project proposal to the funding measure

"Greek-German Bilateral Research and Innovation Cooperation"

Project acronym:

SIT4Energy

Smart IT for Energy Efficiency and Integrated Demand Management

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1. SUMMARY

The goal of the *SIT4Energy* project is to demonstrate how integrated energy management for prosumer scenarios can be realized through a smart IT solution that considers both efficiency potentials in the local energy production and consumption. To this end, the project implements an intelligent mobile recommendation service with context-aware attention triggering, and a Smart Energy Management dashboard that exploit smart analytics to analyse consumption data, behavioural patterns and external context information (e.g. pricing, weather) for providing personalized insights and recommendations for optimizing energy production-consumption patterns. This includes a consumer-centred, user-friendly presentation of evidence-based results on the costs and benefits of ICT-enabled energy efficiency techniques, together with clear and on time, engaging guidance and support on how to realize the energy savings available, so as to increase user adoption of such techniques and their effectiveness.

The developed prototype system and customer applications will be deployed and evaluated in real world pilots in two different climatic regions, Greece and Germany. This will enable the transfer of developed solutions into new commercial offerings of the participating SMEs; a municipal utility company in Germany (SHF) and an innovative IT-service and software development company in Greece (ITML). The validation in pilots will thus serve as the preparation for the uptake of the developed solutions by the German utility (SHF) who will provide it as a service to their customers and as a marketing showcase for the commercial exploitation by the ITML. The research and university partners (CERTH, HOST) will exploit the results through scientific publications, development of new projects and transfer in teaching and consulting for the regional SMEs.

2. PROJECT SCOPE

The specific objectives and main ideas:

1. (Obj.#1) Acquire the necessary insights and understanding of the interests, preferences and behavioural drivers of *SIT4Energy* users.
2. (Obj.#2) Design a prototype Business Model (BM) involving multiple actors within the EU single market.
3. (Obj.#3) Engineer a consumer-empowerment framework (data transparency, usable interface design, behavioural engineering and social marketing techniques and tools) to trigger sustainable energy consumer/prosumer practices
4. (Obj.#4) Pre-validate and adapt accordingly the consumer-empowerment framework to match strategies for increased consumer engagement in sustainable energy
5. (Obj.#5) Exploit micro-moments to implement individualized strategies for inducing and supporting behavioural change.
6. (Obj.#6) Stimulate actual empowerment of consumers and increased understanding of sustainable energy and energy billing
7. (Obj.#7) Implement context-based mobile recommendation services for energy end-users based on user micro-moments and other means of feedback to consumers.
8. (Obj.#8) Develop adaptive incentivation and context-aware triggering service for increasing the uptake of the energy efficiency recommendations and behavioural change by the end-users.
9. (Obj.#9) Exploit and integrate consumption, context data and behavioural analytics to develop a smart visual analytics dashboard enabling integrated energy management that identifies and exploits energy efficiency potentials on both demand and supply side

Taking into account the issues and the aforementioned needs identified above, the main idea of *SIT4Energy* is to combine and advance research findings in 3 pillars, namely (P1) technological innovation, (P2) new business models and (P3) consumer empowerment solutions. In doing so, *SIT4Energy* will: tackle consumers' lack of knowledge and confidence in the new technologies; will increase their awareness about real energy efficiently benefits; and will guide and support them in adopting new energy saving habits. The

developed solutions will be validated in the context of three (3) carefully designed pilots, designed to take place in 2 different climatic regions, namely Greece and Germany. This approach is depicted on the following figure that summarizes the *SIT4Energy* vision and the main steps of *SIT4Energy* methodology.
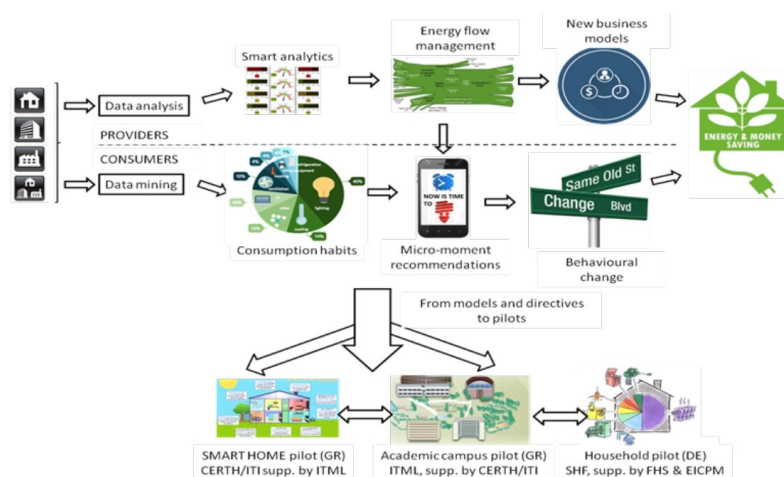
The main ideas and technologies involved:

The project has been developed around the idea of demonstrating how integrated energy management for prosumer scenarios can be realized through a smart IT solution that considers both efficiency potentials in the local energy production and consumption. To deliver this, the *SIT4Energy* project will be developed around two core elements: a) an intelligent mobile recommendation service and b) a SmartEnergy Management dashboard that exploit smart analytics to analyse consumption data, behavioural patterns and external context information (e.g. pricing, weather) for providing personalized insights and recommendations for optimizing energy production-consumption patterns.

The proposed solutions will be designed and implemented based on consumer-centred, user-friendly presentation of evidence-based results on the costs and benefits of ICT-enabled energy efficiency techniques, together with clear and on-time, engaging guidance and support on how to realize the energy savings available, so as to widen user adoption of such techniques and increase their effectiveness.

The overall methodology: The project will be implemented in 4 distinct phases:

1) Definition of user requirements;
2) Framework design;
3) Prototyping, implementation and system integration;
4) Iterative deployment, demonstration and evaluation.

Due to the agile approach adopted by *SIT4Energy*, this phase will be run almost in parallel with design, development and integration activities, and will focus on fine-tuning and validation of the whole framework as well as on the assessment of the demonstration phase of the project.

The scope of collaboration:

Building upon existing experiences of the partners in Greek-German cooperation, the SIT4Energy project's aim, in regards to collaboration, is twofold: (i) collaboration with respect to gaining insight into and access to specifics of Greek and German energy efficiency IT solutions and markets and (ii) collaboration on the specific work topics in SIT4Energy. In particular, the access to competence of German partners SHF and HOST in the area of IT solutions for energy saving will be strongly beneficial to Greek partners, especially ITML who will be enabled to build a new commercial service for their business portfolio. Similarly, the experiences of ITML with their existing mobile services and of CERTH with research in energy management for buildings will be a fruitful input for German partners in addressing the design of the Smart Energy

Management Dashboard for the German pilot. Mutually beneficial is also the validation in two different climatic areas due to a Greek and a German pilot, testing the solutions in such different conditions wouldn't be possible for a single side.

3. PROJECT TECHNICAL DESCRIPTION & IMPLEMENTATION

Implementation and phase of the project:

The SIT4Energy project has started officially in March 2018 and is currently in phase 1: Definition of user requirements. During this phase and within WP1-WP2, the groundwork of the project, including all major common activities required for the definition of the Framework design and the SIT4Energy business models will be set, along with requirements, use cases and operational scenarios.

Main technologies demonstrated and expected results:

SIT4Energy will develop and demonstrate a first smart IT solution for energy efficiency that addresses both energy consumers and energy prosumers, who produce their own energy in an integrated approach and user-friendly service. The conceived Smart Energy Management Dashboard and the Intelligent Mobile Application will demonstrate a novel approach to smart energy analytics that integrates data-driven methods (e.g. consumption monitoring) with context-based information *and* behavioural analytics for optimization of energy demand and energy supply management. These are highly innovative approaches that hold a high chance of publishing in premier scientific publications and can stimulate further research in the field. Finally, the validation in real-world pilots promises to provide valuable empirical data and results that will be published to inform both scientific research and business practice. TRL7 is considered a critical threshold as is a significant step beyond TRL 6, requiring an actual system prototype demonstration in a space environment. The prototype should be near or at the scale of the planned operational system and the demonstration must take place in field[1]. This TRL is the ultimate milestone that is expected to be reached with the final prototype. The process followed will generate a gradually increasing TRL for the whole system and for each component individually.

4. RESULTS ACHIEVED

At Kick-Off: On March 2018 the SIT4Energy project started. To mark this event, have partners get to know each other better and share a clear and detailed overview of the project with everyone's roles in it, and to jump-start implementation of the project, all partners were invited for a full-day online meeting event on the 18 of June 2018. All four partners participated in the event, totalling to 8 participants, including representative from EICPM, which is a sub-contracting company.

During this event, partners reviewed the *SIT4Energy* proposal, discussed on management, dissemination and organisation matters and presented the work already performed in the context of WP1 and in particular T1.1. Furthermore, extended discussion about the pilots followed, towards clarifying the capacity of each pilot and the requirements from each partner. Finally, the partners agreed on the specific actions to be followed within the first months of the project. These would mainly include activities for: disseminating the project's ideas and values (launching the project website, social network pages, hold press releases, distribute them to relevant EU media); performing state of the art analysis on current relevant technologies; agree on functional and technical requirements and draft the *SIT4Energy* technical architecture.

The aforementioned actions would set-up the basis for reaching the 1st year milestones:
1. SIT4Energy pilot sites surveys and use case scenarios available
2. SIT4Energy architectural design available
3. IPR Plan available

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[1] http://serkanbolat.com/2014/11/03/technology-readiness-level-trl-math-for-innovative-smes/

5. IMPACT

Impact on project partners:

SIT4Energy will improve the innovation capacity and the product/service portfolio of (1) ITML by allowing the integration of complementary components which would address different needs of targeted users; (2) SHF by enabling real-time data aggregation and management, which would allow depth understanding of energy consumption of user and building profiles and providing a deep understanding in energy consumption data to be used to develop new services (i.e. new price tariffs) which would create a new era in their customer relationships (3) Facility managers (all partners) by providing better services to optimize energy consumption, which would result in energy efficiency by proving the interoperability and replicability of similar solutions on a wide diversification of types of buildings and European countries (climatic areas); (4) Academia and Research Institutes on applying the acquired knowledge and expertise in the above fields in further national and EU research projects, whereas it will also investigate the creation of SME companies as spin-offs oriented in commercializing products derived from the above research and the participation in new spin-off commercial companies capable of exploiting its research when new market needs and solutions are identified.

Impact on employment:

SIT4Energy will educate and contribute towards more skilled and energy-literate users and facility managers by developing significant know-how in the energy efficiency technological area. Moreover, we envision SIT4Energy's innovative ideas such as negotiation and loyalty approaches will boost new ideas and that will increase the number of SMEs that introduce new services to the EE sector, creating new jobs in the area.

Economic impact:

SIT4Energy contributes to the creation of knowledge intensive services and will deliver its services as "sales of new to market". Developed products will be cost-effective with user friendly interfaces. *SIT4Energy* will be beneficial to DSOs and ESCOs to identify end-users' needs and motivations and will interpret energy consumption data associated with human dimension. This information could be further integrated in respective companies' price tariffs and that they become more competitive and increase their share in the energy market.

Social and/or environmental impact:

The outcomes of *SIT4Energy* will support the decision making process by providing significant information of the sustainability and the affordability of the Ecosystem proposed, that will be the basis to replicate *SIT4Energy's* outcomes in a wide number of buildings and climatic conditions, which will accelerate the consecution of such environmental impacts. Furthermore will substantially on the CO_2 emission savings by shaping human behaviour while ensuring comfort in the living and working environment in low-energy and low-emission buildings

The *SIT4Energy* approach will have a strong social and educational impact beyond direct savings on the pilot sites. In particular, *SIT4Energy* intends to engage highly diverse stakeholders with different profiles including residents, students, staff, and facility managers to be actively using the *SIT4Energy* Ecosystem. In addition to these impacts, the implementation of *SIT4Energy* platform will imply the generation of employment, in particular; it is considered it would create 2 new jobs during the project lifetime, which would be increased until 2023. Finally, the implementation of the proposed solution in social housing would reduce their energy consumption and could reduce the overall levels of energy poverty.

6. CONSORTIUM