D1.3 Concept and Architecture of the platform Concept of the on-line platform and action plan for platform development

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IMPAWATT
IMPlementAtion Work and Actions To change the energy culTure

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Contents

1 Introduction

1.1 Purpose of this document

The purpose of this document is to describe the concept and architecture of the platform including an action plan for the development of the platform. It is based on a first approach to the platform that was introduced, discussed and further developed during a consortium workshop on user requirements of the platform in July 2018 organized by SEC in Berlin. After this kick-off event, SEC was in close exchange with partners to develop drafts of the landing page, the search/filter engine and the monitoring section as well as data models for company data which will be included in an Impawatt prototype. This prototype will not yet have the final frontend design and usability but rather helps partners to understand and to apply the data model of the platform, (e.g. how company data will be linked to other data like e.g. energy saving techniques which are predominant for certain sectors and branches).

Using a mockup approach, basic features as well as specific functionalities will be introduced taking into account the variety of companies regarding different sectors and branches as well as the different information pillars such as energy efficiency, energy culture and green supply chain.

The concept will contain the different functionalities of the portal, like:

- General navigation structure,
- Registration and user authentication,
- Set up area for company profile / Input and edit company data
- Storage and display of content (such as webinars, fact sheets)
- Search/Filter function for tailored user content
- Front-end features and input masks
- Backend for company data and configured content
- User forum and rating system to discuss and rate content.
- Link to external tools like e.g. the energy monitoring system iESA and user survey tools, quizzes and the LCA –Tool.

1.2 Relation to other activities in the project

Based on the concept and timeline of this deliverable the platform will be implemented by SENerCon also taking into account partners input regarding improvements of the platform which will be discussed during the next project meeting on the 10/11 December. For testing the first functionalities, SEnerCon will provide a prototype of the platform by end November 2018. The English working version of the platform will be due in March 2019 which will be the basis for the national versions of the portal due in June 2019. For the design and user interface of the platform a subcontractor will be contracted. Thus the following mock-ups of the navigation structure and functionalities should be understood as first drafts that might change but the input/output of functionalities will remain.

Content produced and translated for the different country versions of the platform will be uploaded by partners as soon as the national versions of the Impawatt platform are ready.

1.3 Partners´ contribution

Envipark and Planair have contributed to the development of the concept of the platform suggesting the data profile and content attribution approach for companies.

# 2 Concept and architecture of the platform

2.1 General Information

The aim of the platform is to provide tailored content regarding the three categories energy efficiency, energy culture and sustainable supply chain to energy managers of companies. The unique selling proposition of the platform is that its users get customized information and materials according to the company's sector and branch and to their needs, especially after being audited or certificated. The overall aim of the platform is to enhance the implementation of recommendations suggested in energy audits, thus to increase energy efficiency and culture through technical measures as well as behavioral changes in companies. These positive changes shall be evaluated in the monitoring section of the platform, where energy saving measures and energy consumption shall be assessed.

2.2 Platform functionalities

In the following, the main functionalities of the platform will be described: The user registration and authentication, the user profile, the filter and search engine and the monitoring section. Additionally, external tools that will be connected to the platform and their location and link to the platform will be shortly explained. Finally, the user story of Mr. Energy will be told while he is guided through the platform.

2.2.1 Landing page and Home section of the Platform

The landing page guides the user through the main functionalities which will additionally be promoted in teaser boxes. Clicking on these boxes the user enters default paths through the platform.
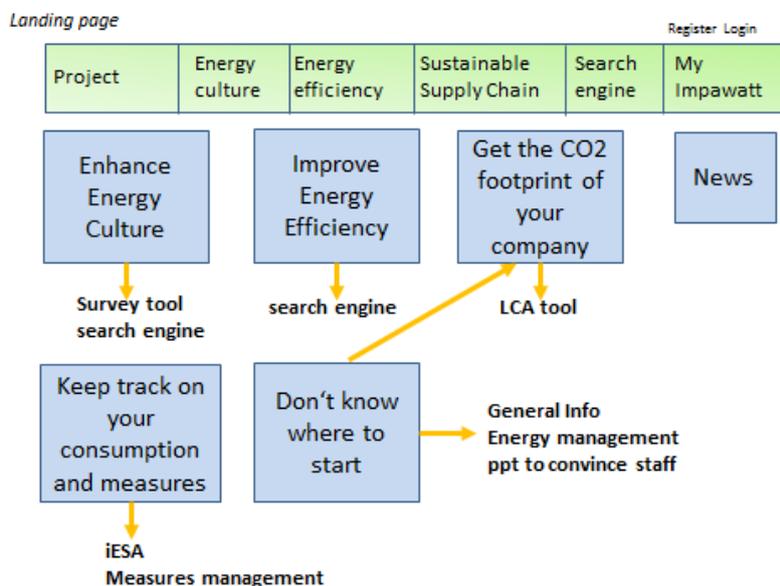
The navigation structure will be the same for all pages, only the *My Impawatt* sub-navigation points will change as soon as the user is registered and logged in.

In the *Project* section, the project will be briefly described. For more information a link to the project website will be installed.

The following three navigation points *Energy Culture, Energy Efficiency* and *Sustainable Supply Chain* will have a similar sub-navigation. In the point *About*, the subject and its importance for companies

will be briefly explained including a short teaser and link to the Search Engine and to additional external tools which are linked to the platform, like e.g. the *User survey Tool* to analyse energy culture already established in a company or the tool for the *Life Cycle Assessment (LCA)* of products and processes of a company.

In the section *My Impawatt* the user can register for an account or log in to his account. As soon as he is logged in, the navigation changes: Now he can enter and edit his company profile data as well as energy saving measures performed and energy consumption data or use the Energy Savings Account.

2.2.2   Registration, login and user authentication

Not registered visitors of the platform have basic access to the content provided by the plat form but they will not be able to see a pre-selection of content tailored to their company profile. The content will be also not be completely displayed to the not registered visitor, instead he will just see parts of it as a teaser, in order to motivate the visitor to become a registered user so he can have full access to the content. This way, visitors are invited and motivated to sign in. Not only is it favourable for companies to register in order to be able to use the whole functionality of the platform (e.g. monitoring section, and some plus-graded content like webinars), but also for the consortium in order to be able to evaluate the impact of the platform based on data inputs in the monitoring section.

Energy managers of companies as the main target group (Mr. / Mrs. Energy) will register to the platform with their name and email address applying a double-opt-in process: They will receive a registration link via email. By clicking the link they confirm their mail address and this way validate their registration.

This way, bots will be excluded from registration and the platform provider complies with the basic data protection regulations for the communication with the user.

To learn more on the user's background he or she is asked for his/her role in the company during the registration process.

Energy managers use their email address and a self-defined password for platform login.

2.2.3   Company profile data

To keep the registration process simple and to guarantee strict data protection of personal data, company profile data are inquired in a second stage after registering to the platform. Companies have to enter the following data (obligatory data are marked with a *):

- Company name*
- Location name*
- Company Sector/Branch (a classification list is included in the Annex)*
- VAT number
- NACE code
- Building size
- Building purpose
- Free text description of activities
- Number of employees
- Technical equipment used (e.g., heating and cooling systems, heat recovery systems, steam, …)*

Additionally, in a third step the user is being asked to enter his total energy consumption and costs as well as the consumption and cost of electricity and heating (gas or fuel). These data will be automatically displayed in the monitoring section of the platform (My Impawatt).

Registration steps including company profile data and total energy data
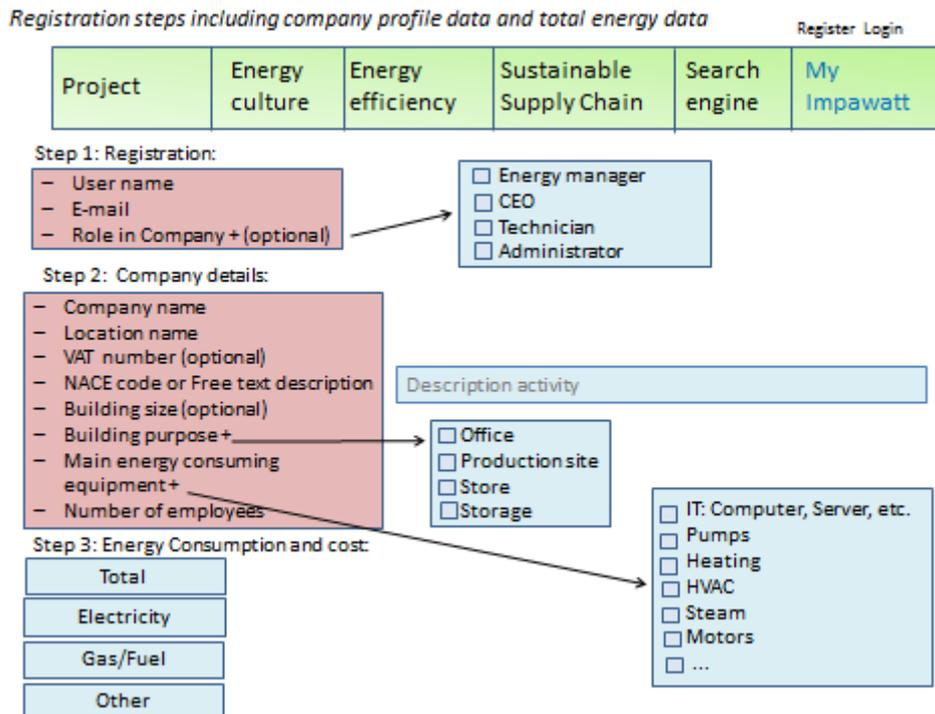
2.2.4 Filter and Search Engine

To filter content for the preselection tailored to companies and to make sure proper content is shown when companies search for it each content will be tagged in the backend table according to its relevance for different categories, like:

- Energy Efficiency, Energy Culture or Sustainable Supply Chain
- Different Energy Carriers (electricity, gas, fuel)
- Behavioural changes or technical measures
- Different sectors/branches
- Different energy consuming equipment
- Kind of content: Factsheet, Webinar, Presentation, Survey, Quiz
- User role

Sectors and branches are grouped according to the following table:

OFFICES (education, insurances, Financial,..)
DATACENTERS
LABORATORIES
TRANSPORT AND STORAGE (H)
WHOLESALE AND RETAIL TRADE (G)
ACCOMODATION AND FOOD SERVICE ACTIVITIES (I)
INFORMATION AND COMMUNICATION (J)
MANUFACTURE OF FOOD PRODUCTS AND BEVERAGES (C/11-12)
MANUFACTURE OF PAPER AND PAPER PRODUCTS (C/17)
MANUFACTURE OF CHEMICALS AND PHARMACEUTICAL PRODUCTS (C/20-21)
MANUFACTURE OF RUBBER AND PLASTIC PRODUCTS (C/22)
MANUFACTURE OF MINERAL PRODUCTS (C/23)
MANUFACTURE OF METALS AND METAL PRODUCTS (C/24-25)
MANUFACTURE OF MACHINERY AND EQUIPMENT (C/27-28)
Others

Content will be given a priority according to the sectors/branches groups above (from 0-10). Content will be displayed according to its score, the higher the score the higher is its position in the list displayed by the search engine). Content with priority 0 will not be displayed.

According to different user roles (energy manager, technician, CEO, administration) a preselection of behavioural content (e.g. for energy manager, CEO and administrator) or of technical content (e.g. for energy manager and technician) will be displayed. If the building purpose is production, technical measures are listed, if it is an office, only measures regarding office equipment, heating and cooling of the building will be shown in the preselection.

2.2.5 Monitoring Section

In order to keep track of performed energy saving measures and of the energy consumption, the system invites the user to enter energy consumption data as well as energy saving measures implemented (both including date) into a special monitoring section of the system (allocated under the navigation point *My Impawatt)*. The system provides a pre-selection of measures in a drop-down menu as well as a free-text field for further description of the respective measure by the user.

For each measure the user will also have to enter a time stamp. All measures will be stored in the backend. If the user has entered time-series of consumption data, energy saving measures will be displayed as little marks (events) in the load profile curves. This will make it easier for the user to keep track of changes in its energy signature. It will also be useful for the evaluation of the impact of the Impawatt project on the participants' energy consumption. The load profile curves will be depicted in the monitoring section. Thus, the user may relate energy efficiency efforts of his/her company to energy consumption development.

The list of energy saving measures according to different categories will be completed during the course of the next months until end March when the English working version of the platform will be finalized. A list of measures is attached in the Annex 1 of this Deliverable.

When the user enters a measure he will be asked to enter the following information regarding the measure (mandatory fields are marked with *):

- Measure category (e.g. technical -> Change to LED -> Free text description of measure)*
- Measure implemented of planned (scroll down)*
- Date of implementation or date of planned implementation (*with the option "not yet determined")
- Energy Savings estimated (according to energy audit)
- Energy Savings achieved (if the measure has already been implemented)
- Investment cost estimated (according to energy audit)
- Investment cost achieved (if the measure has already been implemented)
- Payback period

- Share on energy part of investment cost (in percent, to exclude maintenance cost and depreciation)
- Free text for description of the energy saving calculation
- Free text for comment regarding implementation

The platform also calculates and displays performance indicators and benchmarks if they are available for the respective branch. Companies are flexible to choose the most adequate indicator for their enterprise, e.g. annual electricity or fuel consumption per employee, per working hour or per good produced. Accordingly they are asked for the respective reference value in a scroll down menu and enter the value, like the average number of goods, working hours, kg of good produced, etc. The system compares the performance indicator with specific benchmarks if available for the respective branch.

Above described monitoring data will be accessible to the consortium for further evaluation of the impact of the platform in terms of energy savings and of measured implemented by companies. They will be retrieved by data base inquiries from the backend of the system performed by SEnerCon and will be included in Excel tables to be provided to partners.

2.2.6 Rating system for content including user comment option

All contents can be rated by users including comment function enabling an exchange and dialogue among users. The rating and comment section (used like a user forum) will be moderated by the responsible partner of the national platform. Content can be rated from 1 to 5 stars (1 to 5).

2.2.7 External Tools

Interactive Energy Savings Accounts iESA

The Impawatt platform and the iESA will communicate bi-directionally by an API to collect and display energy consumption data and energy saving measures performed.

Behavioural survey and Life Cycle Assessment (LCA)

VTT will develop a survey tool to assess the degree of energy culture that has already been achieved in a company as well as a tool for the Life-Cycle-Evaluation of equipment and material used and goods produced within a company. The LCA tool assesses the CO_2 footprint of a company per energy carrier based on the energy consumption and the resources used in the production. Companies can "play" with the tool and test different scenarios, e.g. how is the company's footprint decreasing when a PV panel is installed. Companies should get a guidance on how to use the tool, e.g. by a webinar. Regarding CO2 coefficients, the tool is currently using a European average but could be customized to partner countries. Both tools will be promoted in teaser boxes of the landing page and will be allocated under Navigation point Energy Culture (Behaviour Survey) and Sustainable Supply Chain (LCA tool) of the platform and will be linked to the platform by hyperlink.

Quiz/ e-learning system

In the proposal it was foreseen to apply an external quiz tool for multiple choice tests and quizzes on energy issues which is accessible via link from the platform. Two different tools were mentioned in the proposal: iAcademy and Knowledge Fox. Both tools have their pros and cons (already established on the marked, easy to handle vs. high license fees of advanced versions and missing API for transferring the quiz' results to the Impawatt platform). Therefore other tools like e.g. Limesurvey and Moodle were evaluated as well as an in-house solution with the quiz as an integrational part of the platform. During the next meeting the different solutions will be introduced and discussed among the consortium and a decision will be made.

2.2.8 User story of Ms. Energy

Ms. Energy is the energy manager of a company producing pharmaceutic products. She is a technical expert and in charge of surveying and improving the energy efficiency of processes and of the building and the office equipment. Additionally, she has to inform and motivate her colleagues and advise the management to develop and establish an advanced energy culture in the enterprise. She has to take decisions when it comes to purchase new equipment for offices and she also has to contract energy experts who help her decide on energy efficiency measures or who help her maintain the production site or the building by itself.

Ms. Energy has already done the first step to perform an energy audit issued by an external energy adviser who has suggested several recommendations on energy saving measures in the audit. Ms. Energy has now been asked by the management to provide them with further details about the different technical recommendations which are addressed in the audit filled by the external energy adviser.

1. She searches in the internet with key words like energy efficiency and energy culture and gets on the Impawatt portal where she gets a first sight on the basic content regarding energy efficiency and energy culture.
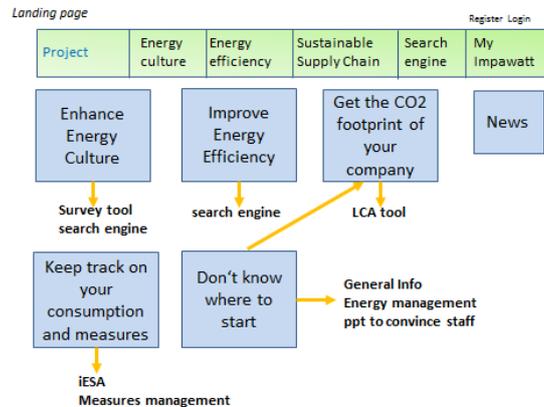
2. She registers an account for her company in order to get more information and especially to sign in for a webinar on recovering process heating which will be organized and emitted the following days. She finds the registration banner already on the stage of the landing page together with an indication of the advantages to sign in, like e.g. to get more tailored and plus rated content and to use the monitoring section for monitoring energy saving measures and energy consumption.
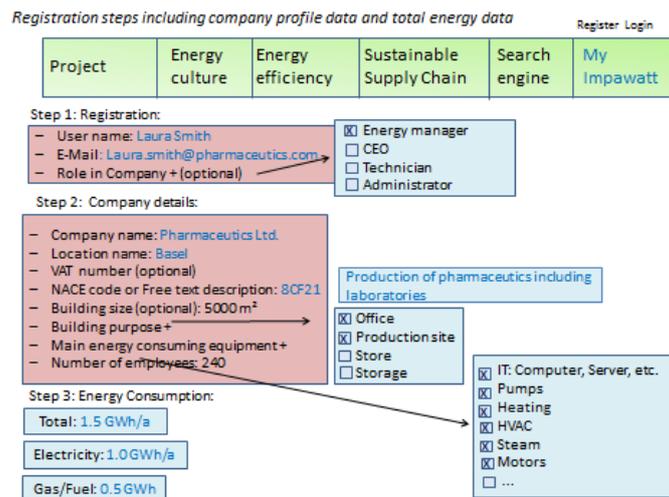
After entering her name and email address she receives an email of the system verifying her registration with a personalized password. She is asked if she would like to continue and enter the profile data of her company, like the NACE code (which she doesn't know) and to choose a branch out of the pre-selection of the system. Additionally, it is possible to add some free text to describe the activities of his company. Furthermore she is asked to enter the number of employees of the company. She is asked to enter the main technical equipment used in the company. After all these data entries she decides to leave the platform and to continue with the search on energy efficiency measures the next day.

3. The next day, she logs in with her user ID and password and clicks directly on the navigation point *Search Engine*.

She accesses the *Search Engine* and content section of the platform with a pre-selection of filter settings and related content according to her company's profile. She is interested in reducing the electricity consumption as well as the consumption of natural gas; therefore she leaves the crosses in the checkboxes for Energy Carrier for Electricity and Natural Gas and deletes the crosses in the checkbox Fuel by clicking at the boxes. As she is only interested in technical measures, she unmarks the behavioral measures box by clicking on it. Now the content is more specific, the webinar she was interested in is shown on top followed by several factsheets about different cross-sectoral energy saving measures. Each content is described briefly in a teaser box. The full content e.g. a fact sheet can be downloaded as pdf file and webinars can be accessed through a link. Ms. Energy is choosing to download fact sheets about the technical measures that were recommended in the energy audit filed for the company by the external energy adviser, like e.g. the change to LED.

4. Before she logs out she is asked if she likes to enter energy consumption data or energy saving measures performed and then will be guided to the monitoring section of the platform.

Here she is asked for the energy consumption of the last year in case she has an energy bill with an annual billing period but she can also enter monthly data or meter readings with a time stamp. The system always asks for the energy consumption of a certain period and if energy saving events have been performed. Ms. Energy enters consumption data of several months for electricity and natural gas. Additionally, she enters the most relevant energy efficiency measures proposed during the

previous energy audit. For each measure she adds the date when the company has implemented it or plans to implement it. She is asked to enter the savings achieved or respectively the estimated savings, investments cost and payback period for each measure. These indications were optional. As in the energy audit these figure were indicated she enters all data inquired by the system and furthermore the investment cost for the exchange of the lightning system in the production site which has already been implemented in October 2017. At the end she has a nice overview of implemented and planned measures with some specific data as investment cost, payback period and energy savings. This allows her to prioritize the most interesting measures. Later when a measure is implemented, she will validate the measure and enter the date of implementation. With this system she always has an overview of the already implemented measures and the total energy saved as well of the remaining measures including energy saving estimation.

Energy consumption data of several months are depicted in a chart together with a mark in form of a little flag. The little flag marks in the load profile the date of implementation of a measure. In this case the measure was the exchange of the old inefficient lightning system for new less electricity consuming LED which had been entered by Ms. Energy before in the monitoring section. A decrease on energy consumption after implementation is visible in the chart. Now she is happy taking a screenshot of the load profile for her CEO to demonstrate the success of having switched to LEDs. But now Ms. Energy is also interested in using more functions of the energy monitoring system iESA which includes far more features than just the load profile. Therefore she clicks on the link "to the iESA system" which brings her directly into her corresponding iESA account. She has automatically access to iESA by her login in to the IMPAWATT platform.

2.3 Applied Frameworks

For the backend implementation in PHP 5.6, the PHP Framework Phalcon Version 3 is used. HTML and CSS are implemented using the web frameworks Foundation in version 6 and Sass in version 3. The JavaScript components of the web application are implemented with AngularJS. MySQL version 5.6 is used as data base server. The finalized portal will be provided by an Apache web server version 2.4.

2.4 Backend and first prototype

The Impawatt platform will be developed as one central portal solution with the ability to have different portal-configurations which can be accessed via separate subdomains or URL parameters (e.g www.italy.impawatt.com).

Regarding the backend, it is planned to split the data structure of the Impawatt portal into the following five modules:

1. Data of user accounts (registration and login data)
2. Company data (each user can create multiple locations/sites)
   a. Basic company data (name, location, size, number of employees etc.)
   b. Information on -technology used
   c. Information on energy carriers used and their energy consumption
   d. Information on already implemented or planned energy saving measures
3. Data of available content[1]
4. Text data store (to provide multiple language support with a fallback mechanism to the English version)
5. Tracking module (basic user-activities and statistic information about the suggested measures

The separation of account data primarily serves to protect personal data. The database tables with this information are given strongly restricted access rights.

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[1] Content means here and in the following all information material that is available from the search engine on the platform, e.g. factsheets, presentations, Excel calculations, webinars, etc.

The company data will be stored in several database tables according to the submodules a to d. The platform generates a specific profile for each company. By applying the Search Engine, company data are combined with content data: According to the company profile, a pre-setting of search criteria is generated which will be connected with existing content available for this profile. For this purpose each content item will get different tags according to the search categories of the search engine.

The text store of the platform contains the whole text of the platform. Partners as admins will have access to these data by a restricted administration section where they can edit and translate these texts. The text store is initially filled with English texts for all frontend areas and content descriptions that are already produced. This version serves as the translation basis for other language versions of the platform. Thus, new content descriptions that will be created in the future must first be created in English and then translated in a second step. If no translation is available, the English text and content is shown. If partners to decide to upload additional content they produced on their own and that is not part of the common content created by the work package leaders responsible for platform content, they can upload it and insert a description of content in their language.

The tracking requirements have not yet been finally defined. Preliminary, the tracking of the login and profile activities of registered users (which can be switched off at any time) and statistics on the display of the existing content will be recorded.

The first step of the implementation will be the basic setup of the framework. That includes access to of the platform over the project URL (impawatt.com), a first simple landing page with a registration and login-screen and the process to register on the platform with a full double-opt-in process. It is planned to integrate also a first version of the company data input forms, so partners can test the data input section and check if all data inquired by the platform are available from companies and if any additional data inquiries are necessary. The testing results will be discussed at the next project meeting on 10/11 December 2018.

2.5 Platform administration und localisation

The platform will be developed as English master version with non-country-specific content to be tested by partners and will then be adapted to partner countries. Frontend text translation will be done directly in the platform within an administration section of the portal with restricted access only for partners. English content produced by the work package leaders responsible for content creation will be uploaded on the English master platform. Partners may choose adequate content for their national Impawatt portal, translate and adapt it to the situation in their country and upload it on their national portal. This will also be done within the administration section of the portal.

3 Timeline

- Calendar week 44 (29 October to 3 November 2018): Testing and adjusting the prototype by Planair and SEnerCon
- Mid to end November 2018: final prototype provided for testing by partners
- Feedback round on prototype testing and on the concept at the next project meeting (10/11 December 2018) in Vienna
- Frontend and design (UX + UI subcontract) as soon as functionalities are decided in the beginning of January 2019
- End January 2019 design of the platform is ready for being implemented in the English master portal until March 2019
- March to June 2019 national versions of the portal will be adapted (including content upload), tested by partners and finalized.

4 Annex

4.1 Annex 1: Set of about 70 energy efficiency measures of cross-sectoral technologies

Nr of Tech	Technologies (im Antrag erwähnt)	Number of measures	Measures
1	Compressed Air	1	Optimisation of compressed air users/appliances
		2	Switch off of appliances in non-operation times
		3	Reduction of leakages
		4	Optimisation of the pressure in the system
		5	Optimsiation of the regulation of the system
		6	Reduction of engine idle (Leeerlauf)
		7	Heat recovery
2	Measurement & Verfication of savings	1	textual description of methods according to IPMVP and ISO 50015, excel tools for calculation
3	Optimisation of steam system	1	Economizers and air preheaters
		2	Minimize excess air (oxygen rate sensor)
		3	Reduce blow-down losses:Improve water treatment to minimize, boiler blowdown; Install an automatic boiler blowdown controller; Recover energy from boiler blowdown
		4	Repair or add boiler insulation
		5	Reduction of starts, Minimize the number of operating boilers
		6	Minimize vented steam
		7	Repair steam leaks
		8	Check the number and location of the stream traps and detect lack/excess of steam traps
		9	Optimize condensate return
		10	Use of vented steam

			11	Optimzation of steam consumers, Eliminate or reduce the amount of steam used by process, Use steam at as low a pressure as possible, Check that heat flows in each specific process are exchanged to optimize the use of the heat.
4	Optimisation of Lighting systems		1	Optimization of day-light use
			2	Optimization of lighting-congrol
			3	Optimization of room
			4	Replacement of driver/ballast
			5	Replacement of lumenaire
			6	Replacement of lamps
5	**Optimisation of industrial refrigeration and cooling systems**		1	Reduction of cooling load
			2	Lower condensing temperature
			3	Raise of evaporation temperature
			4	Compressor control
			5	Efficient fans and control
			6	Use of heat recovery
			7	Reduction of leakages
6	**Optimsation of pump systems**		1	Switch off motors when not needed
			2	Motor replacement
			3	Drive replacement
			4	Reduction of running time for pumps
			5	Optimised control of rotodynamic pumps
			6	Pump replacement
			7	Reduction of flow, if possible (otherwise check adaption of needs)
			8	Improving distirubtion network-reduction of dynamic head
7	**Optimisation of HVAC systems and industrial fans**		1	Reduction of running time of fans
			2	Flow rate adjustment
			3	Flow rate adjustment with frequency converter
			4	Replacement of fan
			5	Replacement of transmission system
			6	Heat recovery
			7	Maintenance reduction of pressure loss

			8	moistuer recovery
			9	leackage reduction of fan pipes
8	Waste heat recocery systems on enterprices level		1	Installation of heat recovery systems Pinch-Analysis?
			2	Installation of heat pump
			3	Installation of storage capacity (hot-, cold water)
9	Insulation of industrial appliances		1	Insulation of hot appliances (boilers, pipes, valves, fittings)
			2	Insulation of cold appliances
10	Optimisation of heat distrubtion system		1	Hydraulic balance (static and dynamic)
			2	Low delta T Syndrome - Optimization
			3	Optimaziation of return flow temperature
			4	Optimization through control
	Further ideas			
11	Green IT		1	Optimization of Hardware in data centers
			2	Optimization of Software in data center
			3	Efficient cooling of data centers
			4	Energy efficient office working places
			5	Stand-by Reduction of Office equipment
12	Building Envelop			
13	Energy Management/Monitoring			

4.2 Annex 2: Sector Branch Classification

First Draft of Sector/Branche classification
Offices (education, insurances, Financial,..)
DATACENTERS
Laboratories
TRANSPORT AND STORAGE (H)
WHOLESALE AND RETAIL TRADE (G)
ACCOMODATION AND FOOD SERVICE ACTIVITIES (I)
INFORMATION AND COMMUNICATION (J)
MANUFACTURE OF FOOD PRODUCTS AND BEVERAGES (C/10-11)
MANUFACTURE OF PAPER AND PAPER PRODUCTS (C/17)
MANUFACTURE OF CHEMICALS AND PHARMACEUTICAL PRODUCTS (C/20-21)
MANUFACTURE OF RUBBER AND PLASTIC PRODUCTS (C/22)
MANUFACTURE OF MINERAL PRODUCTS (C/23)
MANUFACTURE OF METALS AND METAL PRODUCTS (C/24-25)
MANUFACTURE OF MACHINERY AND EQUIPMENT (C/27-28)
Others

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4.3 Annex 3: Example on information to be inquired in the energy saving measure part of the monitoring section

Input	Comments	Example
Standard Measure title	Link with measure database (just title). Possibity to add customed measures.	*Light bulbs replaced by LEDs*
Measure category		*Optimisation of lighting systems*
Measure title		*Replace lamps in the production hall*
General description	free text	*Replace 97 T5 lamps in the production hall by 50 LED lamps*
Description of the energy saving calculation	free text	*Consumption before: 97 x 48 W x 5000 hours = 23 280 kWh/a, after 50*46 W x 5000 hours =11 500 kWh/a.*
Investment cost	number	*€ 10000.-*
Energy part of Investment cost	percent	*50 % (because the lamps are in the half of their lifetime)*
Calculated Energy savings (initial) per energy carrier [kWh/a]		*Electricity: 11780 kWh/a*
Calculated Energy savings (implementation) per energy carrier [kWh/a]		*Not yet known*
Planned implementation date		*17.01.2019*
Implementation date		
Implemented (check box)		*no*
Implementation comment		
Category	Electricity, Heat system, Optimisation, behavior	*Electricity*

Remarks:

The payback time is calculated using the energy savings, investment cost and energy price (entered in company data).