Giacomo Bizzarri
Università di Ferrara
Dipartimento di Architettura

CURRICULUM VITAE

Ferrara, 3 february 2025

1. MAIN DATA

PERSONAL DATA

Name: Giacomo Bizzarri
Birthday: 09.05.1973
Place of birth: Reggio Emilia

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TITOLI e INCARICHI ACCADEMICI

_ Vice-Director and Coordinator of the Energy Sector of the Architecture-Energy Research Center of the Faculty of Architecture, University of Ferrara - since fall 2008
Period 2008 – running.

_ Aggregate Professor of the Course of "Technical Physics 1," at the Department of Architecture, University of Ferrara.
Period 2007 – running.

_ Aggregate Professor of the Course of "Renewable Energy Technologies," at the Department of Architecture, University of Ferrara.
Period 2024 – running.

_ Formerly Aggregate Professor of the "Environmental Technical Physics" course module within the Final Synthesis Laboratories C and E, formerly Professor of "Energy Control of Buildings" and "Technical Systems" and "Energetics," at the Department of Architecture, University of Ferrara.
Period 2007 – 2024.

_ Researcher of Industrial Technical Physics in the Department of Architecture, University of Ferrara.

_ Ph.D. in Energetics received 26-06-2003 from the University of Udine.

_ Master degree in Civil Engineering from the Faculty of Engineering, University of Parma, Italy, on 28-10-1999.

_ Since the 2008-2009 academic year, he has been a member of the Board of Lecturers of the PhD program in Chemical and Energy Technologies, headquartered at the Department of Energetics and Machines of the Faculty of Engineering, University of Udine, and Consortium Locations University of Ferrara, University of Trento, and University of Trieste, as well as Tutor of six PhD students
Period 2008 – 2013.

_ Since the academic year 2014-2015 (cycles XXIX, XXX, XXXI), he has been a member of the Academic Board of the International Doctoral Program in Architecture and Urban Planning (IDAUP) with headquarters the Department of Architecture, University of Ferrara and Consortium Locations: Polis University Tirana, University of Malta, Faculty for the Built Environment, Slovak University of Technology (STU) / Institute of

Management, University of Pécs / Pollack Mihály Faculty of Engineering and Information Technology .
Period 30 cycle 2014-2015, 31 cycle 2015-2016, 32 cycle 2016-2017.

_ Coordinator of the Committee of Scientific Referees of the European Project LIFE LAKS (Local Accountability for Kyoto goalS). Partners: Municipality of Reggio Emilia (project leader), ARPA Emilia-Romagna, Padua, Girona (Spain) and Bydgoszcz (Poland)
Period 2008 – october 2011.

_ Research Manager for the University of Ferrara of the Anglo-Italian British-Italian Partnership Programme for Young Researchers Project 2008-2009:
Research Title: "Potential of organic polymer-based thin-film photovoltaic devices: components development and lca analysis to enhance the devices energy efficiency and improve their characteristic of building integration. Transfer of research from laboratory to industry."
Funding: British Council
Period 2009 – 2010.

_ Research coordinator on professional assignment of Italian partner within European Project VII Framework Program. Proficient.
Period september 2012 – August 2016.

_ Research coordinator on professional assignment of Italian partner within European Project VII Framework Program. Streamer.
Period september 2013 – August 2017.

_ Research coordinator on professional assignment of Italian partner within European Project Horizon2020 P2Endure.
Period september 2016 – August 2020.

_ Author of the 2008 Reggio Emilia Municipality Energy Plan and subsequent updates. The Plan Document was cited among the initiatives that led the Municipality of Reggio Emilia to win the first Klimaenergy Award 09 for the category of Municipalities with more than 150,000 inhabitants for the best national policy in the field of renewable energy and energy efficiency
Period 2006 – 2019.

_ Author and Coordinator of the drafting activities of the Energy Plan of the City of Parma.
Period 2010.

_ Head of Research appointed by the Department of Architecture of the University of Ferrara under the Protocol of Technical and Scientific Collaboration Activities between the same Department of Architecture and the Municipality of Rolo, in its capacity as the Managing Entity of the APEA of Rolo Fabbrico.
Period 2015 – running.

_ Research Manager appointed by the Department of Architecture of the University of Ferrara within the framework of the Protocol of Technical and Scientific Collaboration Activities between the same Department of Architecture and the Municipality of Reggio Emilia with reference to the environmental and energy reporting activities envisaged with the latter's adhesion to the Covenant of Mayors, and other related activities.
Period 2015 – 2019.

_ Author and Coordinator of the drafting activities of the Energy Plans of the municipalities of Lama Mocogno,

Polinago, Palagano, Provincia di Modena.
Period 2012.

_ Member of the University of Ferrara Delegation to the COP 15 World Congress Copenhagen – United Nations Climate Change Conference 2009
Responding to Climate Change TV - http://www.rtcc.org/2010/html/ferrara-uni.html

_ _ Member of the Research Group of the project: sustainable UNIFE. energy screening of the building heritage of the University of Ferrara and preliminary proposals for the planning phase of retrofit interventions - 2016 Research Group: Davoli Pietromaria, Bizzarri Giacomo, Rinaldi Andrea, Calzolari Marta, Belpoliti Vittorino, Cattani Elena, Pitzianti Stefania.

_ Permanent Member Technical Committee Assoidroelettrica Period 2015-.running

_ uthor of more than 100 articles and scientific contributions

2. TEACHING ACTIVITIES

Nell' **A.A. 2024/2025** he is the holder of the teaching:

(I Anno)
Fisica Tecnica 1
60 ore

Tipo Attività	Durata (h)	Tipo Attività Formativa	Settore Scientifico Disciplinare	CFU
Lezione	60	Base	[ING-IND/10] - FISICA TECNICA INDUSTRIALE	6

Nell' **A.A. 2024/2025** he is the holder of the teaching:

(V Anno)
Renewable Energy Technologies (course in English language)
60 ore

Tipo Attività	Durata (h)	Tipo Attività Formativa	Settore Scientifico Disciplinare	CFU
Lezione	20	Opzionale	[ING-IND/10] - FISICA TECNICA INDUSTRIALE	2

3. SCIENTIFIC ACTIVITY

ENERGETICS

In recent years, research activity in the field of energy planning has led to the drafting of numerous technical documents in support of the energy policies of various Administrations, the main ones being the Municipalities of Reggio Emilia, Parma, Lama Mocogno, Polinago and Palagano, for which their respective Energy Plans have been drafted.

In particular, the Reggio Emilia Energy Plan, has been and still is being constantly updated and was cited among the initiatives that led the same municipality to win the first Klimaenergy Award 09, for the category of municipalities with more than 150,000 inhabitants, for the best national policy in the field of renewable energy and energy efficiency.

In the case of Reggio Emilia, a bottom-up approach was followed, which was particularly complex because of the need to proceed with the reconstruction of the energy demand and emission scenario of a city of more than 150000 inhabitants, through a widespread census of the needs of individual users. This activity lasted for almost two years and made it possible to build a very precise city energy model, with which it is now possible to simulate the various energy policy interventions, monitoring their effectiveness a priori.

The imposition of a rigorous methodology, screened, on an arbitration basis, by a well-known international body (i.e. Bureau Veritas), has certified the correctness of the procedures followed, causing them to be declared compliant with the requirements of the UNI ISO 14064-2 standard on the methodology for quantifying, monitoring and reporting the reduction of carbon dioxide emissions, thus making them suitable for the future obtaining of energy efficiency and/or related certificates.

This original approach has recently been recognized by ARPA Emilia Romagna, as part of the European LIFE-LAKS (Local Accountability for Kyoto goalS) Project, as one of the most rigorous within a review of international calculation methodologies for accounting for climate-altering and polluting emissions, being among those selected as a reference for the drafting of Climate Alliance's Ecoregion calculation algorithm, recognized by the European Commission as one of the software for the Covenant of Mayors' "Sustainable Energy Action Plan" (SEAP). The European LIFE-LAKS project itself, adopted some of the previously described procedures in the development of the pilot accounting calculation tool, which was later distributed to the four sample cities: Reggio Emilia, Padua, Bydgoszcz and Girona.

The Energy Plan of the City of Parma, on the other hand, was drafted on the basis of a mixed top-down/bottom-up approach, taking advantage of the macro-area data already calculated for the City of Reggio, extrapolated to neighboring Parma, thus avoiding part of the long and complex search for census data.

In the framework of the LIFE-LAKS Project, Bizzarri from held the role of Coordinator of the Scientific Referees, appointed by the different European Partners, as well as the activity of co-chairman, for the scientific aspects in the different Project meetings.

By virtue of the results achieved with the presentation of the Reggio Emilia Energy Plan, Bizzarri

was invited by RTCC, Responding to Climate Change TV, to the World Congress COP 15 Copenhagen - United Nations Climate Change Conference 2009, together with a Delegation from the University of Ferrara.

COGENERATION

The study of woody biomass-fueled cogeneration systems has led to the development of two separate project proposals drafted as part of the regional operational program POR FESR 2007-2013 - financing the construction of Ecologically Equipped Productive Areas (APEA)of Reggio Emilia (Mancasale) and Pavullo nel Frignano (Madonna Baldaccini). Also as part of the drafting activities of the Reggio Emilia Energy Plan, specific guidelines have been drawn up in order to provide the Public Administration with an effective technical tool in the objective assessment of the environmental impact associated with the construction of these cogeneration stations, with particular reference to the energy transformation efficiencies that characterize the various power generation processes and the potential inherent in the recovery of low-enthalpy waste.

An in-depth study was also conducted on the cogeneration systems operating to serve the district heating network in the city of Reggio Emilia, in order to determine the efficiency to be considered in the energy analyses for housing and buildings connected to the same network. In fact, six power plants operate in Reggio Emilia, three of which are cogeneration type, two thermal plants dedicated to district heating only and one auxiliary thermal power plant. The cogeneration power plants, in turn, are of different types: a medium-sized combined-cycle power plant (55 MWe), a simple-cycle power plant (19 MWe), both fired by natural gas in addition to a waste-to-energy plant (4 MWe). The district heating stations, which are also fueled by natural gas, show sizes ranging from 23 to 58 MWt, cumulating the thermal powers rendered during nomal operation and those of integration only. The evaluation of descriptive energy parameters for the sector turned out to be a particularly complex task given the great heterogeneity of the technologies operating to serve the grid. In fact, all power plants are characterized by different size and operating set-up, as well as different efficiencies and emission factors.
A procedure was therefore defined to provide an overview of the entire park in both energy and environmental (emissions) terms. In the course of carrying out these energy analyses, a method was developed, based on a second-principles analysis, which finally made it possible to determine the electrical and thermal efficiencies of a complex and articulated district heating network such as that of Reggio Emilia, through specific exergetic allocation coefficients.

Finally, a study was conducted with the aim of outlining the framework of the national legislation inherent to the evaluation of primary energy associated with renewable sources, as well as the operation of cogeneration systems, also considering some orientations at the international and regional level, developing a critical analysis inspired by the fundamental dictates of Directive 2002/91/EC, with the intention of formulating some simple proposals for conventional evaluation, supported by specific arguments of a technical-scientific and normative nature.

By virtue of this research, Bizzarri was appointed by CONFAPI Small and Medium Industry of Reggio Emilia to coordinate the Activities of the Local Energy Office throughout most of 2011 and 2012, at the end of which year CONFAPI was dissolved by merging into Unindustria Emilia Romagna. Also as part of 2011 and 2012, Bizzarri participated in the work of the Regional Entrepreneurship Table representing UnionAPI Emilia Romagna.

WIND ENERGY

As part of the experimental research activities, developed at Tozzi Nord's laboratories, in collaboration with the same company, a number of prototypes of mini wind turbines are currently being studied with the aim of being able to achieve their widespread diffusion throughout the territory, similar to that which has recently affected the photovoltaic sector.
The studies started from an analysis of the state of the art that made it possible to select a basket of wind turbines within the scope of the technologies already available on the market today. To these were added prototypes in development of which experimental data related to three test fields, Trento, Ravenna and Foggia, were progressively known. The results of the energy simulations confirmed that the reference wind climate, and thus the type of terrain, naturally represent the main variable to be considered in the choice of wind turbines. Vertical-axis wind turbines are more appropriate at sites with high average speeds, while horizontal-axis three-blade wind turbines can be used more widely, however, presenting some operational limitations compared to the former for particularly turbulent sites. The sensitivity analysis highlighted the importance of the shape parameter k of the Weibull distribution with which the wind resource of the area is described, which, for small-power machines, turns out to be the main reference to be considered in the evaluation of the vocation of the installation site and in the measurement of the expected producibility.
These studies are now continuing through the continuous monitoring of three prototypes, installed at the three pilot sites: the Tozzi Nord research center in Trento, the Molo della Capitaneria in Ravenna, and the Tozzi Sud plant in Foggia, in order to refine the machines by reaching an optimization of their specific producibility (i. e. number of equivalent hours characterizing electrical production) by developing so called "depowered" systems, i.e., operating with mayre continuity, at reduced speed compared to the power theoretically guaranteed by the size of their rotor, with benefits in terms of equivalent producibility.

Also as part of the study of wind technologies, some new site techniques used for the construction of "wind-farms" were investigated with the specific intent of monitoring the energy balance with particular reference to the process energies (internal and external) of these stages. The optimization of these logistic solutions (e.g., the heli-transportation of the rotor blades to limit civil works on the viability in mountain sites), has the ultimate goal of being able to make accessible, and therefore economically attractive, even those wind-farm projects involving portions of the territory that, although very vocated in terms of resource (wind-equivalent hours/year), do not allow today to build wind installations given the difficult accessibility.

BUILDING INTEGRATED PHOTOVOLTAIC SYSTEMS

In recent years, specific research was developed on photovoltaic systems with particular reference to the problems, but also the potential, related to their integration in buildings.
In particular, LCA investigations, already developed in previous years, were also extended to new technologies made of materials other than silicon (e.g., titanium dioxide.
It is precisely these latter photovoltaic systems that make it possible to create semitransparent elements that can also be used as envelope finishes, both on the roof and on the façade (e.g., integrated into so-called double-glazed-skin systems), with dual active (electricity production) and passive (optimized envelope transmittances) functions.

Since transient phenomena greatly affect the efficiency of these systems, a dedicated investigation was developed to reproduce these non-stationary regimes and their effect on energy demand, using dynamic calculation methods, assisted by specific software, simulating different energy retrofit scenarios .

ENERGY RETROFIT

One of the research topics that has most interested the activities of the last riceearch period has been the energy retrofit of buildings.

Energy retrofit of the built environment is in fact one of the topics of mayre interest within the Faculty of Architecture itself and, in particular, within the Center for Energy Architecture.
Analyses have been developed by considering buildings as "cells" of the energy networks they belong to (in analogy with the guidelines of UNI-TS 11300 part 3 and 4) or, more simply, by limiting the study to the local integrated building-plant system.

Of particular importance has been the study of the energy upgrading of buildings, so called "social" housing, i.e., intended to house poor families, guaranteeing subsidized rents to the occupants. The management of these buildings in Emilia Romagna is entrusted to the local Azienda Casa Emilia Romagna (ACER), with which a Research Protocol (ACER Ferrara) and a Doctorate (ACER Reggio Emilia) have been activated.
As part of these investigations, very in-depth energy analyses were developed of a basket of 22 buildings for which energy behavior was simulated in both steady-state and dynamic regimes, correlating the studies with experimental audits and measurements (thermography, etc.).
The same analyses were then extended to 72 additional buildings for which analyses aimed at energy certification were prepared.
At present, starting from the results achieved with the previous studies, it has been possible to arrive at a parametric estimation of the energetics of a truly significant sample: more than 476 buildings, managed by ACER, in the Province of Reggio Emilia for a total of 5400 dwellings, providing an Energy retrofit handbook, built on the priorities for intervention in relation to the financial resources available, and, at the same time, on a precise bottom-up assessment of the energy and environmental benefits related to these energy policies.

LCA ANALYSES

It has become commonplace that technologies related to renewable energy sources are an always sustainable option. However, it is still unclear whether and in what proportion these devices always meet this definition, which is already rather approximate in nature. An answer to the question can only be sought through a rigorous analysis of all energy processes, starting from the packaging stages of plant systems, to the operational stages, to the disposal of system components at the end of their useful life. At the same time, it is possible to conduct a similar study to obtain an environmental impact assessment by considering the climate-altering emissions associated with the same processes. This method follows the procedures of so-called LCA (Life Cycle Assessment) analyses.

In a desire to meet this need, a number of studies have therefore been developed over the past three years aimed at determining the real effectiveness in LCA terms of solar photovoltaic and thermal technologies.