

- [10] López-González LM, López-Ochoa LM, Las-Heras-Casas J, García-Lozano C. (2016). Update of energy performance certificates in the residential sector and scenarios that consider the impact of automation, control and management systems: A case study of La Rioja. *Applied Energy* 178: 308-322. <http://doi.org/10.1016/j.apenergy.2016.06.028>
- [11] Khayatian F, Sarto L. (2017). Building energy retrofit index for policy making and decision support at regional and national scales. *Applied Energy* 206: 1062-1075. <http://doi.org/10.1016/j.apenergy.2017.08.237>
- [12] Pascuas R P, Paoletti G, Lollini R. (2017). Impact and reliability of EPCs in the real estate market. *Energy Procedia* 140: 102-114. <http://doi.org/10.1016/j.egypro.2017.11.127>
- [13] Arcipowska A, Anagnostopoulos F, Mariottini F, Kunkel S. (2014). Energy performance certificates across the EU—a mapping of national approaches. Buildings Performance Institute Europe (BPIE), Brussels.
- [14] Belussi L, Danza L, Meroni I, Salamone F, Ragazzi F, Mililli M (2013). Energy performance of buildings: A study of the differences between assessment methods. In *Energy Consumption: Impacts of Human Activity, Current and Future Challenges, Environmental and Socio-Economic Effects*, S. Reiter, ed.; New York, USA: Nova Science Publisher Inc: 53-75.
- [15] Goldstein DB, Eley C. (2014). A classification of building energy performance indices. *Energy Efficiency* 7(2): 353-375. <http://doi.org/10.1007/s12053-013-9248-0>
- [16] Nikolaou T, Kolokotsa D, Stavrakakis G, Apostolou A, Munteanu C. (2015). Review and state of the art on methodologies of buildings' energy-efficiency classification. In *Managing Indoor Environments and Energy in Buildings with Integrated Intelligent Systems*. Springer, Cham: 13-31.
- [17] Salvalai G, Masera G, Sesana M M. (2014). Italian local codes for energy efficiency of buildings: Theoretical definition and experimental application to a residential case study. *Renewable and Sustainable Energy Reviews* 42: 1245-1259. <http://doi.org/10.1016/j.rser.2014.10.038>
- [18] Corrado V, Ballarini I, Paduos S. (2014). Assessment of cost-optimal energy performance requirements for the

NOMENCLATURE

DHW	domestic hot water
EP	energy performance, kWh m ⁻² a ⁻¹
EPBD	energy performance of buildings directive
EPC	energy performance certificates
fp	primary energy factor
PV	photovoltaic
Q	thermal energy
RES	renewable energy source
SP	simple payback time
ST	solar thermal
UTZ	unconditioned thermal zone

Greek symbols

η	Utilization factor, -
--------	-----------------------

Subscripts

C	cooling
del	delivered
exp	exported
gl	global
H	heating
int	internal
L	lighting
nd	need
nren	non-renewable
ren	renewable
sol	solar
T	transport
tr	transmission
V	mechanical ventilation
ve	ventilation
W	hot water