



**A Gaming and Social Networking Platform
for Evolving Energy Markets' Operation
and Educating Virtual Energy
Communities**

H2020 ICT-731767

**Final version of SOCIALENERGY's virtual
world functionalities**

Deliverable D4.3



H2020-731767 SOCIALENERGY Project	SOCIALENERGY D4.3
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Contributors

Jevgenijs Danilins (NRG)
Andrew Pomazanskyi (NRG)
Atanas Georgiev (SU-NIS)
Krassen Stefanov (SU-NIS)

Internal Reviewers

Prodromos Makris (ICCS)

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Glossary of Acronyms

Acronym	Definition
AECC	Aggregated Energy Consumption Curve
ATMSG	Activity Theory-based Model of Serious Games
C-RTP	Community Real-Time Pricing
DR	Demand Response
EC	Energy Community
ECC	Energy Consumption Curve
EP	Energy Program
ILP	Individual Learning Plan
LCMS	Learning Content Management System
LO	Learning Object
P-RTP	Personalized Real-Time Pricing
RTP	Real Time Pricing
SSO	Single Sign-On
S/W	Software
ToU	Time of Use

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Document History

This deliverable includes the final version of SOCIAENERGY’s virtual world functionalities and more specifically the final version of the SOCIAENERGY GAME and LCMS. It elaborates on the previous deliverable D4.2 to demonstrate all the improvements that have been made during the last 9 months (i.e. M16-M24).

Table 1: Document History Summary

Revision Month	File version	Summary of Changes
12/10/2018	v0.1	Draft ToC circulated to the entire consortium.
19/10/2018	v0.2	Final ToC circulated to the entire consortium.
23/11/2018	v0.6	First round of NRG and SU-NIS contributions.
30/11/2018	v0.7	Comments provided by ICCS and the coordination team regarding some enhancements.
07/12/2018	v0.9	NRG and SU-NIS provide 2 nd round contributions and integrate all required material to address the review comments.
12/12/2018	v0.95	ICCS performs a 2 nd round review and asks for some minor modifications.
20/12/2018	Final	Coordinator addresses final comments from internal review, incorporates last modifications and submits the final version in ECAS portal.

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Executive Summary

This Deliverable deals with the development of the final version of the SOCIALENERGY GAME and LCMS.

For the game, a game design document was created and presented in D4.1 (M9). The game design document includes the global goals, game goals and the technical specifications. Additionally, the future user profile, the avatar design and the game world were described. The use cases of the game were also defined in the D4.1.

The implementation of the initial version of SOCIALENERGY’s virtual world was described in D4.2 (M15). It describes the progress of implementation, the methods used and compared the results with the game design from D4.1. S/W development results from D4.2 have already been incorporated in the first (or else “alpha” version) of SOCIALENERGY S/W platform (cf. D5.2 delivered in M18).

The current deliverable D4.3 describes the S/W development of the final version of the SOCIALENERGY GAME and LCMS. S/W development results from D4.3 will be incorporated in the second (or else “beta” version) of SOCIALENERGY S/W platform (cf. D5.3 to be delivered in M27).

The first chapter is the introduction to the work made in the project so far and the newly implanted features during the last 9 months. The second chapter explains the use cases, which are available for gameplay. The third chapter is about the game interface. In particular, the graphical representation of results (i.e. sections 3.1, 3.2), tutorial (3.3), representation of content provided by LCMS into the game (3.4), the convenience representation in job details (3.5) and the representation of badges (3.6). The fourth chapter is about the animations integrated into the game to advance its aesthetics. The fifth chapter is about the backend of the game and which is not visible. This incorporates the data exchange between GAME and GSRN (5.1), saving of data (5.2) and purchasing upgrades (5.3). The sixth chapter is about the work done in the LCMS development, including a summary of all LCMS S/W modules, which have been integrated during the last 9 months and related S/W development progress that has been realized.

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1. Introduction

As already described in the D4.1, the global goal of SOCIALENERGY is to motivate and engage energy consumers and energy efficiency companies in the objectives of greater energy efficiency, deeper interaction between the consumers and companies, and user engagement and profiling. Resulting from this goal, the game was created as a simulation and management game.

Within the game, the goal is to satisfy avatar’s convenience and achieve minimum energy consumption or else the maximum energy efficiency. To achieve this goal, an optimal balance between the convenience and low consumption (or else optimal Energy Consumption Curve (ECC)) needs to be made. Technically, the game is made in Unity with web browser (WebGL) as target platform. The game exchanges data with the core GSRN S/W platform as described in D4.1 and implemented in the current D4.3.

It was decided in D4.1 that a customizable avatar editor is needed to create a more personalized personal experience for the users. In D4.1, four use case scenarios were defined for the game. The first one, which is also used as benchmark, is the fixed pricing energy program (EP), where the energy price is fixed throughout the whole day time for all end users. This use case is used as introduction and tutorial of the game. The second use case is the Real-Time Pricing (RTP) with price depending on the day time, but being the same for all end users. In the third use case, the price depends additionally on the consumption of the player and is called Personalized Real-Time Pricing (P-RTP). Finally, the Community Real-Time Pricing (C-RTP) is the fourth use case and the price in it depends on the consumption of more end users, who belong in the player’s community.

The virtual world, as described in D4.1, is modelled according to the real environment of an average residential household. The objects are divided in electric and electronic appliances, functional objects, decoration items and inventory items. The electric appliances can have multiple energy consumption modes that produce various energy costs. The functional objects are used while fulfilling jobs within the household. Decoration items are only to beautify the virtual household. The inventory items are used together with electric/electronic appliances and functional objects to fulfil jobs.

The previously mentioned jobs are tasks that the player needs to do during the day. Each job has different amount of activities in it, which include interactions with electric appliances, functional objects and inventory items. As mentioned previously, convenience of the player’s avatar plays a big role. The convenience of the player depends on the consumption mode of the electronic appliances and at which time of day the activity is performed. Details about the convenience, price and cost calculation are provided in D4.1.

When a certain job is finished, the player is rewarded with experience points and credits. Experience lead to level-ups with the game, which unlock new electric appliances’ upgrade, decoration items and use cases. The upgrades for electronic appliances and decoration items are bought with credits. At the end of the in-game day, player is awarded with score according to player’s performance. The score is then translated into “cash”, which can be spent in the core GSRN S/W platform (or else the SOCIALENERGY’s real world).

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The graphic style of the game is described in D4.1 as simplistic realism. The perspective of the game is a tile-based isometric view. An insight into the mindset of designing the game was given in D4.2. In the designing process it was considered that the game needs to appeal to a wider range of user. As a result, certain universal activities or challenges needed to be in the game. The first would be to explore and learn the mechanics of the game. The second is to apply the knowledge of the mechanics to achieve a certain goal. The last challenge is to apply the knowledge of game mechanics while the outcome can be changed by outside circumstances.

Additional considerations were the use of the Activity Theory-based Model of Serious Games (ATMSG). In D4.2, a classification of components of the game according to ATMSG was made and it was shown that the initial version of the game already meets the basic requirements of the project by only implementing one use case.

Furthermore, in D4.2, the initial version was described and compared with the concept illustrated in D4.1. In the initial version, a virtual world was created where the player can move around and perform daily jobs. The daily job incorporates the usage of electronic devices with multiple consumption modes. The player is rewarded with experience points and in-game currency for the finishing of each job. In the initial version, the real-time pricing and the fixed pricing was implemented.

An important part, which needed to be considered in the development was the performance of the game and the risk of low number of frames per second due to the targeted platform and the goal to be playable on a wide range of computers. This reflected especially in the development of the models and animation as it required a lower polygon count and texture resolution.

D4.2 also explored the learning process and the motivation of the SOCIALENERGY game. It is important that the user has the possibility to choose the activity freely and that s/he is not over-whelmed by the learning content. The motivation is to earn points and to unlock additional objects in the virtual world.

The functionalities of the LCMS were also part of the D4.2. Initially, the learning content of each competence was mapped in three levels, which the user can achieve in LCMS. The learning content is presented to the player in presentations, videos, lessons, quizzes and other test challenges. To detect the competences that a certain user is lacking and to create an Individual Learning Plan (ILP), the GSRN is providing the user with an initial questionnaire, when s/he registers in the S/W platform.

2. Use Cases

One of the main features of the game are the four use cases implemented in the game. These are Fixed Pricing, Real-Time Pricing (RTP), Personalized Real-Time Pricing (P-RTP) and Community Real-Time Pricing (C-RTP).

2.1 Fixed Pricing

The first use case is that the price stays stable (see horizontal price curve in the lower right corner of figure 1) and does not depend on timeslot of day or player's actions.



Figure 1: Fixed Pricing Use Case

2.2 Real-Time Pricing (RTP)

In the Real-Time Pricing (RTP) case, the price depends on the time an activity is performed. This use case is further described in D4.1 as Time of Use (ToU) Pricing. It should be noted that we merged the ToU and RTP cases as they both follow the same rationale.



Figure 2: Real-Time Pricing Use Case

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2.3 Personalized Real-Time Pricing (P-RTP)

The Personalized Real-Time Pricing (P-RTP) calculates the prices not only depending on the timeslot that the activity is performed, but also on the actions of the player. This means that each user/player gets a different price according to her personalized behavior.



Figure 3: Personalized Real-Time Pricing Use Case

2.4 Community Real-Time Pricing

In the C-RTP use case, the price of energy is changing not only depending on the time of the day and the personal consumption of the player, but also depends on the consumption of all the end users/players, who belong in the same community. This means that the player should monitor the aggregated energy consumption curve of her community and respectively instruct her community members to follow energy efficient actions in order to get a high game score.

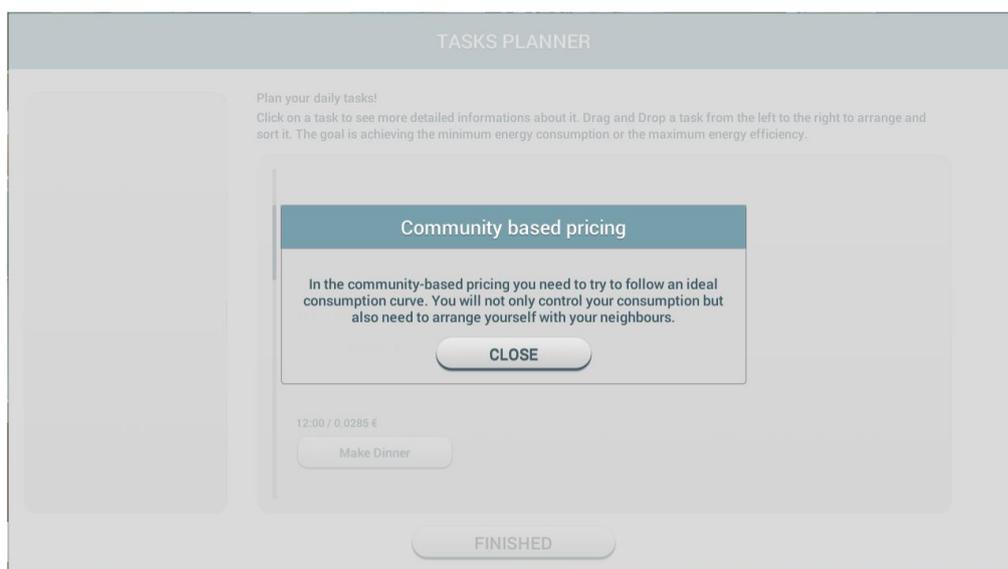


Figure 4: First Introduction to C-RTP

In addition to the changing price, the player needs to follow the ideal consumption curve, which is presented to the player.



Figure 5: Ideal aggregated Energy Consumption Curve in the bottom right corner

The player can influence the consumption of the community via the use of pop-up windows, which show the intentions of player’s neighbours to consume energy. The player can allow or deny it. Neighbours’ intentions can have different high energy consumption, even negative consumption to correct over-consumption. The neighbour will try to consume energy every two hours with a certain probability.

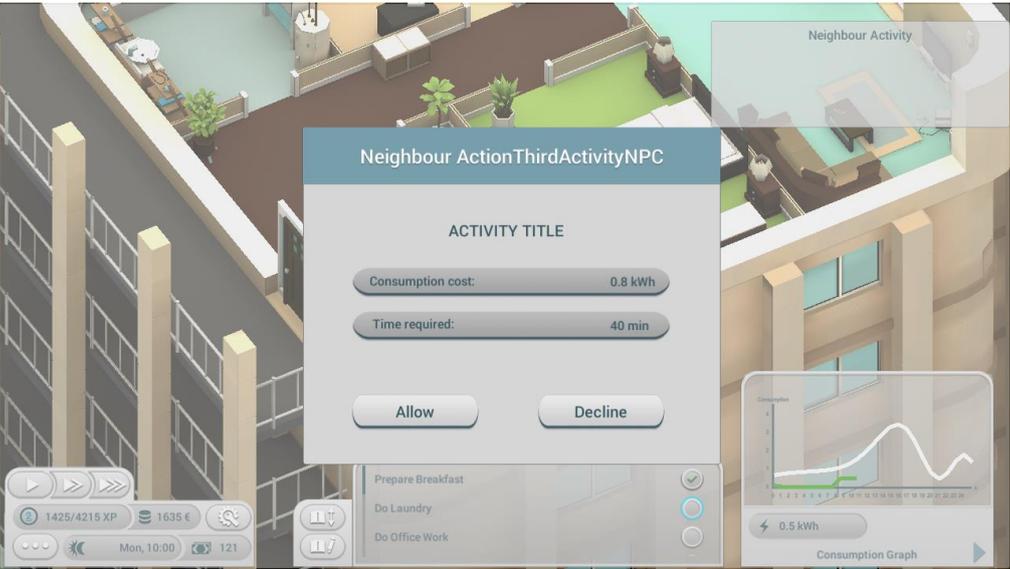


Figure 6: Neighbour’s Activity

The consumption of the community is compared with the ideal energy consumption curve every in-game hour. Consuming too much or too little energy would lead to rising community energy price, while consuming on point would reduce the energy price.

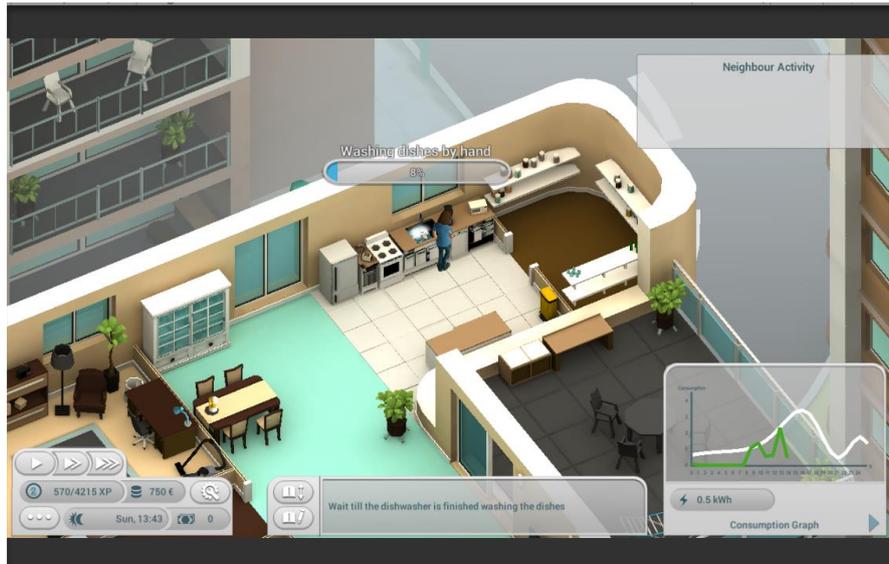


Figure 7: Consumption Progress over the day (indicative snapshot)

3. Interface Changes

The following chapter deals with the changes made in the interface of the game.

3.1 Graphical Representation of Task Results

In response to the comments made by future customers about the “alpha” version in July 2018, we have implemented a more graphical representation of the in-game task results beside the numbers. The convenience is now shown through ‘stars’. The number of stars shows how much convenience was earned from the possible amount. The cost of the consumed energy is presented with numbers and with a fill bar, which is green in the beginning and goes slowly to red after the minimum costs.



Figure 8: Graphical Representation of Results (with full convenience points)



Figure 9: No Convenience Points

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3.2 Graphical Representation of Daily Results

In the daily results screen, the same graphical improvement was made like in the Task Result screen as can be seen in the indicative screenshot below:

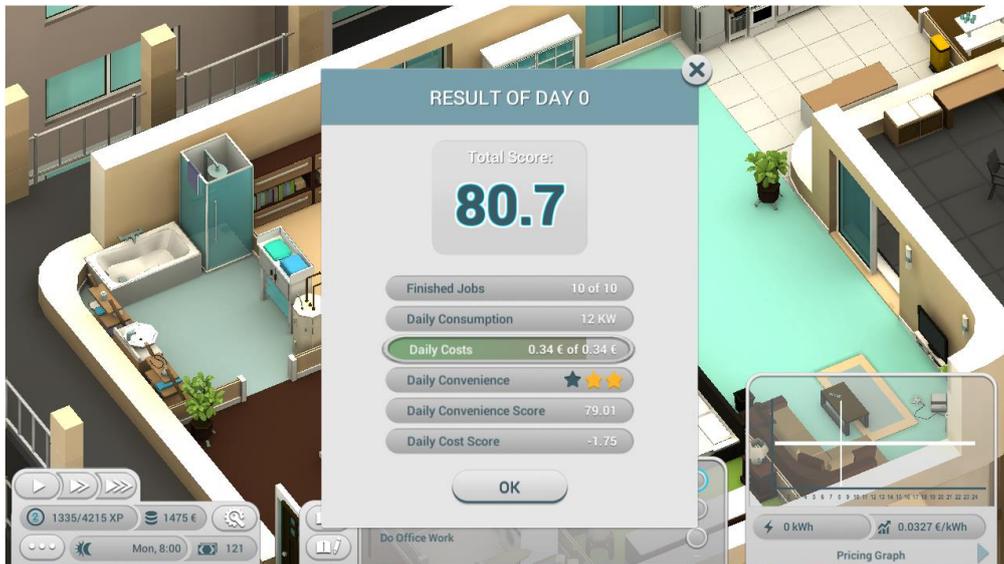


Figure 10: Graphical Representation in the Daily Result Screen

3.3 Tutorials

Like described in D4.1, a tutorial was added to explain the game to the players. The Tutorial consists of texts and highlighting of interface elements. The fixed pricing use case was used for the Tutorial. The Tutorial steps are:

- Avatar Editor
- Fixed Pricing
- Task Planner
- Game User Interface
- Moving
- Performing Tasks
- Electronic Device Modes
- Finishing Tasks
- Changing Tasks
- Gaining new Level
- Upgrades and Decorations Shop
- Finishing the Day

Additional Tutorial steps are in the last use case of community real-time pricing with the following steps:

- Community Real-Time Pricing Explanation
- Additional User Interface Elements specific for C-RTP.

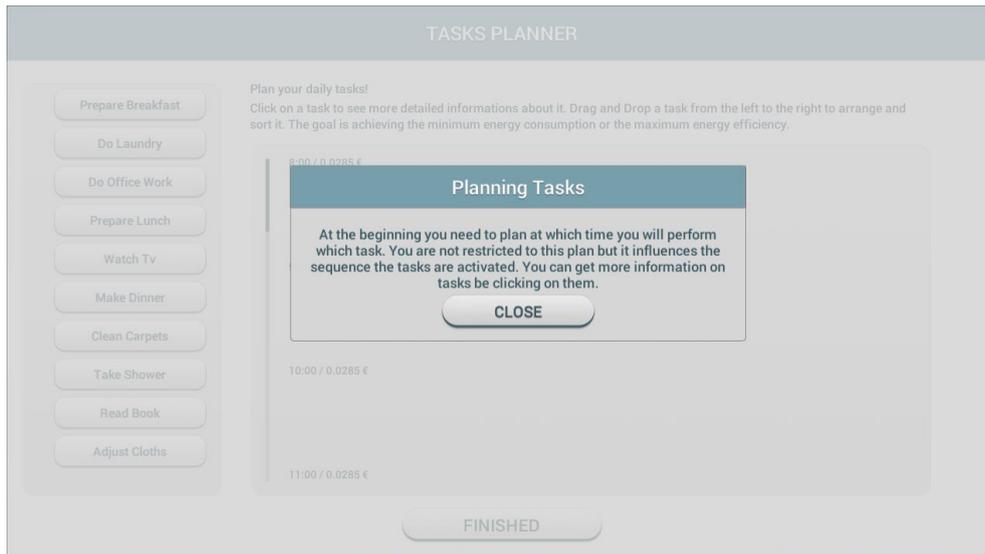


Figure 11: Introduction to the Task Planner

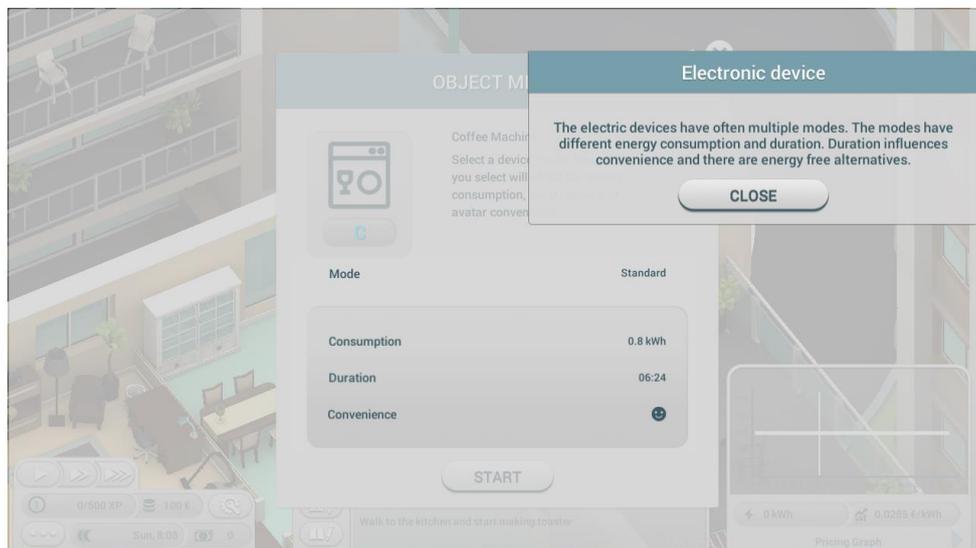


Figure 12: Explanation of Different Energy Device Modes

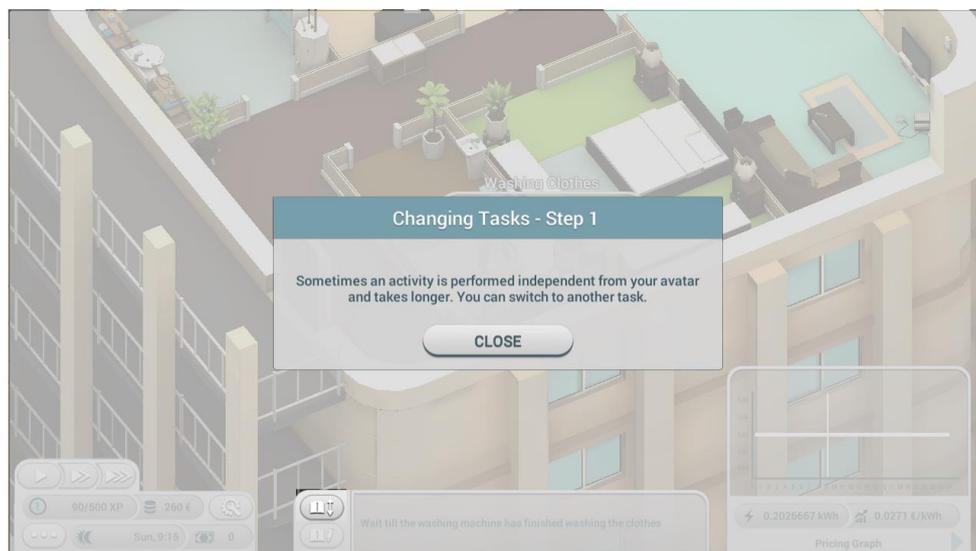


Figure 13: Hint to a highlighted button

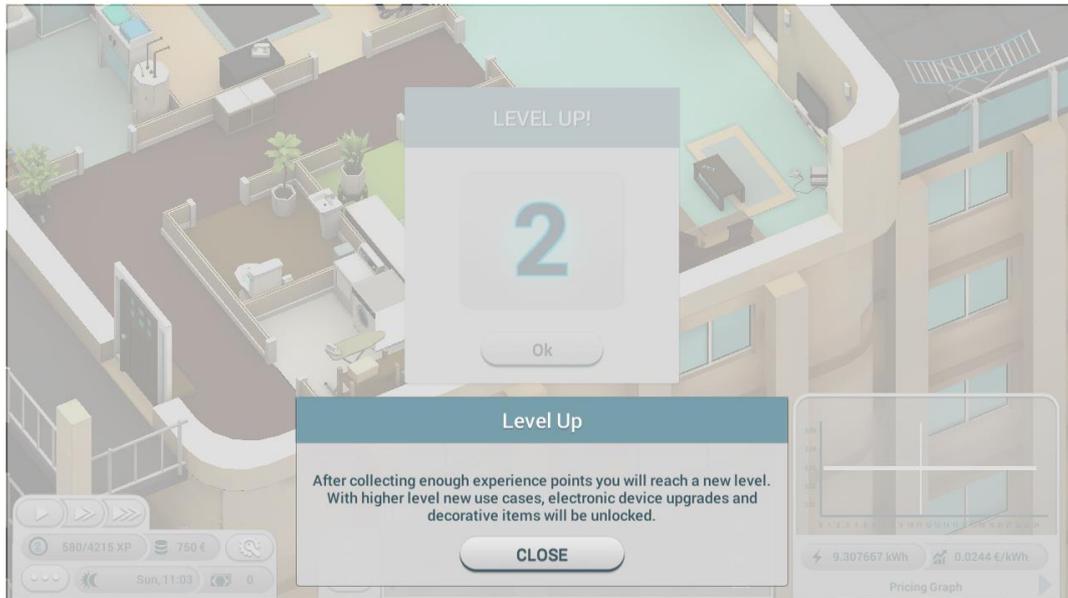


Figure 14: Explanation of new possibilities after gaining a new level



Figure 15: Explanation of the Daily Results

3.4 Representation of LCMS provided content

In the D4.2, it was mentioned that the game would include content from the LCMS. The information from the LCMS can be called in the Use Case Selection Menu, where one can get the information about each use case. Further information from the LCMS can be seen if clicking on the tasks in the Task Planning Menu.

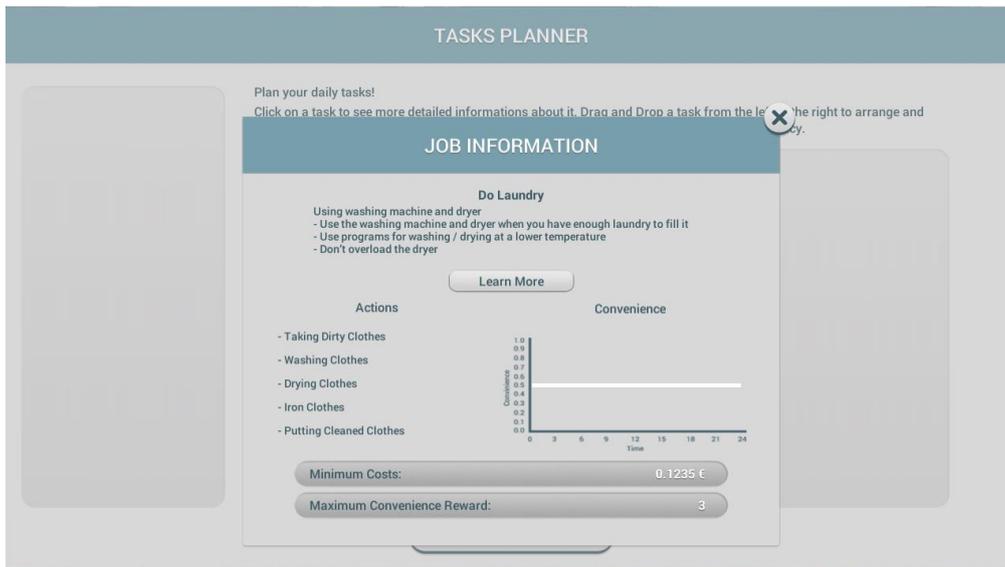


Figure 16: Learning Content about Washing Laundry

3.5 Graphics in Job Information

A part of the Learning Content in the Job Information a new graph was added to display the possible change of convenience over time. This graph was already included in the early drafts of the information from D4.1 and now have been considerably enhanced and finalized.

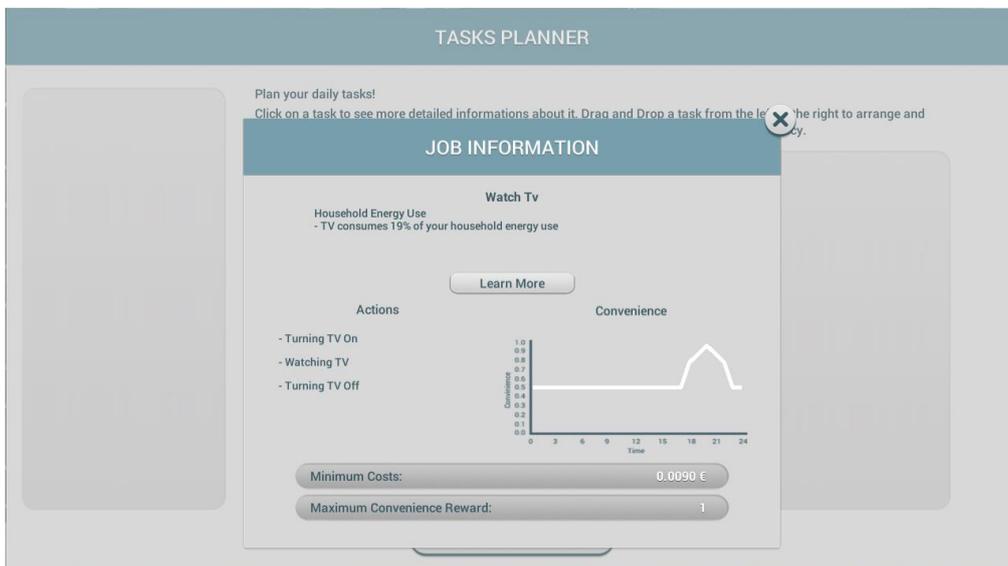


Figure 17: Change of Convenience over time

3.6 Badges

Player can be rewarded with badges for achieving things like buying all decoration items or reaching a certain use case. The player is notified about the new badge with a pop-up window appearing in the top left corner for five seconds.

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Figure 18: Player is notified over the new badge

4. Animation

Additionally, to the animations described in D4.2, new animations were included in the game. The animations show the player's avatar, while performing different energy-related activities in the game. The activities are:

- Simple Interactions
- Ironing Clothes
- Sitting and Eating
- Typing on the Computer
- Opening Fridge
- Turning the TV on
- Watching TV on the Couch
- Washing Dishes
- Vacuum Cleaning
- Showering
- Reading a book

In the following figures, indicative screenshots are provided for various jobs, such as working on laptop, using hair dryer, reading book, eating food, watching TV, vacuum cleaning, etc.

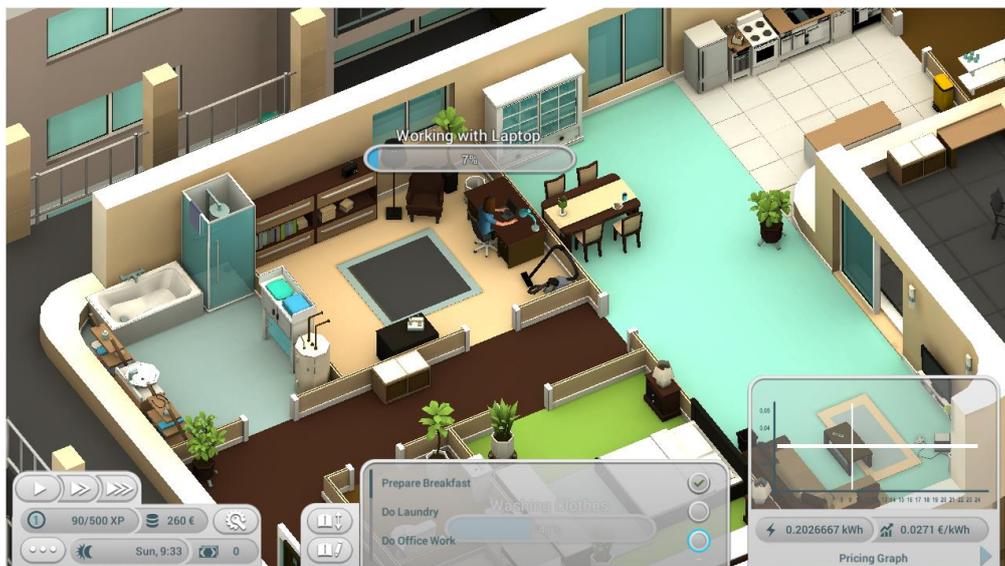


Figure 19: Working on Laptop (indicative snapshot for animation)



Figure 20: Using Hair Dryer

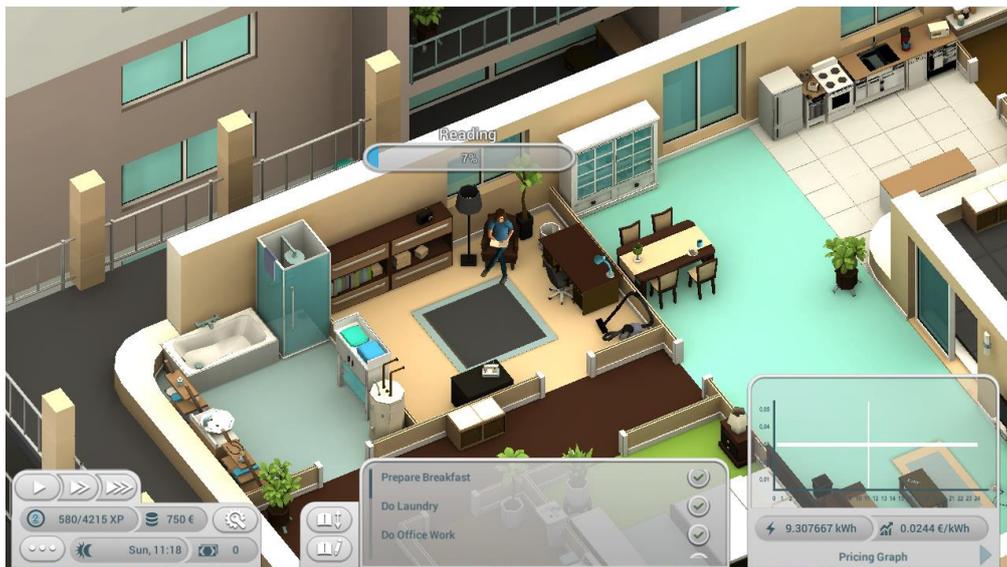


Figure 21: Reading Book



Figure 22: Eating Food

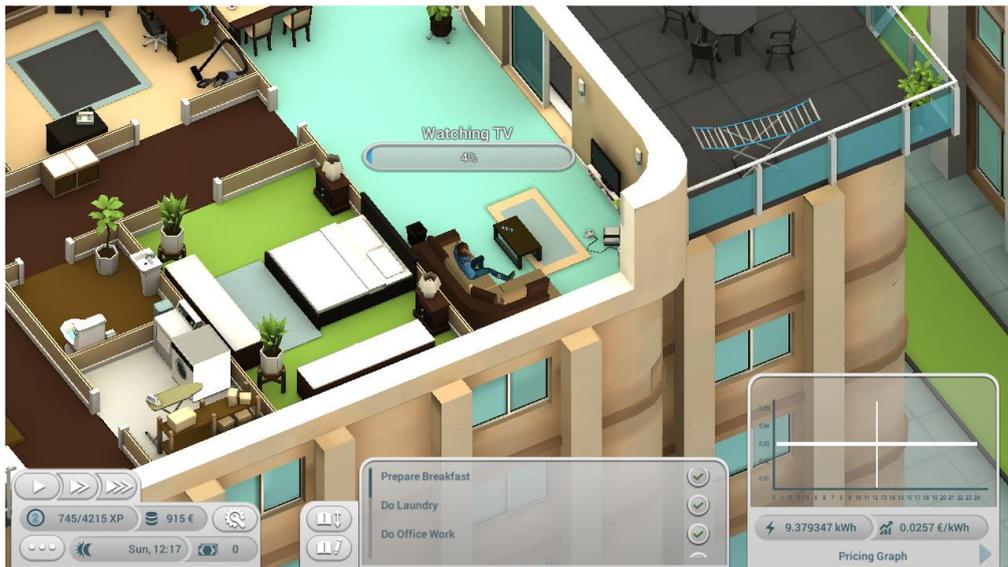


Figure 23: Watching TV

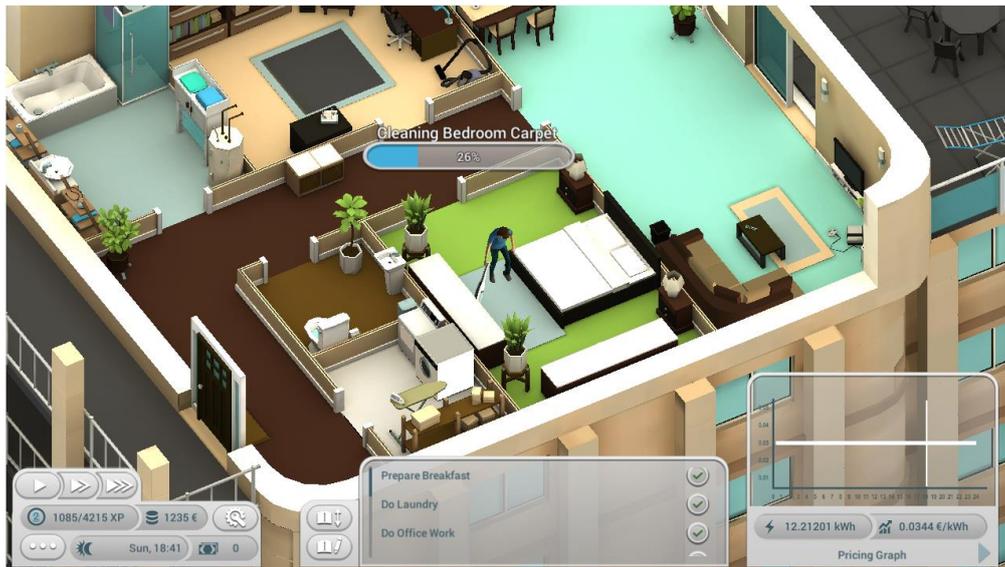


Figure 24: Vacuum Cleaning

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There are also objects’ animations, which are independent of the player’s actions. For example, as shown in the figure below, regarding the job “Preparing lunch”, smoke is coming out from the stove, while noodles are being cooked.

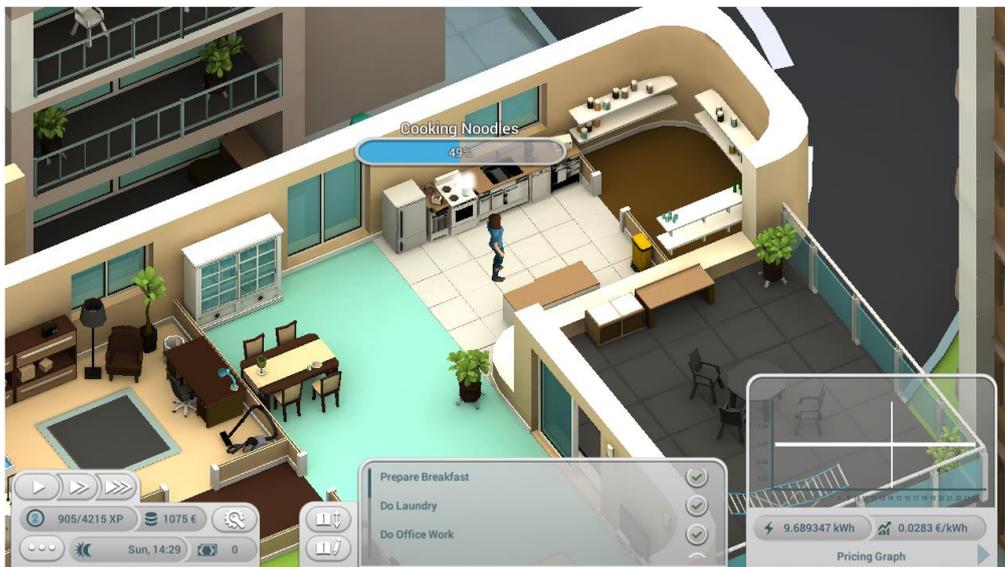


Figure 25: Smoke is coming from the stove, while noodles are being cooked

5. Changes in the Backend

5.1 Exchange of data between GAME and GSRN

In reference to the data exchange between GAME and GSRN defined in 4.1, additional functionalities have been implemented in the background. Values like experience points, earned cash, level and badges are now sent to the GSRN for statistics. This is very important in order for the GAME’s value proposition for electric utility companies to be commercially strong enough in the energy efficiency sector. More details about the business modelling and value propositions can be found in D6.2 (M15).

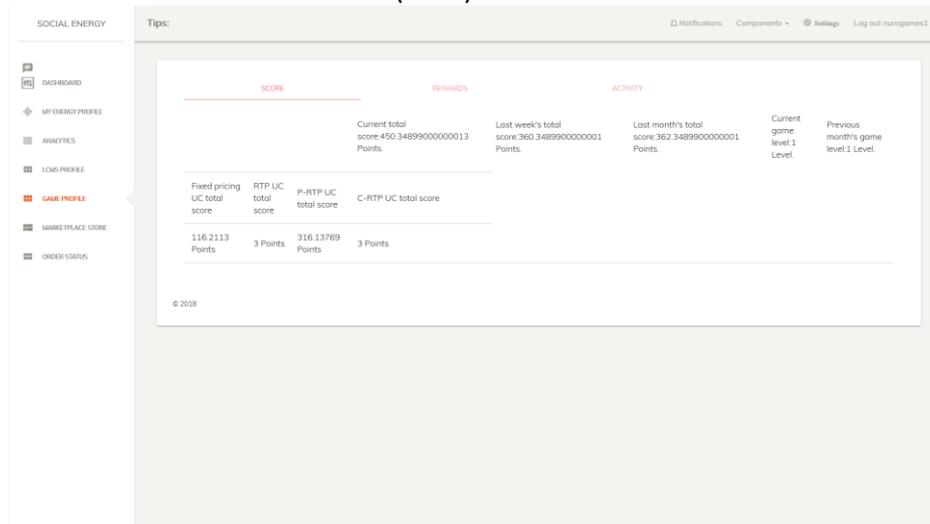


Figure 26: Statistics provided to GSRN by the Game

5.2 Saving Data

The game now can save the progress of the game and the daily task plan. Saving the progress made the main menu useful and improved the user experience, as the player can now continue the previous game.

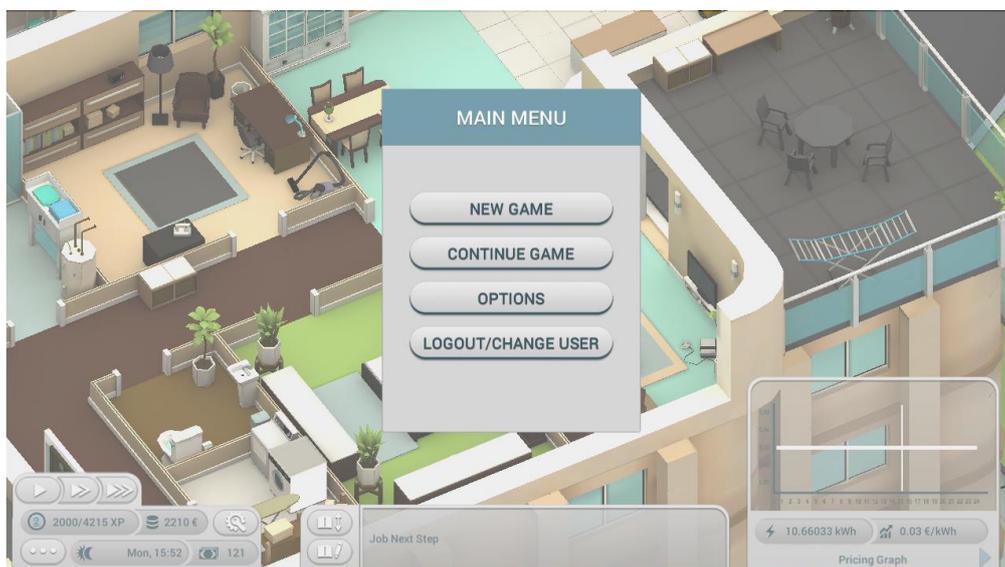


Figure 27: Main Menu allowing to create a new game or continue the last one

5.3 Upgrades

The upgrading of the electronic appliances not only changes the outer appearance of the appliances, but also its electricity consumption model. After upgrading the basis consumption of the electronic appliances is multiplied with a factor according to its level.

Table 2: Consumption factor for electronic appliances upgrades

C	B	A
1	0.8	0.6



Figure 28: Microwave before upgrade

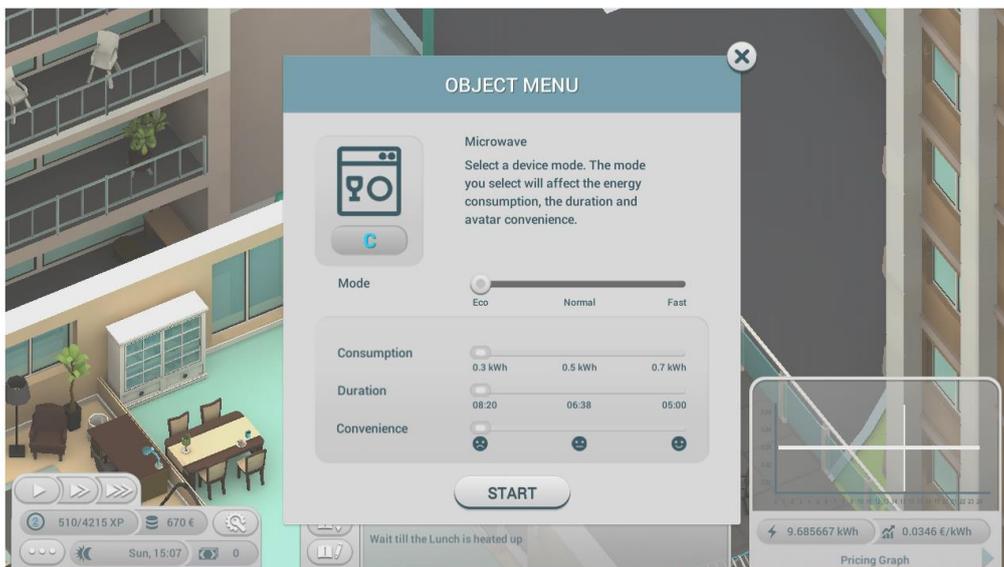


Figure 29: Electronic appliances modes (e.g. microwave) before upgrade



Figure 30: Microwave after upgrade

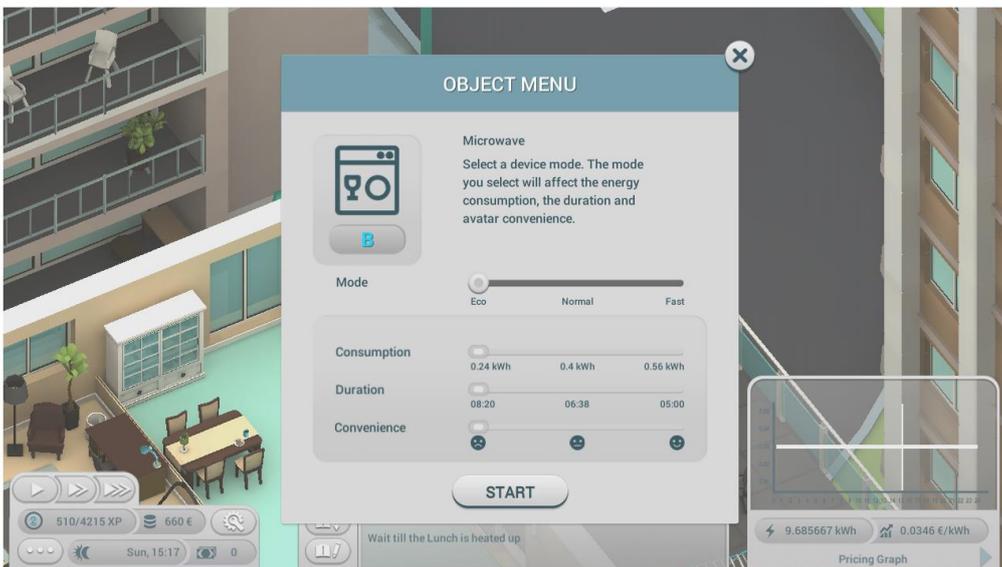


Figure 31: Electronic appliance modes (e.g. microwave) after upgrade

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6. LCMS

LCMS is the educational S/W component of SOCIALENERGY and as such it tries to efficiently connect SOCIALENERGY’s virtual and real worlds towards better end user’s engagement in energy efficiency. In this chapter, a summary of LCMS work is provided. During the next three months, LCMS will be integrated in the ‘beta’ version of SOCIALENERGY S/W platform (cf. D5.3 to be delivered in M27).

6.1 Introduction

The main goal of the LCMS is to educate the end users (i.e. residential energy consumers) to understand and cope with difficulties and challenges related to energy efficiency. In the earlier stage of project’s implementation, SU-NIS researched and adopted the competence-based learning approach. The most important characteristic of competency-based education is that it measures learning rather than time. Learners progress by demonstrating their competence, which means they prove that they have mastered the knowledge and skills required for a particular competence, regardless of how long it takes.

Moodle LCMS was chosen to be the base for the SOCIALENERGY LCMS platform, due to its advanced competence-based functionalities. These functionalities include, among others, the opportunities to design, develop, and utilize:

- Competence frameworks;
- Individual competences, included in competence frameworks;
- Learning Plan Templates, and Individual Learning Plans (ILPs);
- Various competence-based modules/courses, individual learning resources and activities

6.2 Competence Framework

6.2.1 Objectives

The competence framework should support competence-oriented learning in the respective SOCIALENERGY domain of energy management and energy efficiency. It is mainly motivated by the need to implement a solution that a diverse variety of end-users could understand.

The purpose is to improve the communication models between energy sector stakeholders and residential energy consumers, allowing them to discover each other’s needs, to educate and reach a better understanding of the main difficulties and challenges and finally to interact on the energy market and to trade especially in the scope of demand-response (DR) energy programs (EPs).

A research has been performed and several competence frameworks have been identified in literature in the field of energy efficiency, energy management, energy saving, and energy efficiency behavioral change. Most of the existing competence frameworks are designed mainly for employees and staff working in the field of energy management and energy efficiency.

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6.2.2. Structure of the Competence Framework

A new competence framework has been developed, following the EC Competence Framework. The new framework responds to the subject domain, the target user needs, and the specifics of the project activities described in detail in the previous deliverable D4.2 (M15). For convenience, we present it here below in its final implemented form. It consists of 7 competencies:

- Competence #1: Energy efficient electric appliances
- Competence #2: EU energy labelling
- Competence #3: Energy metrics
- Competence #4: Demand Response (DR)
- Competence #5: Smart Grid
- Competence #6: Types of pricing schemes and energy programs
- Competence #7: Energy communities

The learning outcomes for competences are defined based on the EQF's framework in terms of:

- Knowledge
- Skills
- Responsibility and autonomy

Each competency has three levels of proficiency, namely: basic (level 1), intermediate (level 2), and expert (level 3).

EQF-based competence framework for SOCIALENERGY

The following competence framework is used in SocialEnergy platform. It includes 7 base competencies, each one divided into three levels of proficiency. The user competence profile, stored at the GSRN platform, includes 7 values (each one corresponding to the level of proficiency of the respected competence). Value 1 indicates Basic (Level 1) of proficiency, value 2 indicates Intermediate (Level 2) of proficiency, and value 3 indicates Expert (Level 3) of proficiency for each of the seven competencies.

Competencies

▼ SE_EnergyEfficiency Frwk_3 - LAST NEW

1.1. Energy efficient electric appliances. Level 1 - Basic

1.2. Energy efficient electric appliances. Level 2 - Intermediate

1.3. Energy efficient electric appliances. Level 3 - Expert

2.1. EU energy labelling. Level 1 - Basic

2.2. EU energy labelling. Level 2 - Intermediate

2.3. EU energy labelling. Level 3 - Expert

3.1. Energy metrics. Level 1 - Basic

3.2. Energy metrics. Level 2 - Intermediate

3.3. Energy metrics. Level 3 - Expert

4.1. Demand Response (DR). Level 1 - Basic

4.2. Demand Response (DR). Level 2 - Intermediate

4.3. Demand Response (DR). Level 3 - Expert

5.1. Smart Grid. Level 1 - Basic

5.2. Smart Grid. Level 2 - Intermediate

5.3. Smart Grid. Level 3 - Expert

6.1. Types of pricing schemes and energy programs. Level 1 - Basic

6.2. Types of pricing schemes and energy programs. Level 2 - Intermediate

6.3. Types of pricing schemes and energy programs. Level 3 - Expert

7.1. Energy communities. Level 1 - Basic

7.2. Energy communities. Level 2 - Intermediate

7.3. Energy communities. Level 3 - Expert

Selected competency

[Edit](#)

1.1. Energy efficient electric appliances. Level 1 - Basic 1.1

- 1. Knowledge**
Knows the main types of mostly used appliances, presented in the market.
- 2. Skills**
Can operate main types of mostly used appliances, presented in the market.
- 3. Responsibility and autonomy**
Applies autonomously and with responsibility knowledge and skills for the main types of mostly used appliances, presented in the market.

Cross-referenced competencies:

No other competencies have been cross-referenced to this competency.

+ ADD COMPETENCY

Figure 32: LCMS Competence Framework

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Based on the level of proficiency LCMS defines three user’s profiles:

- **Basic profile:** Traditional individual energy consumer, who shall acquire general knowledge and new skills in the energy efficiency domain; End-user – one family / household end-user; No preliminary competences.
- **Intermediate user profile:** Experienced user, competent on the liberalized electricity market, knows and participates in DR and advanced energy programs, forms and manages Energy Communities and shares knowledge and skills.
- **Expert user profile:** Proficient and active end-user with specific interests in innovative Energy Programs savings and energy efficiency.

6.3 Competence development

6.3.1 Learning Plans

The LCMS gives to end users full autonomy in their Learning Plans. As long as course activities match the Plan’s designated competence, end users can take and pass those learning activities through which performance ensure the achievement of every competency in the Learning Plan. Thus, the latter support individual competence development and map it onto a generic schema of learning progression.

The definition of the learning objectives can follow two routes: a **pre-defined (template-based) Learning Plan**, or an **Individual Learning Plan**, based on the outcome from the GSRN questionnaire, which is completed by the end user once s/he initially registers in the SOCIALENERGY S/W platform.

6.3.1.1 Pre-defined (template-based) Learning Plans

In the first case, i.e. the pre-defined competence development profile, a learner selects from the existing list of profiles on offer the one that they would like to aim their learning towards.

Three templates-based common/”typical” user profiles are also developed and available to all LCMS users, namely “Basic”, “Intermediate”, and “Expert” user profile. Each of the three typical user profiles corresponds to one particular level of the SOCIALENERGY Competence Framework, namely:

- For the Basic user profile, a template-based ILP is created, which contains for achievement the first level of all 7 competencies from the SOCIALENERGY Competence Framework
- For the Intermediate user profile, a template-based ILP is created, which contains for achievement the second level of all 7 competencies from the SOCIALENERGY Competence Framework
- For the Expert user profile, a template-based ILP is created, which contains for achievement the third level of all 7 competencies from the SOCIALENERGY Competence Framework

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Social Energy - LCMS

Dashboard / Site administration / Competencies / Learning plan templates / Basic - traditional electric utility user

Basic - traditional electric utility user *

Basic – traditional electric utility user, who shall acquire general knowledge and new skills in the energy efficiency domain; End-user – One family / household end-user; No preliminary competences.

[ADD COMPETENCIES TO LEARNING PLAN TEMPLATE](#)

Learning plan template competencies

7 out of 7 competencies linked to courses

0 out of 2 learning plans completed for this template

+

-

1.1. Energy efficient electric appliances. Level 1 - Basic 1.1

SE_EnergyEfficiency Frwk_3 - LAST NEW - Competency

1. Knowledge

Knows the main types of mostly used appliances, presented in the market.

2. Skills

Can operate main types of mostly used appliances, presented in the market.

3. Responsibility and autonomy

Applies autonomously and with responsibility knowledge and skills for the main types of mostly used appliances, presented in the market.

Path:
SE_EnergyEfficiency Frwk_3 - LAST NEW /

Linked courses:
Energy efficient electric appliances. Level 1 - Basic (Competence 1.1) (Energy efficient electric appliances - Basic)

Figure 33: Learning Plan Template for Basic - traditional end user

6.3.1.2 Individual Learning Plans

The identification of missing gaps in competences is taking place in GSRN. All users fill in an initial questionnaire, which defines the set of missing competences and combine them in an Individual Learning Plan (ILP). Thus, the latter can provide recommendation services to the user according to the educational content that is mostly keen on watching next based on her/his current educational status and experiences in both SOCIALENERGY’s real and virtual worlds.

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John Papas

Dashboard / Profile / Learning plans / Individual Learning Plan

Individual Learning Plan

Status
Active

Progress
1 out of 3 competencies are proficient

+ Comments (0)

Learning plan competencies

Name	Rating	Proficient	Status	Actions
2.1. EU energy labelling. Level 1 - Basic 2.1 Path: SE_EnergyEfficiency Frwk_3 - LAST NEW /	-	No	-	Edit
4.1. Demand Response (DR). Level 1 - Basic 4.1 Path: SE_EnergyEfficiency Frwk_3 - LAST NEW /	Competent	Yes	-	Edit
6.1. Types of pricing schemes and energy programs. Level 1 - Basic 6.1 Path: SE_EnergyEfficiency Frwk_3 - LAST NEW /	-	No	-	Edit

Figure 34: Individual Learning Plan (ILP)

6.3.1.3 Free selection and study of courses (mastering competencies)

In addition, every registered user in the GSRN or LCMS can take courses on their choice and curiosity, out of their ILP.

6.3.2. Grading and Awarding

Each successfully completed course leads to mastering the respective competence, and brings grade for the user. The user receives an achievement badge based on the score of the completed course.

The table below describes the updates of the grading scheme and badges for achievements in LCMS.

Table 3: Grading Scheme: Three-Levels passing grades in points

No	Activity	Satisfactory	Good	Excellent	Remarks
Grading the First Level Competencies					
COMPULSORY - Graded					
1	Reading material(s) – PDF format	Each Activity 1-4 should be read or visited in order to be eligible to Pass the Course			
2	Presentations – PDF format				
3	External URLs: Readings / web-pages				
4	External URLs: Short videos				
5	“Lesson” activity***	25-33 points	34-42 points	43-50 points	At least 25 p. to pass* the Lesson
6	“Quiz” activity	25-33 points	34-42 points	43-50 points	At least 25 p. to pass* the Quiz

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TOTAL Score (points)	SUM(5,6) 50-66	SUM(5,6) 67-84	SUM(5,6) 85-100	
Names of BADGES	Sufficient	Good	Excellent	

Grading the Second Level Competencies

COMPULSORY - Graded					
1	Reading material(s) – PDF format	Each Activity 1-4 should be read or visited in order to be eligible to Pass the Course			
2	Presentations – PDF format				
3	External URLs: Readings / web-pages				
4	External URLs: Short videos				
5	“Lesson” activity***	50-66 points	67-83 points	84-100 points	At least 50 p. to pass* the Lesson
6	“Quiz” activity	50-66 points	67-83 points	84-100 points	At least 50 p. to pass* the Quiz
TOTAL Score (points)	SUM (5,6) 100-132	SUM (5,6) 133-166	SUM (5,6) 167-200		
Names of BADGES	Sufficient	Good	Excellent		

Grading the Third Level Competencies

COMPULSORY - Graded					
1	Reading material(s) – PDF format	Each Activity 1-4 should be read or visited in order to be eligible to Pass the Course			
2	Presentations – PDF format				
3	External URLs: Readings / web-pages				
4	External URLs: Short videos				
5	“Lesson” activity***	75-100 points	101-125 points	126-150 points	At least 75 p. to pass* the Lesson
6	“Quiz” activity	75-100 points	101-125 points	126-150 points	At least 75 p. to pass* the Quiz
TOTAL Score (points)	SUM(5,6) 150-200	SUM(5,6) 201-250	SUM(5,6) 251-300		
Names of BADGES	Sufficient	Good	Excellent		

* The minimum number of points, needed for a user in order to pass each of the activities 5 and 6, and thus to qualify for successful passing the course!

** Non-compulsory activities DO NOT count/contribute to the grading scheme

*** Marking of the Lesson activity is similar to the Quiz marking – particular number of points (assigned by the course creator) are awarded to each correctly answered question in the Lesson. The total score for the Lesson is automatically calculated as a sum of all questions’ points.

6.4 Learning Objects

A concept of Learning Objects (LOs) and their pedagogical and technological interpretation was explored and developed. As a result, it was decided that a LO in the LCMS will constitute of a course. In addition, each LCMS course covers the knowledge, skills, autonomy and responsibility, required to achieve one single level of a competence. Each

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course includes different types of learning activities/resources related to the three main aspects of the competence framework: knowledge, skills, responsibility and autonomy. These major types of learning assets are:

A) Compulsory

1. Reading material(s) – PDF format
2. Presentations – (summarizing/highlighting the readings’ key points)
3. External URLs:
 - a. Readings / web-pages
 - b. Short videos
4. “Lesson” activity
5. “Quiz” activity

B) Optional activities**

1. Additional Readings (single or in folder(s))
2. Additional external links (explicitly marked as additional)
 - a) Web-pages
 - b) Videos
3. Short Games (Hidden Picture, Hangman, Crossword, etc.)
4. Pictures, Graphics Diagrams, Schemes
5. Podcast(s)
6. Video Tutorial(s)
7. How-to materials (Mind Maps, Animation/s)

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EU energy labelling. Level 1 - Basic (Competence 2.1)

-  **Presentation: Energy Labelling. Introduction**

Basic Introduction about EU Energy Labelling.
-  **Reading: Framework for Energy Labelling**

This is Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU (Text with EEA relevance)

The document is available on EU website: <http://data.europa.eu/eli/reg/2017/1369/oj>
-  **Reading: EU Energy Labelling Legislation**
-  **Infographic: Energy Efficiency - Saving energy and money**
-  **Link: The Energy Label Generator**

Get creative! Make a tailor-made energy label for one product in high resolution pdf format.
-  **Lesson: Introduction of the energy labelling issue and its importance**

This lesson is based on materials from the publication: [Energy labelling for domestic appliances in Central and Eastern Europe – overview of enforcement and promotion activities](#) (June 2008, Prepared as a part of the “CEECAP – Implementing EU Appliance Policy in Central and Eastern Europe” project.)
-  **Quiz: Energy Labelling**

Figure 35: Indicative learning activities in LCMS

In order to complete a course and obtain a competence, learner should perform ALL learning activities, marked as mandatory.

Demand Response. Level 1 - Basic (Competence 4.1): Completion progress details

Dashboard / Completion progress details

Status Complete
Required All criteria below are required

Criteria group	Criteria	Requirement	Status	Complete	Completion date
Activity completion (all required)	01. The concept Demand response	Viewing the file		Yes	18 September 2018
	02. What is Demand response	Viewing the file		Yes	18 September 2018
	Demand Response Quiz	Achieving grade		Yes	18 September 2018

[RETURN TO COURSE](#)

Figure 36: Completion progress details

6.5 System integration

6.5.1 Users’ profile

LCMS supports the OAuth2 authentication strategy chosen as a Single Sign-On Authentication (SSO Authentication) mechanism. The OAuth2 authentication plug-in enables

end users to login in LCMS using their credentials from GSRN. Please note that a similar procedure is followed for the authentication among all SOCIAENERGY subsystems.

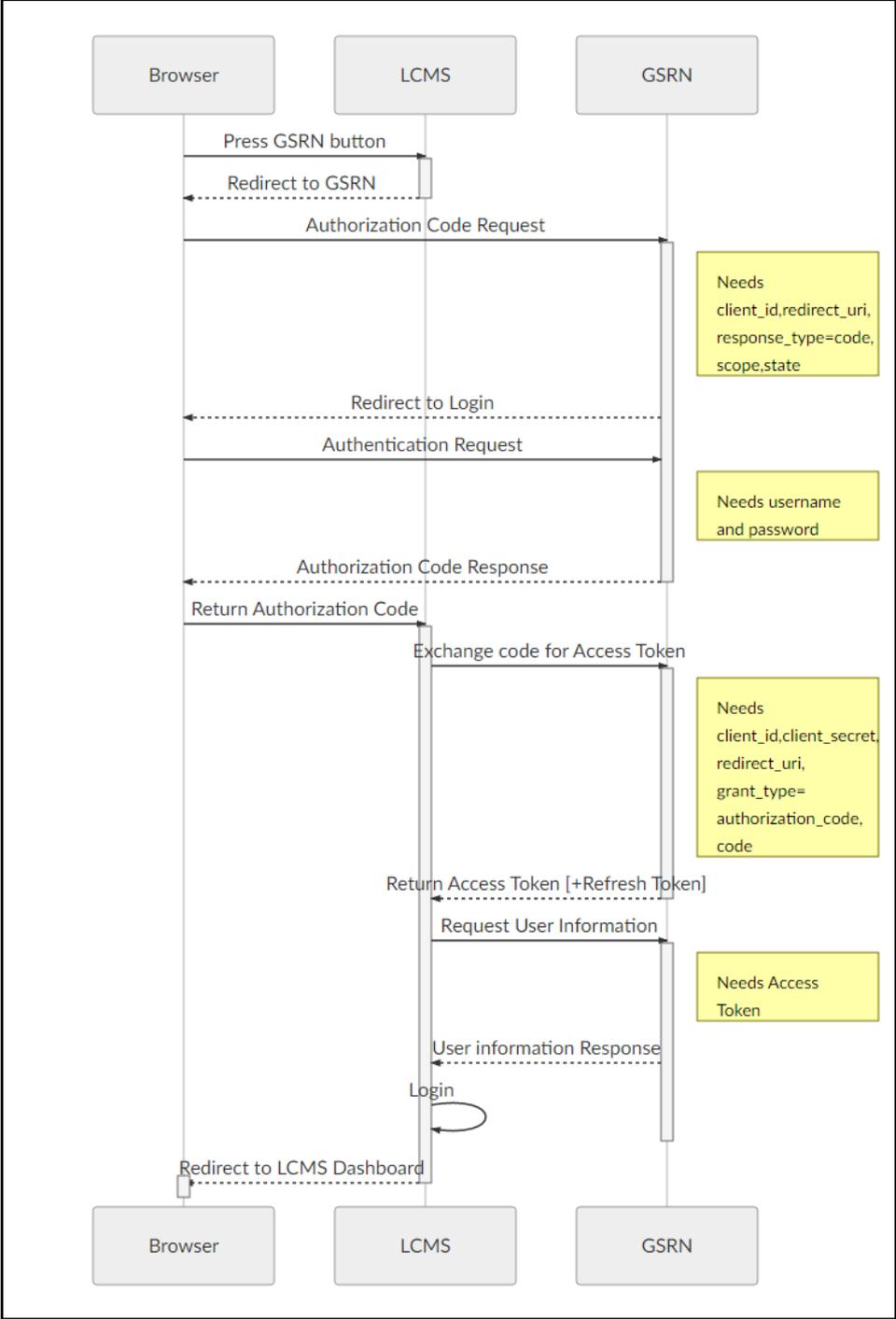


Figure 37: LCMS User Authentication Flow

6.5.2. Data exchange between GSRN and LCMS

A new analytics reporting features extends the RESTful API communication between LCMS and GSRN defined in D3.1. It provides summary data of all most important LCMS scores that the end user has achieved so far:

- Sum of LCMS scores from all courses since end user's 1st registration
- Sum of LCMS scores of all courses for the last 7 days

- Sum of LCMS scores of all courses for the last 30 days
- Sum of LCMS scores only for competence 1 courses
- Sum of LCMS scores only for competence 2 courses
- Sum of LCMS scores only for competence 3 courses
- Sum of LCMS scores only for competence 4 courses
- Sum of LCMS scores only for competence 5 courses
- Sum of LCMS scores only for competence 6 courses
- Sum of LCMS scores only for competence 7 courses

In GSRN, through the LCMS’s Score sub-tab, the end user can visualize the summary report of all most important LCMS scores that s/he has achieved so far.

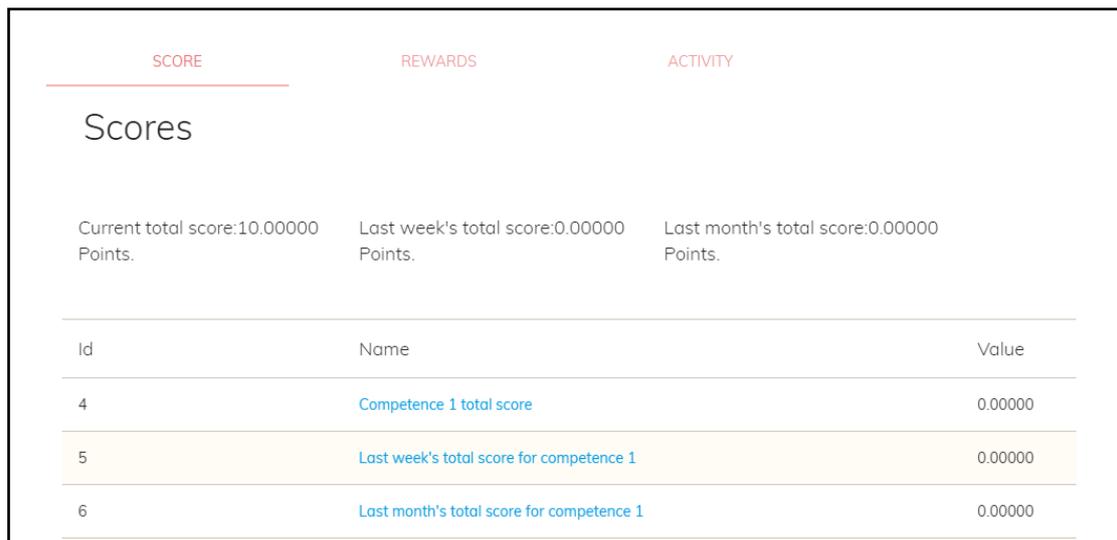


Figure 38: Analytics Reporting Data provided to GSRN by the LCMS

6.5.3. Data exchange between LCMS and GAME

SU-NIS has closely collaborated with NRG in order to add targeted educational content within the GAME (e.g. advice in the form of “pop-ups”, “mouse-over”, “on-click”, etc.) to guide the user to related educational content within LCMS. There is not a technical API for the dynamic data exchange between these two subsystems, because this would considerably reduce the quality of the gameplay. According to user’s gameplay results, the guidance to the appropriate educational content is supported.

Some indicative examples for educational content from the *Energy efficient electric appliances (Basic Level 1)* course giving advice on how to reduce the energy bill and information for household energy use in the GAME as pop-ups are shown below:



Prepare Lunch

- Use the appropriate pot size for each cooker
- Turn off the oven a few minutes before food is ready



Do Office Work

- Set your computer's screen saver to shorter intervals
- Light your workspace, not the entire room



Watch TV

- TV consumes 19% of your household energy use

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7. Conclusions

The game and the LCMS have made great progress and achieved the aspired goals. Together with other components of the SOCIALENERGY Project, it has the potential to educate and incentivize utility customers towards understanding and adopting modern DR Programs.

Conclusively, the consortium has now reached Milestone 6, meaning that it has released the final version of SOCIALENERGY functionalities via the delivery of D3.2 (“Final version of GSRN platform functionalities”) and D4.3 (“Final version of SOCIALENERGY’s virtual world functionalities”) in M24. Via the delivery of D6.2 in M15, the consortium is now focusing the work progress on one unique business model and five value propositions (or else business cases). Moreover, the ‘alpha’ version of the integrated SOCIALENERGY S/W platform has been released via D5.2 in M18 and live demonstrations of SOCIALENERGY product and services have taken place during the interim review meeting in front of the EC and customers (i.e. electric utilities) from the real business receiving excellent and very encouraging comments.

The afore-mentioned achievements and work progress give pace to the finalization of the S/W integration work, which will end in M27 with the release of D5.3 (“Final integration and validation activities of SOCIALENERGY system”). Step-wise, the actual work schedule plan is the following:

- The core S/W integration work is currently taking place in the context of technical Work Package 5. Partners work closely and collaboratively on the APIs implementation and the “fine-graining” of S/W prototypes for the interaction among the various subsystems following the review comments received by potential customers during last months’ live demonstrations.
- Real-life small scale experiments are currently ongoing and the goal is to receive as many real-life energy/behavioural/online social network datasets until the start of the official pilots in April 2018. On the meantime, we continuously testing our system collaborating with the end users who identify missing/wrong information and/or S/W system bugs.
- During the last 3 months of the project’s lifetime, we aim at gathering real life pilot results and assess the final results of the project including listing all lessons learned and providing interesting research and business insights towards the further exploitation of SOCIALENERGY product and services.

The goal until the end of the third reporting period is to demonstrate the final stable version of SOCIALENERGY system during the 3rd review meeting in front of an extended audience of real customers throughout Europe in July 2019.