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*The Norwegian University of Science and Technology (NTNU) creates knowledge for a better world and solutions that can change everyday life.*

**Faculty of Engineering  
Department of Energy and Process Engineering**

**The Research Centre on Zero Emission Neighbourhoods in Smart Cities (ZEN Centre)**

## **PhD Position within Simulation of Energy Related Occupant Behaviour in Buildings (IV-210/17)**

### **Information about the Centre**

The Research Centre on Zero Energy Neighbourhoods in Smart Cities (ZEN Centre) is a Centre for Environment-friendly Energy Research (FME) funded by the Research Council of Norway and the consortium partners. The main objective of the ZEN Centre is to develop knowledge, competitive products and solutions that will lead to realization of sustainable buildings and neighbourhoods that have zero emissions of greenhouse gases related to their production, operation and transformation. The FME status enables long-term research in close collaboration with trade and industry, as well as other research partners. The Centre is a follow-up of the Research Centre on Zero Emission Buildings, <http://www.zeb.no>.

### **Background**

Energy related occupant behavior (OB) is a key issue as regards real energy use and indoor environmental quality in buildings. However, OB is over-simplified in the design, construction, operation, and retrofit of buildings. OB is complex, stochastic and multi-disciplinary. Having deep understanding of OB and being able to model and quantify its impact on use of building technologies and energy performance of buildings is crucial to design and operation of low energy buildings.

### **Position Summary**

A PhD research position is available on the topic "Modelling and Simulation of Energy Related Occupant Behavior for Better Design and Operation of Buildings". This project aims to develop improved knowledge and advanced models on the topic of occupants' interactions with building technologies with the goal to obtain better design and operation of buildings.

### **Specific Responsibilities**

The PhD research will pursue the following objectives:

- To model OB following the path from presence, activities patterns, actions and sensation of comfort with thorough analysis using the new standard definitions and classifications.
- To collect and analyze OB data in field and create a high quality data set for validation of the model.
- To apply the developed model to practical engineering, including integration with relevant simulation tools for prediction of energy performance used for better design and operation.

This PhD research project is part of the established cooperation on the issue of OB with the Institute of Built Environment at Tsinghua University, Beijing, China. This research will also contribute to the international work planned for the new project inside the IEA-EBC Programme entitled "Occupant behavior-based building design and operation" that is the direct successor of the recently completed Annex 66 (<http://www.annex66.org/>). Collaboration with the Tsinghua University researchers is projected, and the PhD candidate is expected to spend from 6 to 12 months in Beijing.

### **Qualifications**

We seek a highly motivated candidate with a Master's degree (or equivalent) within Mechanical, Energy or Civil Engineering, Architecture, Applied Physics or Mathematics, or a relevant subject. The candidate should present a strong interest for multi-disciplinary analysis of technical building systems, as well as for modelling and simulations of energy/environmental performances. A prior and concrete experience with the aforementioned disciplines will be considered as an advantage.

It is fundamental that the person hired can communicate and cooperate well with people from different communities and cultures, and has good written and oral language skills in English. Working knowledge of a Scandinavian language is an advantage.

### **General terms and conditions:**

The position as a PhD candidate is administratively located at the Department of Energy and Process Engineering (EPT), Faculty of Engineering, Norwegian University of Science and Technology (NTNU). The position will be a part of the research team at the Energy and Indoor Environment group that has a well-established expertise as regards energy supply systems and services in buildings, and is strongly involved in the Norwegian FME ZEN Centre as well as in various IEA Tasks or Annexes and other international activities.

Further information about the Faculty is available at <https://www.ntnu.edu/iv>. Information about the ZEB Centre at NTNU is available at <http://www.zeb.no>. Information about NTNU's Thematic Strategic Areas is available at <http://www.ntnu.edu/research/strategicareas>.

The employee is obliged to follow the regulations that concern changes and developments within the discipline and/or the organizational changes concerning activities at the University.

PhD Candidates are remunerated in code 1017, and are normally remunerated at gross NOK 436 900 before tax. There will be a 2 % deduction to the Norwegian Public Service Pension Fund from gross wage.

Engagement as a PhD Candidate is done in accordance with "Regulation concerning terms and conditions of employment for the posts of post-doctoral research fellow, research fellow, research assistant and resident", given by the Ministry of Education and Research of 19.07.2010. The goal of the positions is to obtain a PhD degree. Applicants will engage in an organized PhD training program, and appointment requires approval of the applicants plan for a PhD study within three months from the date of commencement.

The appointment has a duration of 3 years as a researcher towards the degree of PhD. Depending on the candidate's preferences and qualifications, the position duration could be changed to 4 years with a 25% teaching duty for the Department throughout the employment period.

For further information, please contact: Professor Vojislav Novakovic, Department of Energy and Process Engineering, phone: +47 92657274 , email: [vojislav.novakovic@ntnu.no](mailto:vojislav.novakovic@ntnu.no) or Coordinator NTNU Energy Eleni Patanou, phone: +47 96696545 , email: [eleni.patanou@ntnu.no](mailto:eleni.patanou@ntnu.no).

See <http://www.ntnu.edu/ivt/doctoral-programme> for more information.

The engagement is to be made in accordance with the regulations in force concerning State Employees and Civil Servants. The positions adhere to the Norwegian Government's policy of balanced ethnicity, age and gender. Women are encouraged to apply.

#### **The application**

The application must contain information of educational background and work experience. A 2-page project description, elaborating on the research plan to be followed and tasks to be carried out is also required. CV, certified copies of transcripts and reference letters, and other enclosures should be submitted via this webpage at (<http://www.jobbnorge.no>). **Mark the application with IV-210/17.**

Start-up date may be discussed, but no later than 1 June 2018

#### **The application deadline is 1 February 2018.**

According to the new Freedom of Information Act, information concerning the applicant may be made public even if the applicant has requested not to be included in the list of applicants.

Jobbnorge-ID: 146284, Søknadsfrist: Avsluttet