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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

PhD position within HVAC for wooden dwellings renovated to nZEB (IV-187/18)

Description
A PhD scholarship is available within the Energy and Indoor Environment research group at the Department of Energy and Process Engineering (EPT) on the topic “HVAC for wooden dwellings renovated to nearly Zero-Energy Buildings”. The Energy and Indoor Environment group has a well-established expertise about energy supply systems and services in buildings. This PhD is part of the OPPTRE project led by SINTEF Building and Infrastructure. The goal of OPPTRE is to propose a nearly Zero-Energy Building (nZEB) level for the renovation of Norwegian wooden dwellings. To this end, this multidisciplinary project will identify nZEB concepts that have high architectural quality, are cost-efficient and low-carbon. Furthermore, barriers and driving forces for nZEB renovation will be identified to capture a significant market share.

Objective:
The PhD aims to compare the performance of different ventilation, heating and energy supply strategies for renovated wooden dwellings. Different technologies for the mechanical ventilation (balanced, exhaust, decentralized), for the heating system (air source and ground source heat pumps, hydro-stoves, district heating) and the photovoltaic (PV) electricity generation will be combined to form alternative HVAC concepts. Their performance will be evaluated using multiple criteria: thermal comfort, lifecycle costs, energy use and yearly CO2eq emissions, simplicity and robustness to users, self-consumption of the PV generation as well as the integration inside the building structure. The ability of the heating and ventilation systems to create different zones in the building with different temperature levels will be investigated (typically warm living room and cold bedrooms).

Research questions:
• Which concepts of HVAC and energy supply systems lead to low CO2eq emissions and cost-effective solutions that could take a significant market share?
• How these concepts are dependent on the performance level regarding CO2eq emissions?
• Should the current design procedures be adapted to size such systems correctly?
• Which concepts lead to a reasonable level of complexity so that they will be accepted, maintained and operated properly by users?

Outcome:
• Guidelines for simple and robust strategies for ventilation and heating systems that meet different resident preferences.
• Definition of concepts for HVAC and renewable energy supply for the renovation of wooden houses to the proposed nZEB levels.

Methodology:
• OPPTRE is based on a large multidisciplinary research team combining SINTEF Building and Infrastructure and the Norwegian University of Science and Technology (NTNU) with the Faculty of Architecture and Design, the Energy and Process Engineering Department and the Department of Industrial Economics and Technology Management. The project is supported actively by the Norwegian industry (Isola, Mesterhus, Systemhus, Hunton Fiber, RATIO Arkitekter AS, Flexit and Velux) as well as institutional actors (Enova). The PhD candidate will work in close collaboration with these partners in order to propose building-integrated solutions relevant for the Norwegian context.
• The performance of the different HVAC and nZEB concepts will be compared using detailed dynamic simulations (typically using IDA-ICE) leading to scientific publications.
• During the first phase of the project, nZEB concepts for renovated wooden dwellings will be established for several building archetypes during an architecture competition attracting leading actors in the field. The PhD will provide support during this competition regarding HVAC solutions and will (further) learn about design procedures applied by the industry. .

Qualifications
We seek a highly motivated candidate with a Master's degree (or equivalent) within HVAC systems for buildings or in building science, with strong collaboration skills. The following competences and background will be considered as advantages: professional experience in the building industry, working knowledge of one of the Scandinavian languages and knowledge of building performance simulation packages such as IDA-ICE.

Conditions
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 position is of 3 years duration.

For further information, please contact: Associate Professor Laurent Georges , Department of energy and Process Engineering, NTNU, Trondheim, tel. +47 73592484, email: laurent.georges@ntnu.no; regarding OPPTRE, Senior Researcher Anne Gunnarshaug Lien at SINTEF Building and Infrastructure, tel. +47 977 57 930, email: anne.g.lien@sintef.no.

See https://www.ntnu.edu/iv/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. Certified copies of transcripts and ideally three reference letters should be enclosed. Applications with CV, grade transcripts and other enclosures should be submitted via this webpage at www.jobbnorge.no . In addition, the candidate should mention when she/he can be able to start. **Mark the application with IV-187/18.**

Start-up date should be discussed, but tentatively fall 2018.

Application deadline is 30 June 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: 153456, Søknadsfrist: Søknadsfristen er gått ut