcomes for the stakeholders involved in the value chain is presented in the different scenarios:

- o S1: A community of neighbours who requests a service retrofitting. The demonstrator simulates the global retrofitting of the facades of an apartment building.

Figure 3: Spanish S1 Results

o S2: A tender of a big retrofitting work to show that a set of SMEs can tackle it. The demonstrator simulates how different SMEs can use the NewBEE tool to present a joint offer to tackle the subject of the tender.

PUBLIC HOSPITAL

La tabla muestra los flujos de efectivo esperados por el proyecto durante su vida útil. El gráfico representa gráficamente la salida/entrada anual y los ahorros acumulados generados por el proyecto.

Volver al inicio

Inversión	92000 €	Tipo Finanzas		Own capital
% Interés	5 %	TIR		41.1 %
VAN	489909 €	Tiempo de retorno de la inversión		2.43039 years

Años	Los gastos anuales	Ahorro anual	VAN Salida	VAN Entrada
0.	-92000 €	0 €	-92000 €	0 €
1.	0 €	41074 €	0 €	39118.1 €
2.	0 €	41074 €	0 €	37255.33 €
3.	0 €	41074 €	0 €	35481.27 €
4.	0 €	41074 €	0 €	33791.68 €
		Muestra más datos		
Suma	-92000 €	1151720 €	-92000 €	595849.66 €

Figure 4: Spanish S2 Results

o S3: A real work of retrofitting from which we can obtain both physical and economic data and compare them with NewBEE system. The demonstrator simulates how a retrofitting intervention can be done from the different user´s perspective:
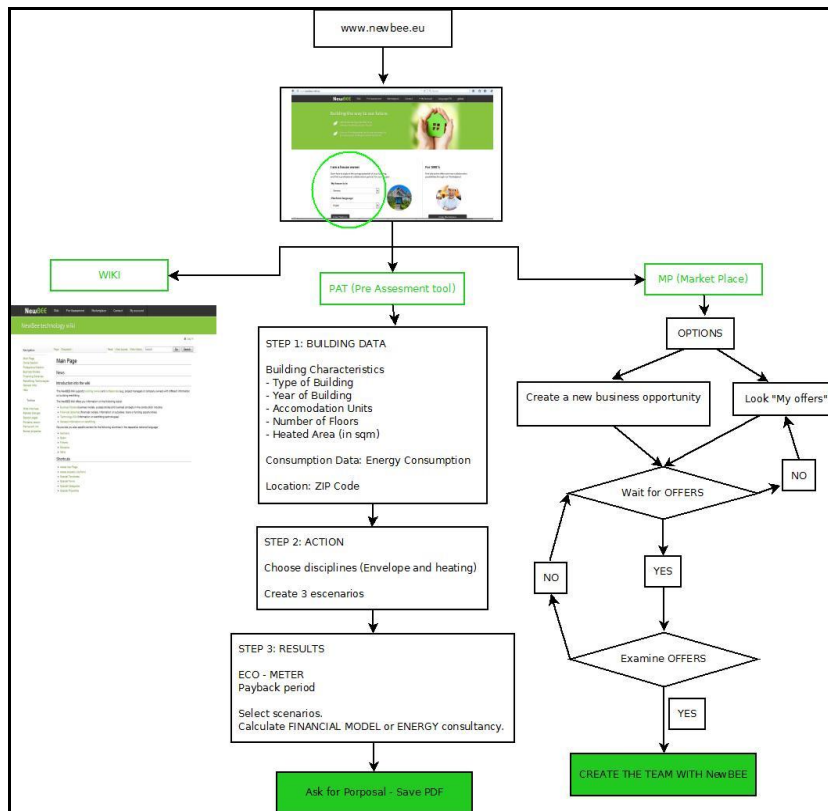
Figure 5: Spanish S3 Owner workflow
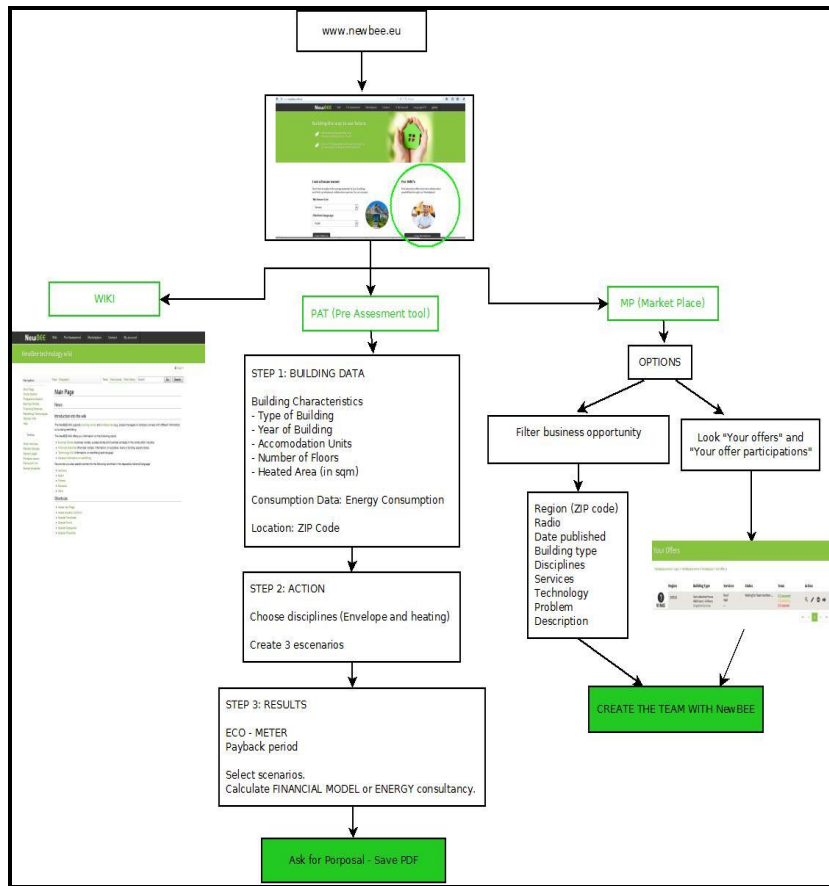
Figure 6: Spanish S3 SME workflow

- S4: The MEEFS project to test accurately the E-PASS tool. The demonstrator simulates the MEEFS technology in an apartment building located in Merida.

Figure 7: Spanish S4 Results

German Business Case

Three German business cases of the NewBEE project have been defined to validate and demonstrate the energy saving measures. It provides insight into future collaboration mechanism of stakeholders

in the retrofitting process. Business case G1 and G3 describe the application of the NewBEE knowledge repository (wiki) and the NewBEE business model assessment by professionals/SMEs in the construction sector. G2 focus on the improved integration of building owners in the planning of a specific retrofitting measure. It is exemplarily shown for one specific retrofitting project how the new process is designed and at which stages of the project the NewBEE platform will bring benefit.

- Business case G1: Support of a working group on energy-efficient construction and refurbishment

  This business case describes the application of the wiki within a working group for the construction industry. The main idea is to use the wiki as a collaboration and knowledge platform within a working group and give registered users access to information and knowledge provided by working group members or knowledge that was developed in common sessions in the working group itself. The wiki will improve the collaboration and is a new element for knowledge sharing that increases the overall value of a working group for participating members. Compared to former (traditional) ways of providing the gained knowledge, like distribution of information by mail or providing a paper-based summary of working group meetings, the wiki is more attractive for members. Its advantages are the better structuring, the flexibility concerning continuous adaptions of the content and the semantic features (like semantic search).
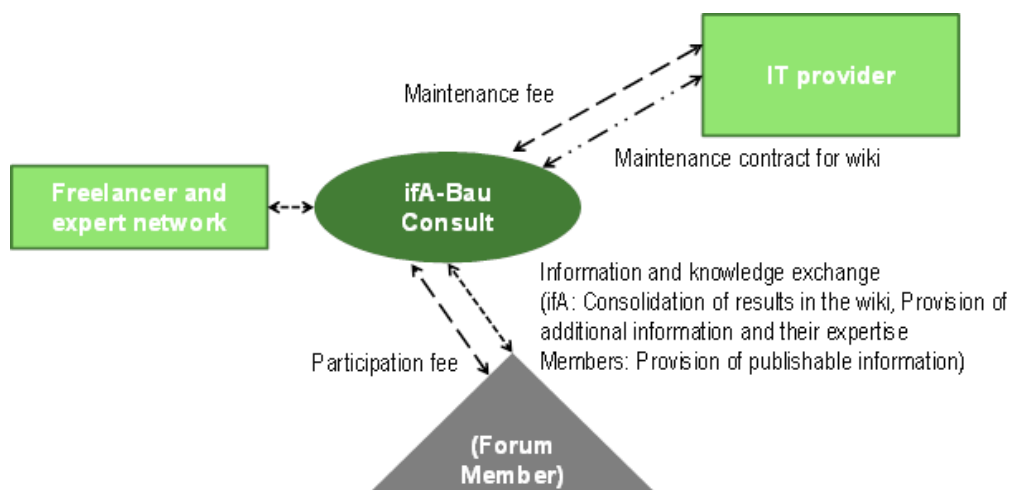
Figure 8: German Demonstrator Building of Scenario G1 description

- Business case G2: Application of NewBEE platform to support the retrofitting of a German single-family building

  This scenario shows the future collaboration of building owner and Rahm due to the advances provided by NewBEE. The application of the tool is mainly at early stages of a retrofitting project and, in the future (in an extended version of the wiki), also at a building's operation stage. The NewBEE platform provides value-added from the first information research of an owner seeking to refurbish his building. The business case description shows how the user is supported by identifying a construction company with a good reputation by means of the NewBEE marketplace, how the user can benefit from the pre-assessment tool, the financial calculator and the wiki. These tools can be used in general to support the initial research activities of a building owner, the meeting with the construction companies and their

preparation activities but also the early planning activities in the construction process. The building that has been chosen for the demonstration is a typical detached house in the area of Stuttgart, Baden-Wuerttemberg (Southern Germany). It was originally a two-flat building that has been turned into a one-family building by connecting both floors and adapting the building according to the needs of a young family with two children. Due to the age of the building (it was constructed in 1935), a holistic energy-efficiency concept was developed and realised for the building. The specific needs of the region and the new owners were considered.
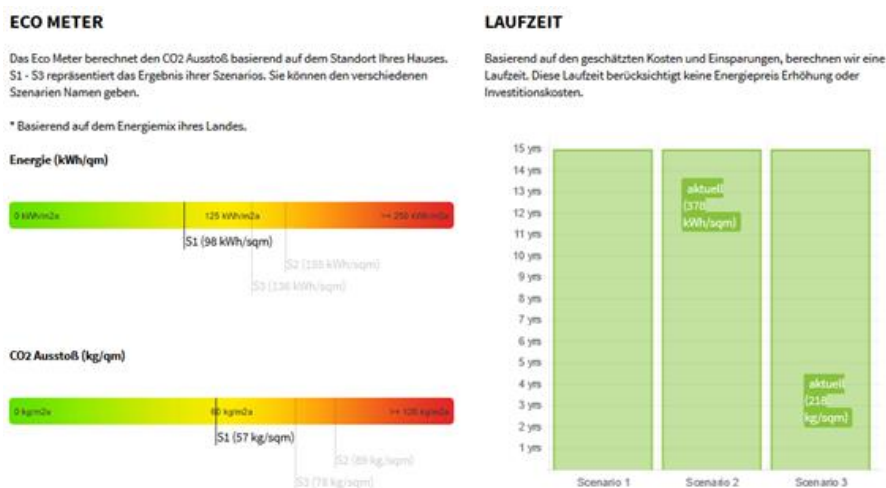
Figure 9: Demonstrator Building of Scenario G2

- Business case G3: Application of the Business Model Assessment to support the business development of a SME in the construction industry.

The Business Model Assessment is a tool that supports the review of a business model. The structure is presented in the picture below. The guided assessment for CEOs or managers helps them to identify the strengths and weaknesses of their business model. The NewBEE wiki gives additional advice concerning the improvement of a business model and next steps after the assessment. This business case shows exemplarily for the company Rahm how they conducted the assessment, which results they achieved and, based on the report, which recommendations where given in a first step. The tool can be accessed via: (http://plm.iao.fraunhofer.de/newbee/homePage1.aspx).
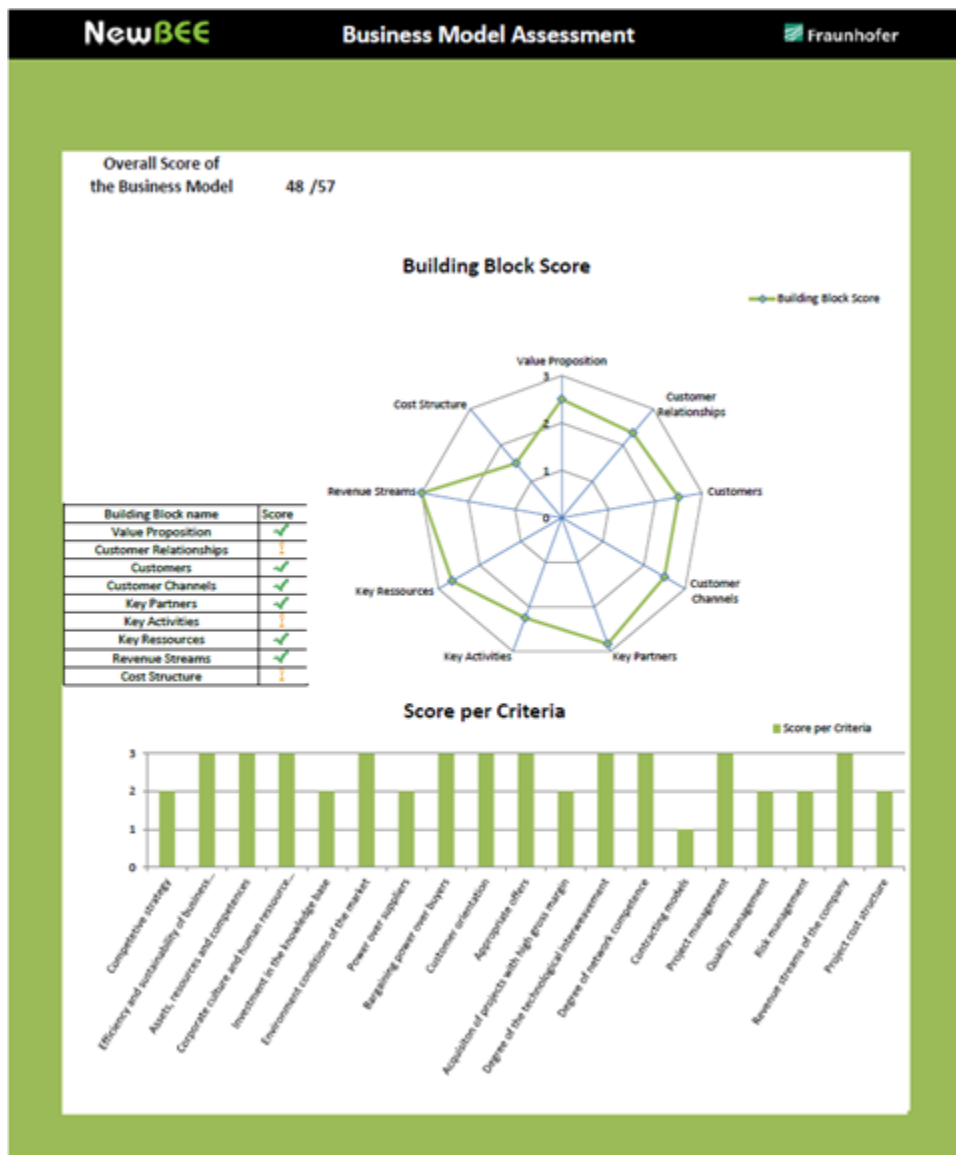
Figure 10: NewBEE Business Model Assessment - Rahm report

Finnish Business Case

The Finnish Business Case focuses on the development of energy-efficient and sustainable retrofitting processes with the help of three different case studies based on different building types (detached houses, block houses and office buildings). The SMEs involved in this Business Case put in practice the project concepts and tools and involved a refurbishment client in the application of the NewBEE platform and Methodology. The measures and solutions are based on the project scope: the location, use, type, age, structures of the building as well as the client's budget. A close collaboration with research partners and SMEs is in the centre of this business case. The role of the cases studies provide concrete scenarios where the sustainable retrofitting processes are developed and tested. The Finnish SMEs (FE, KVA and T-E (former ERI)), with the support of VTT, described the Business Cases and extracted functional requirements, based on previous retrofitting projects experiences, for the specification and development of NewBEE system. The SMEs demonstrated the new retrofitting processes in three case studies within this Business Case.

The NewBEE Market Place tool was demonstrated in organized sessions where the Finnish SMEs used the tool following the corresponding steps of realistic cases. Here two different scenarios were taken into account:

- S1: House manager of housing association created a Business Opportunity (consultant);

Figure 11: Finnish S1 Results

- S2: Energy consultant or architect searched for Business Opportunities.

Figure 12: Finnish S2 Results

E-PASS tool was demonstrated in two different scenarios:

- S3: In this case study the Finnish SMEs used the tool to follow the steps of a real situation (Energy consultant or architect uses E-PASS to support a house manager to find rational opportunities for energy refurbishment).

E-PASS RESULTS

Done!
Please find the results of the applied refurbishment measures. The impact is listed by sub-system type and summarized as an impact on the operational costs and CO2-emissions.

Case	Space heating and hot water		Appliance electricity		Space cooling		Carbon footprint		Energy cost	Investment	Payback time
	kWh/a	kWh/m2,a	kWh/a	kWh/m2,a	kWh/a	kWh/m2,a	tCO2/a	kgCO2/m2,a	€/a	k€	a(year)
Before	281560	141	56058	28	0	0	120	0.06	31689	-	-
After	270163	135	56058	28	0	0	116	0.06	30898	18005	22.8
Savings	11397	6	0	0	0	0	4	0	791	-	-

Figure 13: Finnish S3 Results

- S4: In this case study the E-PASS was demonstrated by arranging a session together with a (real) house manager. Finnergia used the tool together with the client to show how it would work in a real situation where the best options for energy refurbishment are searched for with the help of the E-PASS tool.

E-PASS

| Step 1 | Step 2 | Step 3 | Step 4 |

E-PASS RESULTS

Done!
Please find the results of the applied refurbishment measures. The impact is listed by sub-system type and summarized as an impact on the operational costs and CO2-emissions.

Case	Space heating and hot water		Appliance electricity		Space cooling		Carbon footprint		Energy cost	Investment	Payback time
	kWh/a	kWh/m2,a	kWh/a	kWh/m2,a	kWh/a	kWh/m2,a	tCO2/a	kgCO2/m2,a	€/a	k€	a(year)
Before	390064	128	85684	28	0	0	169	0.06	45639	-	-
After	372991	122	85684	28	0	0	163	0.05	44453	20849	17.6
Savings	17073	6	0	0	0	0	6	0	1186	-	-

Figure 14: Finnish S4 Results

Pre-assessment tool was demonstrated in one scenario:

- S5: Refurbishment in "HakaPaavo".

Figure 15: Finnish S5 Results

Slovenian Business Case

The proposed case derives from experiences gained during renewal of Posočje region after the earthquakes in 1998 and 2004. As more than 3.000 buildings were damaged in the 1998 earthquake the state organized help to reconstruct the area. The government secured funds for subsidies to residents in order to reconstruct their damaged homes. The government established the State Technical Office (STO) to be an administrator of governmental help. The office helped owners in the process of reconstruction and to obtain financial governmental aid. The STO also took care of revision (check of design) and supervision work. For design and construction works supported by government the companies have to attend short training (prepared by STO) on specifics of earthquake reconstruction to achieve a unified level of quality. After that, owners were free to choose one from the list of their choice.

The rationale of why to organize a STO was to handle a high spike of demand on reconstruction in the area. On the free market that would greatly increase the works prices. The second objective was to guarantee a high quality of the performed reconstructions.

This experience should be transferred into a new scheme for large scale retrofit of energy efficiency of buildings. One reason is because construction sector in Slovenia is in deep crisis and there were suggestions to help sector with government support to EE renovation with two main objectives:

- To lower Slovenian footprint on environment (energy consumption, CO_2 emission, etc).

- To help to survive Slovenian SMEs in construction sector by providing more reconstruction works.

The envisioned large scope reconstruction for achieving better energy efficiency of the building stock should be holistic, taking into account that Slovenia is an endangered by natural threats country. It needs mitigation measures for earthquakes, landslides, floods, even strong winds or high snow. All this should be (and is) considered during the design phase. More problematic is to ensuring proper financial resources and governmental support to meet those goals.

With Slovenian Business Case "large scope retrofit of apartment buildings in Slovenia" we tried to demonstrate the working method of the NewBEE platform and its parts:

❑ Using the NewBEE calculation tools – comparison with current existing methodology:

  ❑ Pre-assessment

  ❑ Financial calculator

❑ Simulating the use of:

  ❑ Marketplace

  ❑ Wiki

The demonstration is based on data of real buildings (type, dimensions, characteristics, energy consumption) in normal practice for handling retrofitting works by the partner staff and other partner companies. Results of NewBEE tools are compared to results of other (more time consuming) methods.

In the case of Slovenian Business Case there were three scenarios to demonstrate the NewBEE system in real environment:

1. **Motivate for retrofit**; use of NewBEE platform/tools (quick tool) to show owners of residential multi-apartment old building the potential of energy efficiency retrofitting;
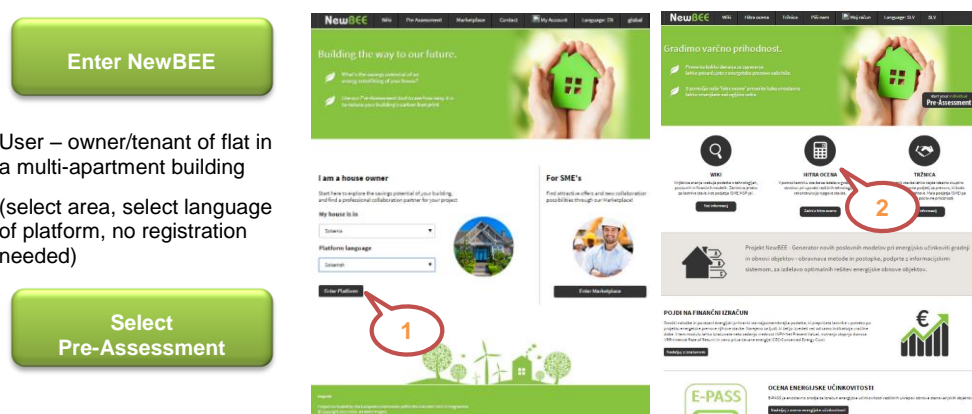

Figure 16: Slovenian S1 Results

2. **Finance for retrofit**; use of NewBEE financial tool for owners to play with different scenarios for financing the retrofitting of their building;
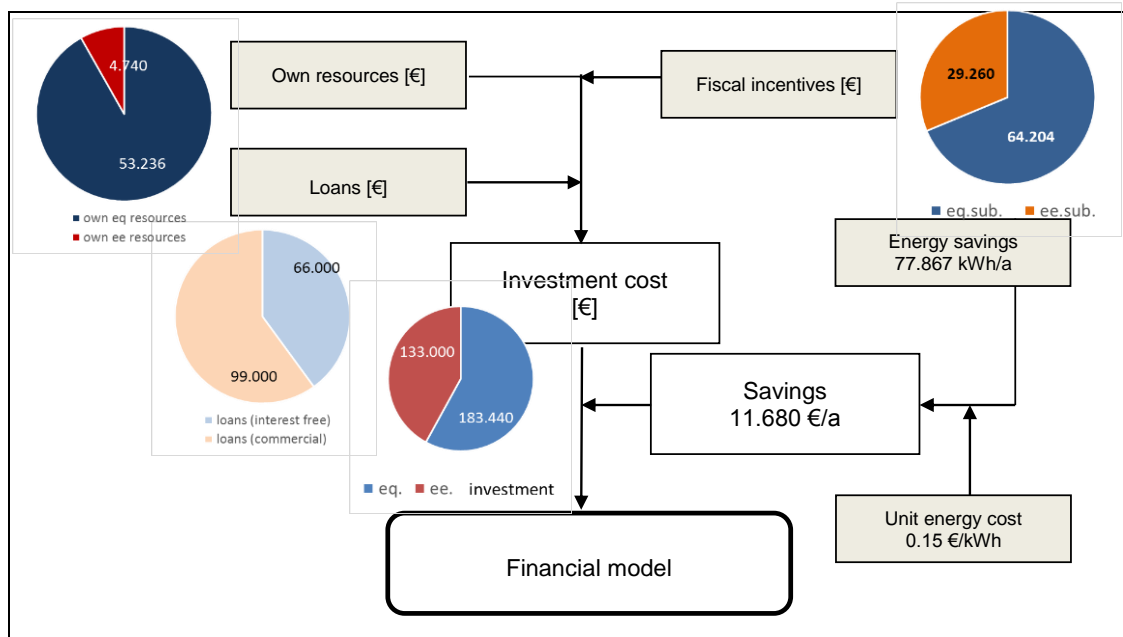

Figure 17: Slovenian S2 Results

3. **Connect for retrofit**; test the response of SME on published inquiry for retrofitting works on a NewBEE marketplace.

SME is checking published inquiries

SME enter NewBEE

(SME has been previously already registered)

filter opportunities (1)

Requests for offers can be filtered by location, dates, services requested…

compose a team (2)

After checking own company capabilities and resources a user can decide to invite partners to form a team.

The platform provides a list of required services (works) and for each a sub list of possible partners together with their rating.

select an appropriate partner for a part (3)
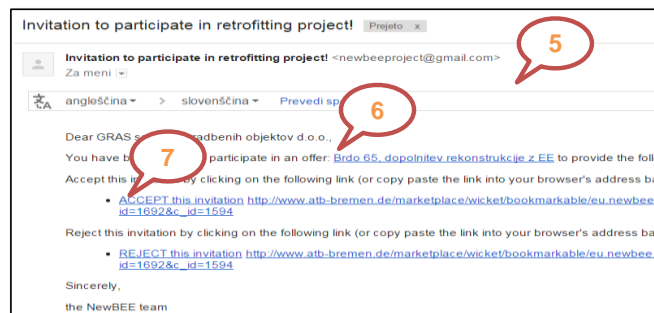
invite partners (4)

Figure 18 – Slovenian S3 Results

4.1.4 Potential Impact

The following table presents an overview of the main scenarios and benefits achieved by the four *NewBEE Demonstrators*.

Table 2: Main scenarios and benefits of the four demonstrators

Partners	Scenarios	Benefits
ACC/TEU/ ESL /TEC	• S1: A community of neighbours request a service retrofitting • S2: A tender of a great work to show that a set of SMEs can tackle it • S3: A real work of retrofitting from which we can obtain both physical and economic data and compare them with NewBEE system. • S4: The MEEFS project to test accurately the E-PASS tool.	• The project allows an SME to work in new collaborative way getting involved in projects born in the market-place. • The project allows training internally our own technical staff, having also new tools to advice the market. • Also the NewBEE Platform is an opportunity to advice the Retrofitting market (Having a Local Parameterization) that permits a SME a different approach to a potential customer, having a new Commercial tool. • The possibility of finding partners easily helps to focus only in the main company core business and thus to improve its skills in the specific fields needed.
RAHM/IFA /FHG	• S1: Support of a working group on energy-efficient construction and refurbishment • S2: Application of NewBEE platform to support the retrofitting of a German single-family building • S3: Application of the Business Model Assessment to support the business development of a SME in the construction industry.	• The Assessment is easy to handle for managers of small companies • Gives a first indication concerning optimization potential • Based on the results of the assessment experts can be consulted • Is not tied to another (charged) service but freeware • Combined with the other information available in the wiki there are several tools (examples, best-practices, Handbook on Business Model Design) that support the evolution of a company
FINN/ ERIK/KVA /VTT	• S1: House manager of housing association creates a business opportunity (consultant); • S2: Energy consultant or architect searches for business opportunities. • S3: Energy consultant or architect uses E-PASS to support a house manager to find rational opportunities for energy refurbishment. • S4: E-PASS demonstration by arranging a session together with a (real) house manager. • S5: Refurbishment in "HakaPaavo".	• It was regarded as a good feature that the input fields are filled with default data once the construction year is selected, and the user just needs to check, if they are correct. Especially for the heating and cooling options the tool seems to give correct options right away. • The demonstration participants concluded that the tool could be very useful for the planner or consultant for first estimations of the renovation options.
ZRMK/ SGG/ ATB/ UNIPD	• S1: Motivate for retrofit; use of NewBEE platform/tools (quick tool) to show owners of residential multi-apartment old building the potential of energy efficiency retrofitting;	• Quick estimates for costs and benefits of building retrofit for energy efficiency (visual enhanced – better communication with investors) • Info pages – compendium on technology, finance and business models also good practice cases, references, info on SMEs

• S2: Finance for retrofit; use of NewBEE financial tool for owners to play with different scenarios for financing the retrofitting of their building; • S3: Connect for retrofit; test the response of SME on published inquiry for retrofitting works on a NewBEE marketplace.	• Fast forward from initial estimates to getting an offer • A new channel generating more demand on their services • A new connection place (between SMEs) to act as a cluster and provide and manage integral, comprehensive approach to rehabilitation projects, integrated design, comprehensive solution at reasonable overall cost • A cluster organization enable specialization and optimal use of resources

The demonstrators, conceptualized and prepared by the NewBEE consortium as technological showcases, provided not only an optimal way to communicate the project results to a wider audience, but also a framework from which to evolve NewBEE prototype into a successful commercial product. Based on the technical and business metrics assessment provided by the industrial partners who participated in the creation of the demonstrators, it can be established that the features of the system realized in the integrated prototype have, by far, exceeded end-users' needs and expectations.

The impact associated to the results will affect to several actors and communities. Next sections explain which impacts result after full implementation of the project:

Impact on economic, organisational and social innovation: The transformation towards low carbon cities is supported by the NewBEE project through enabling SME driven retrofitting projects for building types that incorporate the highest potential for optimising cost, quality and energy efficiency throughout their lifecycle. The creation of a framework that (1st) motivates the building owner to start a project, (2nd) identify the most appropriate technological retrofitting solutions based on their lifecycle performance, (3rd) appropriate business models and necessary stakeholders within the value chain are proposed through the business model generator and (4th) the creation and collaboration of SME-networks is supported through appropriate project management and data interaction tools.

Impact on incentivise uptake of these energy-efficient solutions by increasing profitability and reducing risk. Financial and organisational aspects within the business model are able to link risk and profitability to performances throughout the building lifecycle. Through the integration of lifecycle performance already in early planning phases of retrofitting projects by developing an easy-to-use "simulation" platform that incorporates performance indicators on newest technological solutions, retrofitting projects are evaluated not only by their direct cost, but by their potential by means of energy reduction, increase in comfort and overall building valuation. The application of performance related financial and organisational models enables the incentivisation of stakeholders and thereby is a major driver for carrying out retrofitting projects.