The RenOnBill Tool

Evaluating energy efficiency interventions with a probabilistic approach

Webinar | 17th January 2022 | 15.00 – 16.00 CET

Please stay muted while listening

Please raise your hand if you want to speak

Please use the chat for questions and comments

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 847056.

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AGENDA & SPEAKERS

1. Welcome
2. Introduction to the RenOnBill project
3. The RenOnBill Tool: probabilistic approach & main features
4. Discussion

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University of Genoa (Italy)

David Pérez Navarro
Creara (Spain)

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adelphi (Germany)

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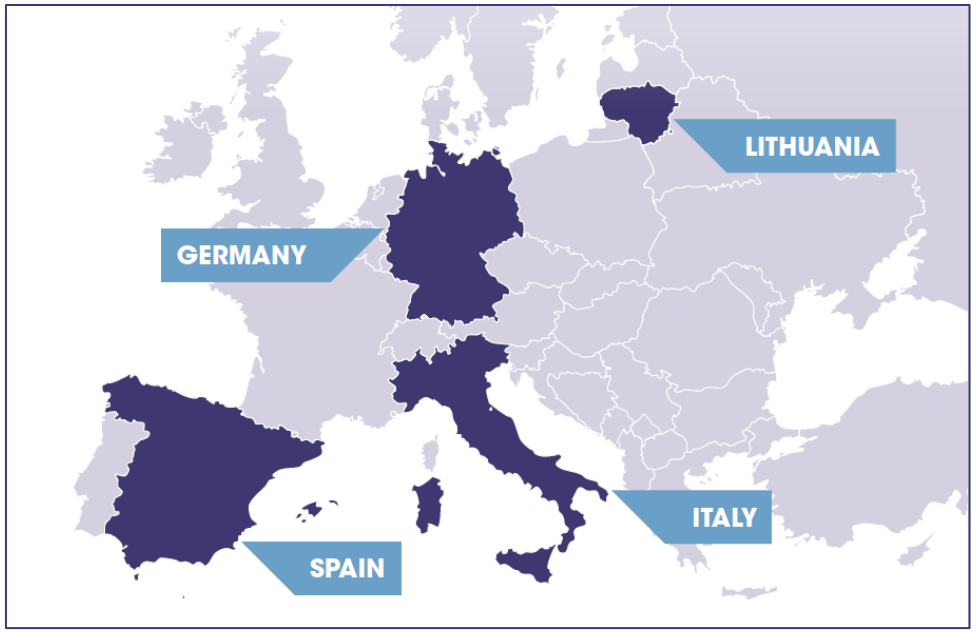
THE RENONBILL PROJECT

RenOnBill promotes the development and implementation of **on-bill schemes** in Europe, to scale up investments towards **deep energy renovations** of residential buildings.



Client | European Commission – EASME

Funding | Horizon 2020

Project duration | 2019 – 2022

adelphi

BLUENERGY Energia per crescere

BPIE

creara ENERGY EXPERTS

EPTA PRIME

fenie energia

KAUNO ENERGIJA

LIETUVOS ENERGETIKOS INSTITUTAS

UNIVERSITÀ DEGLI STUDI DI GENOVA

More information: www.renonbill.eu

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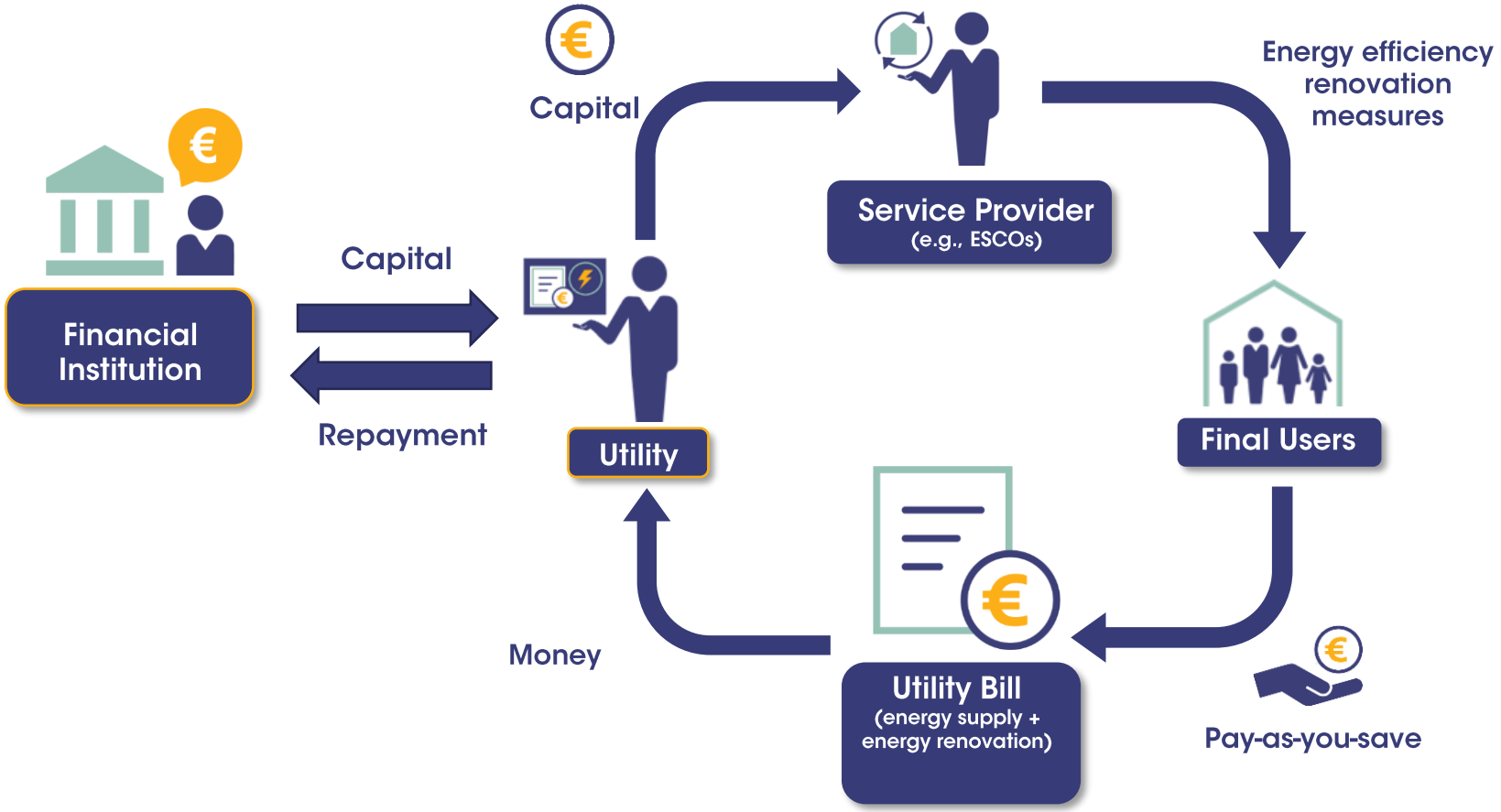
ON-BILL SCHEMES



More information: www.renonbill.eu

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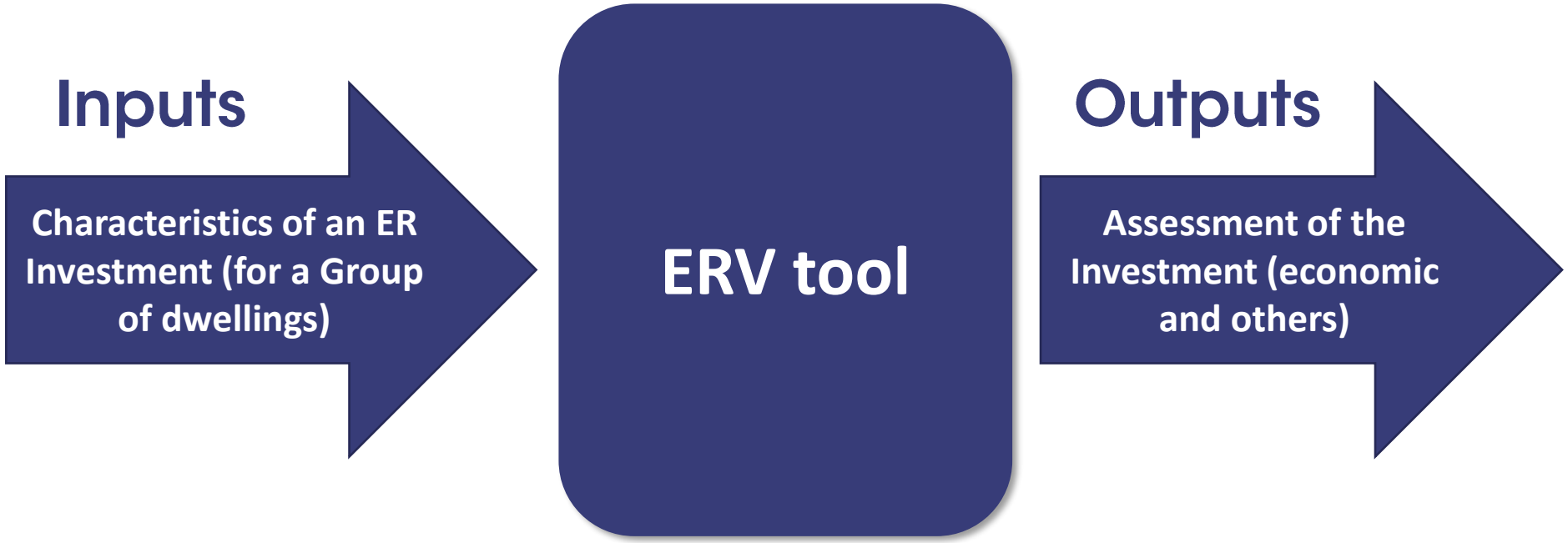
The ERV tool assesses ER investments



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Objectives of the RenOnBill Tool

The RenOnBill Tool aims to:

- Simplify the estimation of energy savings for "*non-technical users*" (e.g. users with financial background)
- Provide an adequate degree of flexibility for "*technical users*" (e.g. energy engineers)
- Develop a complete financial analysis by including a probabilistic approach
- Bundle investments for an overall evaluation

Development of quite a flexible tool adequate for *technical* and *non-technical* users in the development of complex analyses of energy renovation interventions for the residential sector

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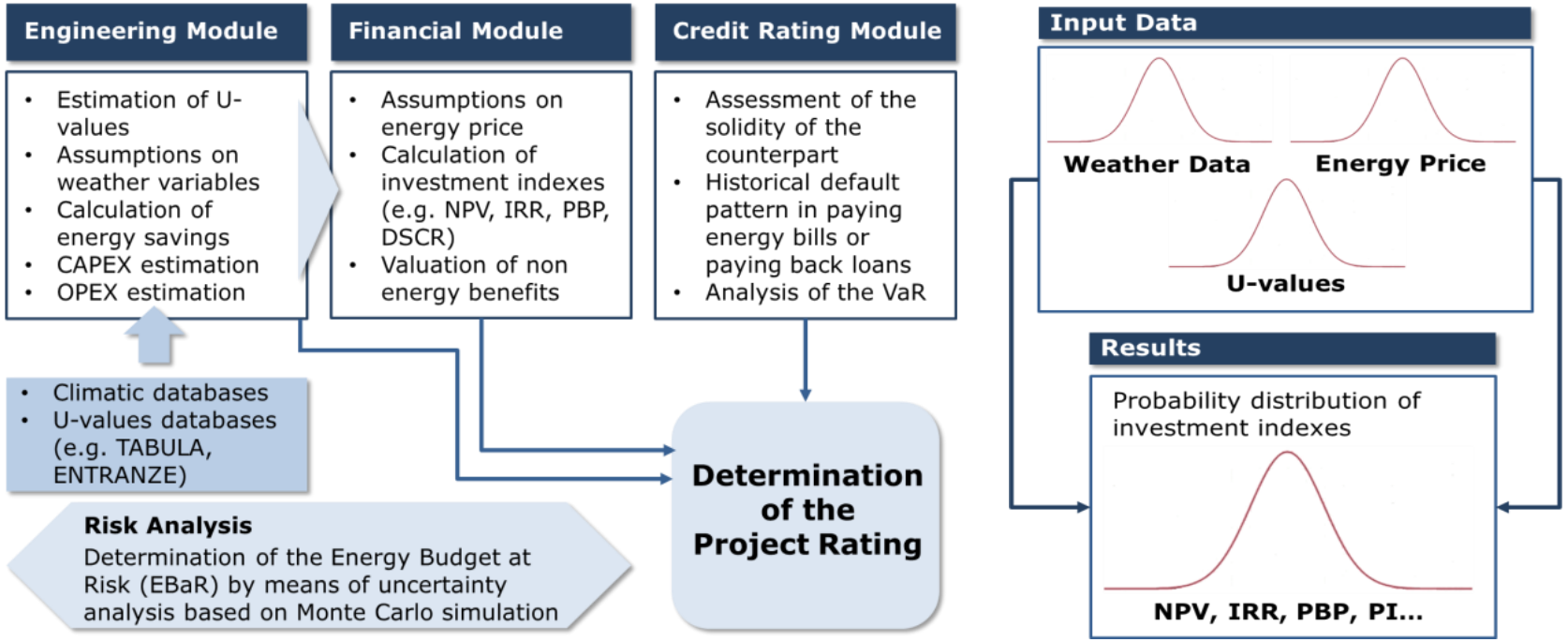
Schematic of the RenOnBill Tool



Engineering and Financial Calculations embedded in one tool

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RenOnBill Tool – Engineering Module

Engineering Calculations Module

Climatic Data

- Heating Degree Days
- Solar Irradiation
- Heating Season
- Heating Hours per day

Buildings Archetypes

- Simplification of the buildings stock in a set of typologies
- Definition of reference thermal features
- Exploitation of Tabula Project analyses

Definition of interventions

- Definition of a set (10) of standard interventions
- Estimation of the CAPEX
- Possibility to customize

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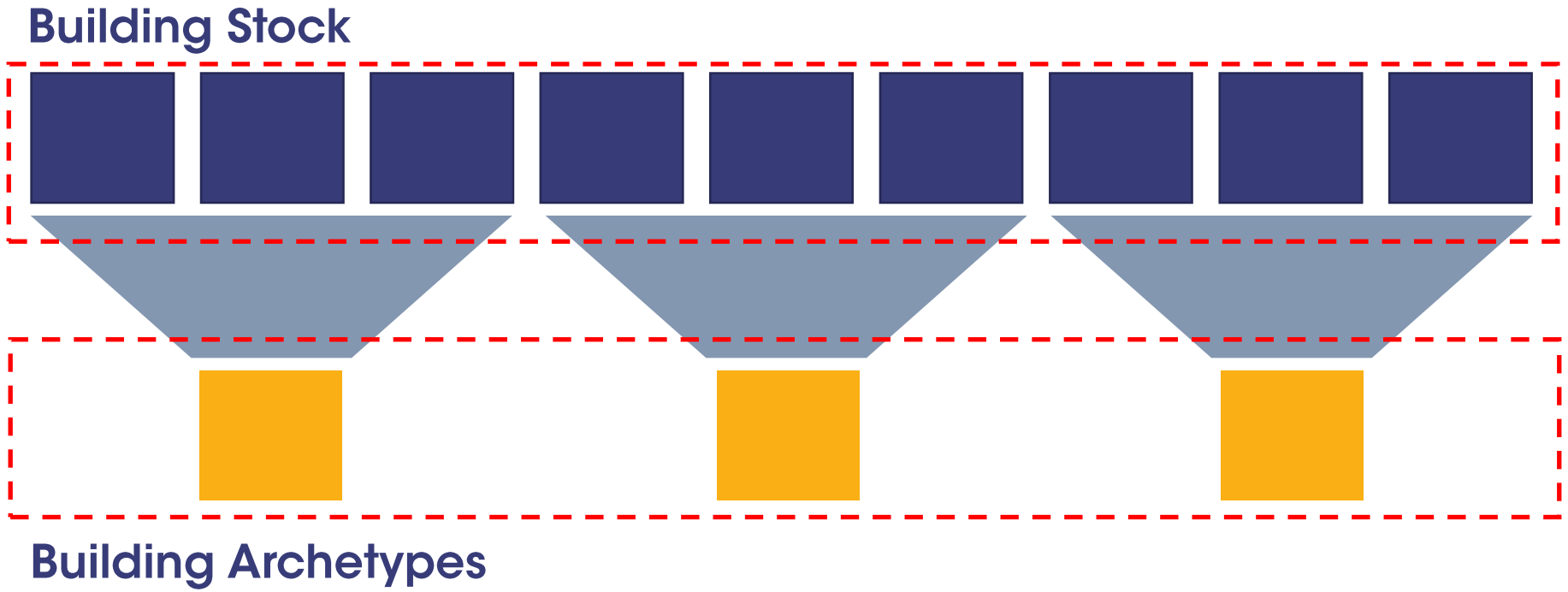
The archetype concept



Synthesis of the building stock in a limited number of typologies (e.g., per year of construction, technical features, etc.)

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RenOnBill Tool – Financial Calculation Module

Financial Calculation Module

1. Data input for discount rate (i.e., hurdle rate, evolution of energy cost & other parameters, e.g., CPI)
2. Calculation of financial viability indexes, namely NPV, IRR, PBP, PI
3. Valuation of non-energy benefits

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RenOnBill Tool – Probabilistic Approach

Monte Carlo Analysis

1. Simulation of the stochastic nature of the variables and of the uncertainty levels present in the real world
2. Definition of the uncertainty levels for some selected variables connected with engineering and financial analysis
3. Calculation of probabilistic figures of merits, e.g., "at Risk".

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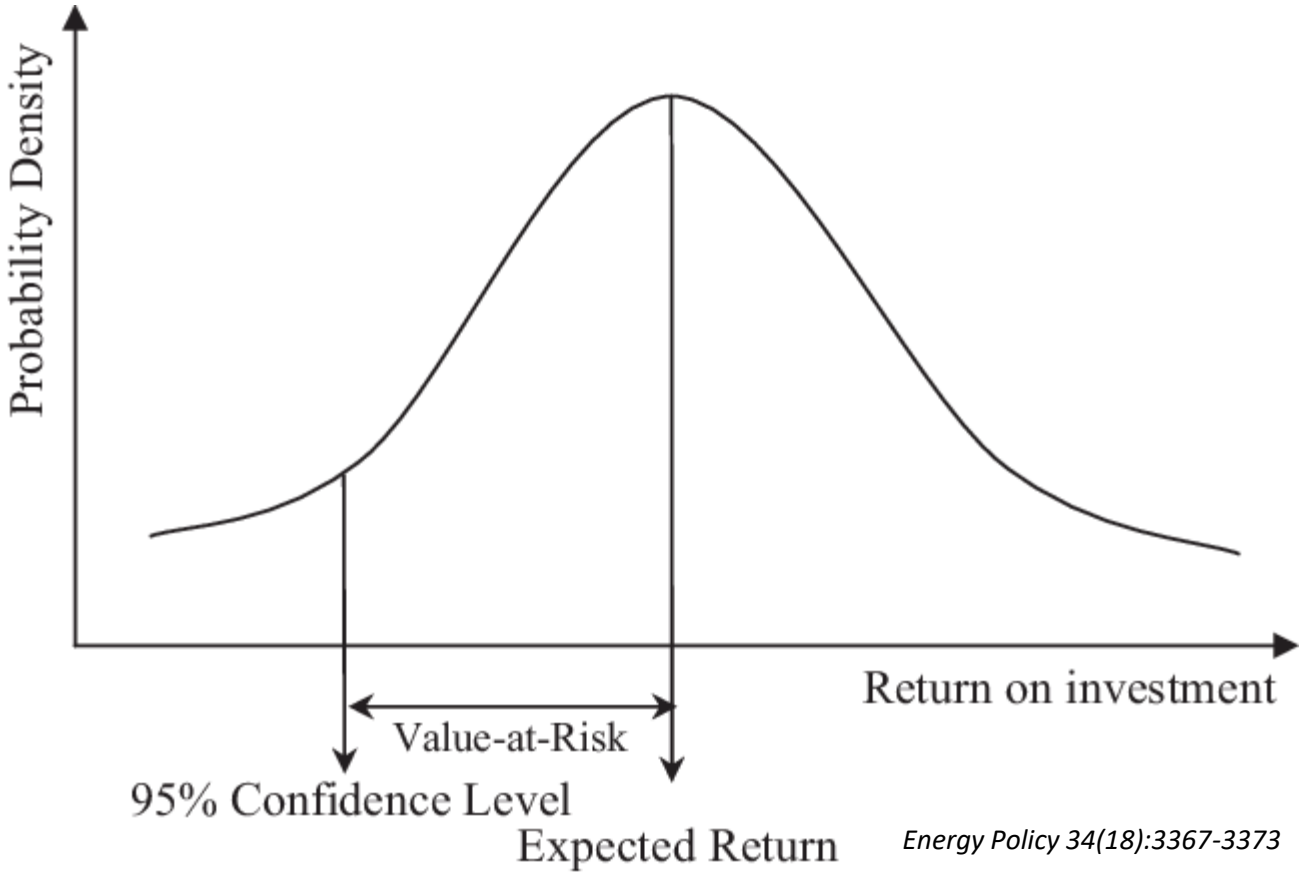
RenOnBill Tool – "at Risk" metrics concept



Energy Policy 34(18):3367-3373

$$X_{@\,RISK} = E(X) - X_{5\%}$$

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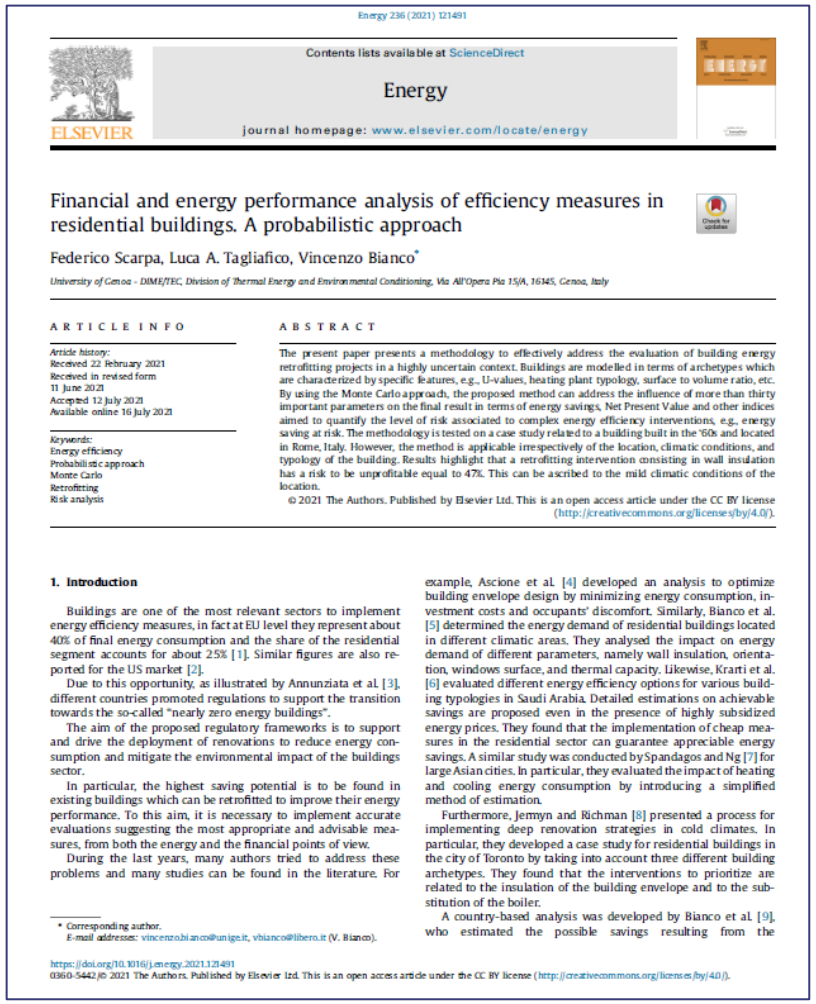
RenOnBill Tool – Detailed Methodology



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Financial and energy performance analysis of efficiency measures in residential buildings. A probabilistic approach

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ABSTRACT

The present paper presents a methodology to effectively address the evaluation of building energy retrofitting projects in a highly uncertain context. Buildings are modelled in terms of archetypes which are characterized by specific features, e.g., U-values, heating plant typology, surface to volume ratio, etc. By using the Monte Carlo approach, the proposed method can address the influence of more than thirty important parameters on the final result in terms of energy savings, Net Present Value and other indices aimed to quantify the level of risk associated to complex energy efficiency interventions, e.g., energy saving at risk. The methodology is tested on a case study related to a building built in the '60s and located in Rome, Italy. However, the method is applicable irrespectively of the location, climatic conditions, and typology of the building. Results highlight that a retrofitting intervention consisting in wall insulation has a risk to be unprofitable equal to 47%. This can be ascribed to the mild climatic conditions of the location.

1. Introduction

Buildings are one of the most relevant sectors to implement energy efficiency measures, in fact at EU level they represent about 40% of final energy consumption and the share of the residential segment accounts for about 25% [1]. Similar figures are also reported for the US market [2].

Due to this opportunity, as illustrated by Annunziata et al. [3], different countries promoted regulations to support the transition towards the so-called "nearly zero energy buildings".

The aim of the proposed regulatory frameworks is to support and drive the deployment of renovations to reduce energy consumption and mitigate the environmental impact of the buildings sector.

In particular, the highest saving potential is to be found in existing buildings which can be retrofitted to improve their energy performance. To this aim, it is necessary to implement accurate evaluations suggesting the most appropriate and advisable measures, from both the energy and the financial points of view.

During the last years, many authors tried to address these problems and many studies can be found in the literature. For example, Ascione et al. [4] developed an analysis to optimize building envelope design by minimizing energy consumption, investment costs and occupants' discomfort. Similarly, Bianco et al. [5] determined the energy demand of residential buildings located in different climatic areas. They analysed the impact on energy demand of different parameters, namely wall insulation, orientation, windows surface, and thermal capacity. Likewise, Krarti et al. [6] evaluated different energy efficiency options for various building typologies in Saudi Arabia. Detailed estimations on achievable savings are proposed even in the presence of highly subsidized energy prices. They found that the implementation of cheap measures in the residential sector can guarantee appreciable energy savings. A similar study was conducted by Spandagos and Ng [7] for large Asian cities. In particular, they evaluated the impact of heating and cooling energy consumption by introducing a simplified method of estimation.

Furthermore, Jermyn and Richman [8] presented a process for implementing deep renovation strategies in cold climates. In particular, they developed a case study for residential buildings in the city of Toronto by taking into account three different building archetypes. They found that the interventions to prioritize are related to the insulation of the building envelope and to the substitution of the boiler.

A country-based analysis was developed by Bianco et al. [9], who estimated the possible savings resulting from the

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Q & A

We kindly invite you to discuss with us.

Please post your questions in the chat or raise your hand.

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THANK YOU!

Publication of **"On-bill business model development guidelines"**

Publication of **"national roadmaps"** for on-bill replication in Lithuania, Spain, Italy, and Germany

Final conference in April 2022

NEXT STEPS IN THE PROJECT

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