

MOEEBIUS contribution to energy performance gap reduction



Modelling Optimization of Energy Efficiency
in Buildings for Urban Sustainability
Project duration: November 2015 – April 2019

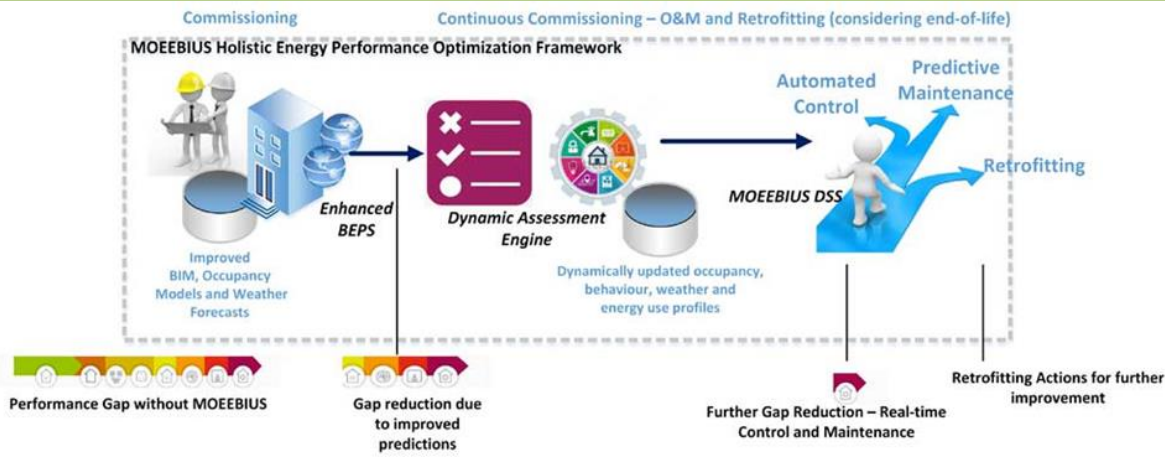
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MOEEBIUS faces the challenge of reducing energy consumption in the building sector. Project's ambition was to elaborate products and services enabling the minimization of the 'performance gap' and promote customer confidence in the attractiveness of diverse energy efficiency business models and contracts, such as Energy Performance Contracting.

Overview of the project



As the project's intention was to propose useful solution to diverse stakeholders of the energy market, **the system has been evaluated in the pilot sites located in the UK, Serbia and Portugal**, incorporating diverse building typologies, heterogeneous energy systems and spanning diverse climatic conditions. **Living Laboratories** have been established in the pilot sites to serve as a channel for gathering feedback from the end-users, building occupants, etc. In this way, all project developments are optimized to address the critical needs of relevant stakeholders.

MOEEBIUS introduces a **Holistic Energy Performance Optimization Framework** that enhances current modelling approaches and delivers innovative simulation tools which deeply grasp and describe real-life building operation complexities in accurate simulation predictions that significantly reduce the “performance gap” and enhance multi-fold, continuous optimization of building energy performance as a means to further mitigate and reduce the identified “performance gap” in real-time or through retrofitting.



Overview of MOEEBIUS products

The innovation achieved in MOEEBIUS project is expressed in **Key Exploitation Results (KERs)**. KERs should be considered as Prototypes with a high potential exploitation into the market, as **all of them reach a minimum average Technology Rediness Level (TRL) 7**.

All KERs compose innovative MOEEBIUS tool that as a consolidated product presents interesting commercial and business opportunities.

As a result of demonstration and validation phases (pre-monitoring VS the post-monitoring analysis) and after the KERs market benefit estimation (market penetrability, paybacks, exploitability and added values, etc.), the consortium has agreed to go to the market considering that the MOEEBIUS KERs are implicitly an added value in terms of **new product, new method and new process**.

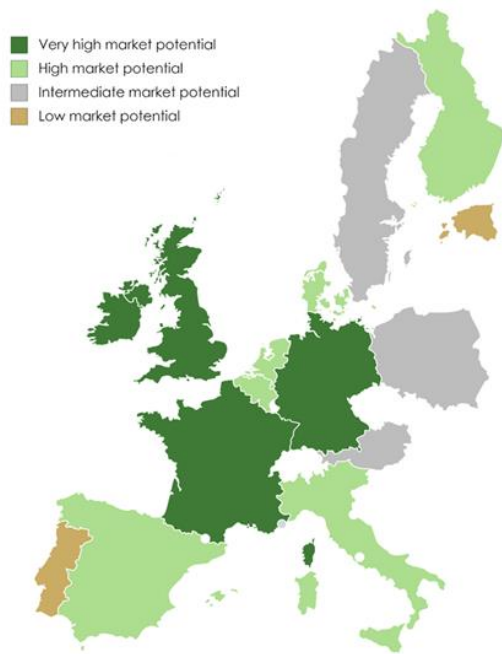
MOEEBIUS Key Exploitable Results (KERs)

1	Cloud-based management system for building or home operation optimization	New process
2	Automated Fault Detection with prioritization and monetization of the impact of faults	New product
3	Improved set point optimization using the models of occupant behaviour	New method
4	Context based Profiling Engine (Application for Consumers)	New product
5	Data Analytics Engine (DER Flexibility Analysis, Aggregation and Forecasting Engine)	New method
6	Behavioral Model linked to Building Energy Model for advanced estimation, assessment, and control of actual building energy use.	New product
7	Predictive analytics and peak demand management solution.	New product
8	MOEEBIUS NOD IoT Device	New product



Diffused geographic coverage of the MOEEBIUS consortium as well as the extensive European networks of each partner means that the entity in charge of taking the MOEEBIUS tool to market has the possibility of covering the most interesting regions for the launch of the solution.

Target markets of MOEEBIUS products



MOEEBIUS consortium was able to identify **the most promising geographic markets through the cross referencing of ESCO market size and activity with that of market openness of demand response aggregation.**

As a result, the areas where the MOEEBIUS Tool features can be applied and leveraged in their entirety have been identified. The map and table represent the summarized assessment.

Although **France, Germany and Great Britain represent the most interesting markets for the implementation of the MOEEBIUS technology, its exploitation does not have to be limited to these countries**, as immediate partner networks at home markets are at disposal, and what is more, some entities participate in projects where the MOEEBIUS technology might be potentially implemented.

Moreover, the three countries are also the ones with the highest amount of building floor space within the EU (BPIE data), implying important potential and opportunities for implementing the MOEEBIUS tool.

ESCO market activity was calculated by a scoring system taking into consideration current market value, number of competitors and market potential while **demand response openness** was reflected in the Smart Energy Demand Coalition (SEDC) scoring system performed in their last report.

COUNTRY	ESCO overall score	SEDEC overall	Combined indicator (x)
Austria	1	3	2
Belgium	0,5	5	2,75
Denmark	2	3	2,5
Estonia	0	0	0
Finland	0	5	2,5
France	5	5	5
Germany	5	3	4
Great Britain	5	5	5
Ireland	2	5	3,5
Italy	5	0	2,5
Netherlands	1,5	3	2,25
Poland	3	1	2
Portugal	1	0	0,5
Spain	5	0	2,5
Sweden	0,5	3	1,75

Special task entirely dedicated for validating and demonstrating the project objectives in pilot sites was deployed in MOEEBIUS. Through the implementation of this task and the related methodology it has been demonstrated that the vast majority of the project targets were successfully accomplished.

Detailed description of MOEEBIUS impact evaluation is presented in the report Framework Holistic Performance Evaluation and Lessons Learnt available on the project website. Please visit www.moeebius.eu for more information.



Evaluation of MOEEBIUS operation phase across the pilot sites

OBJECTIVE	Accomplishment
Deviations between forecasted and measured consumption below 10%	✓
Targeted payback period for ESCO projects at acceptable values below 5 years	✓
ESCO Customers' Acceptance and Satisfaction (~100%)	✓
At least 10.000 occupants directly or indirectly involved in the pilot roll out activities in the 3 pilot sites	✓
57 buildings and 3 districts actively engaged in the pilot roll out	✓
MOEEBIUS tools and overall framework evaluated over a period of 20 months and validated in real-life conditions	✓
Energy peak-demand reductions of at least 50%	28.5%
Reduced energy consumption through real-time optimization 35%	32.0%
Energy savings in HVAC adjustment through the Human-centric control under regulated comfort conditions of 70-80%	✓
Reduction of unscheduled maintenance or corrective actions above 50%	✓
Final reduction of GHG emissions by 180.000 tones CO2 on an annual basis	NO
End-User Acceptance and Satisfaction (>95%)	87.0%
Achievement of at least TRL 7 for the final project results	✓

MOEEBIUS Partners



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