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Projects

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Special Edition

Innovating real-life building operations

MOEEBIUS – Modelling Optimisation of Energy Efficiency in Buildings for Urban Sustainability

Minimising the performance gap

MOEEBIUS is a European project addressing the challenges construction and energy services industries face in meeting the increasing demand for energy efficient buildings. The recently finished project developed solutions to reduce the gap between predicted and actual energy performances and reduce the business risks that hindered the growth of the ESCO market. We spoke to Michele Vavallo, Ander Romero and Pablo de Agustín from MOEEBIUS

What were the aims and objectives of the MOEEBIUS project?

The inability of current modelling techniques to represent realistic use and operation of buildings was the motivation behind the project. MOEEBIUS aimed to develop a holistic energy performance optimisation framework that describes real-life building operation complexities in accurate simulation predictions and enhances the optimisation of building energy performance. In order to address the challenges, the project pursued five key objectives which focused on technical, environmental, social and business factors.

Can you explain the work the project has done to meet these objectives and now, what's next?

The diverse nature of the objectives required the cooperation of all 15 project partners and the crosschecking with MOEEBIUS Living Lab members. End-users and business requirements were assessed, and new business models proposed prior to any technical development. The MOEEBIUS Holistic Energy Performance Optimisation Framework was then developed before finally being adapted to the pilot sites' (UK, Portugal, Serbia) needs and validated. The project is now looking to make these components available on the market however, the technical readiness of them is varied and some are closer to the market than others.

What were the main technical and market challenges MOEEBIUS had to overcome that will enable greater energy efficiency in buildings?

Both the hardware and software components of the framework proved technically challenging, and the innovations presented in their development. MOEEBIUS also had to ensure interoperability and address the specific requirements of diverse business scenarios defined by building managers, ESCOs or aggregators.

How are you addressing the energy performance gap in buildings – and what is new about the project's approach?

MOEEBIUS presents a holistic approach where the multiple and heterogenous factors in the use and operation of buildings are taken into account. A Building Energy Performance Simulation tool has been established to run the models and update them according to the inputs from other components (i.e. user behaviour profiles, weather forecasts). The Dynamic Assessment Engine also uses fault detection and diagnosis to recognise when the building is performing sub-optimally and identify the trends that could lead to performance deviations.

What innovations is the project hoping to deliver to the energy market and what will be their impact on energy consumption?

The MOEEBIUS-PIPE is just one of the components the project delivers innovation which draws on external data sources (weather, building energy management systems (BEMS), district heating) to provide enhanced analytics. For example, this mechanism is used in DR strategies, DR potential of domestic customers and real-time building operation optimisation through simulation-based automation. The project has also tested virtual reality for predictive maintenance support and an assessment framework for energy performance optimisation. If successful, MOEEBIUS is on the way to achieve one of its main objectives of reducing energy consumption.

How has the project demonstrated the value of its solutions and how can end users still engage?

Specific targets were laid out to validate MOEEBIUS objectives across the project life span, the majority of which have been successfully accomplished. For example, some of the targets achieved include: deviations between forecasted and measured consumption below 10 per cent; at least 10.000 occupants directly or indirectly involved in the pilot roll out activities in the three pilot sites. Therefore, the final version of the MOEEBIUS tools was created to meet the needs of stakeholders, and end users helped fine tune the tools to facilitate market uptake.

Can you explain the MOEEBIUS Living Lab approach?

The Living Lab environment runs across the whole project for co-creation through experience sharing and exchange between stakeholders. Three workshops were organised to involve these stakeholders. The first aimed at raising end user and stakeholder awareness, engagement and acceptance of the project objectives. The second for training them on how to contribute to the MOEEBIUS concept and operation in the pilot sites, and the third workshop involved all stakeholders in the evaluation of MOEEBIUS results. Therefore the final version of the MOEEBIUS tools was created to meet the needs of stakeholders and end users helped fine tuning the tools to facilitate market uptake.

Can you explain the business proposition that makes MOEEBIUS solutions attractive to the market?

Currently, the BEMS market is generally characterised by ESCO, facility management and the energy optimisation of building type services. Some actors take on the role of ESCOs with their hardware and software solutions, such as Siemens, Johnson Controls and Schneider. Since the objective of MOEEBIUS is to offer integrated solutions to ESCOs and facility managers, the project's integrated framework which works on top of existing BEMS installations opens up competition

Serbia pilot site

Mafra City Hall building, the pilot site of MOEEBIUS project in Portugal

PROJECT INFORMATION

Project Title:
MOEEBIUS: Modelling Optimization of Energy Efficiency in Buildings for Urban Sustainability

Project Objective:
MOEEBIUS introduces a totally new approach to reduce energy consumption in the building sector, based on modelling optimisation of energy efficiency in buildings for urban sustainability. Project elaborated products and services enabling 'performance gap' minimisation and promoting customer confidence in diverse energy efficiency business models and contracts, e.g. Energy Performance Contracting.

Project Duration and Timing:
11/2015 – 04/2019

Project Funding:
European Union's Horizon 2020 research and innovation programme

Project Partners:
- Tecnalia Research & Innovation,
- Honeywell SPOL. S.R.O,
- Hypertech Energy Labs,
- CORK Institute of Technology,
- Solintel M&P SL,
- Tyndall National Institute,
- Almende B.V.,
- Technischen Hochschule Nürnberg,
- Belit - Belgrade Information Technologies,
- KiWi Power LTD,
- Instituto de Soldadura e Qualidade,
- Grindrop Ltd,
- Beogradske elektrane,
- Municipio de Mafra,
- ASM - Market Research and Analysis Centre Ltd.

MOEEBIUS

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Moorhouse, UK

against these large players in medium and small markets of non-residential buildings, requiring cheaper solutions and faster implementation. Moreover, MOEEBIUS' hybrid business models could enable a new form of organisation in that DR and load shift activities could perform simultaneously rather than ESCOs specialising solely in demand flexibility.

Can you outline the business models developed for ESCOs and the demand response model?

An entity made up of the main industrial and research partners of the project takes over the commercialisation of the integrated solution offering a service to ESCOs that would enable their customers to enact the project's novel and innovative hybrid business models through Energy Efficiency Service Agreements (EESA). The MOEEBIUS go-to-market strategy would focus on offering a product that is a Software-as-a-Service model, compatible with current smart devices and sensors with the possibility of implementing it with the required hardware or over existing BEMS and BACS hardware.

From ESCOs to consumers, who will now benefit from the MOEEBIUS solutions and how do you see the future in relation to the EU's ambitious energy targets?

According to the business model specifications and the go-to-market strategy, the MOEEBIUS solution would be economically beneficial to both profiles; ESCOs could increase incomes and consumers could reduce their energy bills. From an energy efficiency point of view, the benefit arises from improving the use of energy as a resource for medium and small non-residential buildings and achieving the 2030 European Energy targets.

What are the main lessons to have emerged from the project and how will this impact on future work in helping to reduce energy consumption, increase efficiency etc?

One of the lessons learnt has been that residents can be prone to use old systems which resulted in MOEEBIUS automisation systems not being exploited effectively. Reluctance to use a prototype can be because it is not commercially attractive or too technical, therefore specific attention needs to be paid to the design. Another barrier was the difficulties associated with the control-oriented retrofitting of existing buildings, for example, occupant's hesitation, the high costs of deploying one NOD per person and separating the heating supply from the thermal circuit.

The project collates these findings with the results of the Living Lab co-creation process to refine the MOEEBIUS system in order for it be as effective as possible (financially and increasing efficiency) for the market. ★

MAIN CONTACT

Ander Romero Amorrortu

Ander is Project Manager in the Building Technologies Division of TECNALIA. Having worked for more than 15 years managing projects and departments in the fields of energy efficiency and sustainability in buildings and cities, he has extensive experience within the international research and innovation industry. He is currently coordinating several H2020 projects focused on energy efficiency and demand response.

Contact:
Tel: +34 667 178 893
Email: ander.romero@tecnalia.com
Web: www.moeebius.eu

SECONDARY CONTACTS

Michele Vavallo

Project and Policy Officer, Fundraiser, Industrialization Leader with more than 17 years experience into Industrial and Innovation Projects, R & D in European Programmes (FP6, FP7, Intelligent energy, Life Environment, Life +, Eco-Innovation, Interreg, SUDOE, MedMedinet, Leonardo, H2020, etc.) and Networks.

Email:
michele.vavallo@solintel.eu

Pablo de Agustín

Pablo de Agustín, PhD., researcher at TECNALIA, has been working on energy efficiency, renewable energies' integration and emissions reductions in buildings for 10 years. He has actively participated in FP7 and H2020 research projects.

Email:
pablo.deagustin@tecnalia.com