

**Expression of Interest**  
**of the Open University of the Netherlands – Centre for Actionable Research**  
**to join a consortium on HORIZON calls:**

- **Smarter buildings for better energy performance (HORIZON-CL5-2022-D4-01-03)**
- **Demand response in energy-efficient residential buildings (HORIZON-CL5-2022-D4-01-01)**
- **Renewable-intensive, energy positive residential buildings (HORIZON-CL5-2022-D4-01-02)**

**The Open University of the Netherlands (OUNL)** is an independent government-funded Dutch university, known for its state-of-the-art teaching methods. Within the various scientific areas, the university conducts societally relevant, impactful research, often in collaboration with businesses and other institutions. Its administration is based in Heerlen, but it counts twelve study centres and three support centres dispersed throughout the continental Netherlands, as well as six study centres in Dutch-speaking Flanders (Belgium) and partnerships with institutions in Aruba, Bonaire, Curaçao, St Maarten and Suriname. The university has over 20,000 students, 700 staff members, and is growing fast.

**The Centre for Actionable Research at the OU (CAROU)** is a research centre of the OUNL, which specifically aims to conduct actionable research with both academic and business value. It achieves this end by capitalizing on the substantial research expertise available in various research programs of the OUNL, and by extensive collaboration with co-creation (business) partners, including some of the largest organizations of the Netherlands and the Limburg region, SMEs, start-ups, and knowledge institutes. Its areas of expertise include data science, artificial intelligence, social innovation, and business analytics.

*Possible input of CAROU to all three projects:*

CAROU has extensive multidisciplinary expertise (computer science, technology-enhanced learning, and psychology) on the use of AI in built environment in several specific aspects:

- The formation and implementation of IoT sensors within built environment (e.g., smart houses and offices),
- Capitalizing on the data collected by the sensor array, modeling the inhabitant behavior in terms of room usage, power, and heating utilization,
- Predicting the energy consumption patterns and optimize demand and supply both at the household and neighborhood levels,
- Using gamification and behavioral change interventions to assist inhabitants to adopt a sustainable lifestyle habits with the help of AI,
- Designing and implementing digital twins of smart houses that have the capability of business intelligence reporting (past data), visualization of current state (present -real time- data), and predicting upcoming states and simulating various scenarios (future data).

In addition, CAROU has an extensive network of architectural firms, construction companies, social housing corporations, and local governmental organizations in the region of Dutch and Belgian Limburg.

*Specific expertise relevant to the project “Smarter buildings for better energy performance”:*

- Design, develop, and implement IoT sensors and actuators that form the basis of smart homes and building automation and control systems (BACS),
- Planning, executing, and monitoring the development activities using privacy-by-design principles,

- Developing machine learning algorithms to recognize and predict inhabitant behavior in relation to energy use,
- Designing interventions with gamification to foster behavior change that is supported by AI,
- Building Digital Twins that can report past behavior, visualize present status, and simulate future scenarios to optimally control the energy use within a household,
- Devising application interfaces to provide aggregate data to external systems (e.g., logbooks and data lakes) in necessary cases.

*Specific expertise relevant to the project “Demand response in energy-efficient residential buildings”:*

- Designing and implementing IoT sensors and actuators to model the energy use/demand in households,
- Demand prediction at the household and neighborhood levels,
- Predicting renewable energy production, excess solar power generation, close proximity energy sharing to mitigate demand spikes in a neighborhood (or an apartment complex).

*Specific expertise relevant to the project “Renewable-intensive, energy positive residential buildings”:*

- Developing Digital Twins for smart building that can be used to examine the relationship between building design and energy consumption, and to form scenarios to test alternative designs,
- Detecting and predicting the inhabitant energy consumption patterns using IoT and AI,
- Regulating inhabitant behavior using behavior change interventions with gamification,
- Incorporating instructional scenarios to assist inhabitants cope with the complexities of energy system settings (e.g., by providing feedback and step-by-step instructions to set the optimal settings on the particular devices they have installed such as a boiler).

*In case of interest, please contact:*

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