Jobbnorge ID: 279993
Deadline: 7/15/2025
Website: http://www.ntnu.no
Scope: Fulltime
Duration: Temporary

The Department of Energy and Process Engineering has a vacancy for a

PhD Candidate in Scalable Model Predictive Control for the Space-Heating Flexibility of Buildings

This is NTNU

NTNU is a broad-based university with a technical-scientific profile and a focus in professional education. The university is located in three cities with headquarters in Trondheim.

At NTNU, 9,000 employees and 43,000 students work to create knowledge for a better world.

You will find more information about working at NTNU and the application process here.

Video: https://youtu.be/Xt-yHCN5QS0

About the position

Are you ready to take the next step toward a doctorate and unlock exciting career opportunities? As a PhD candidate with us, you'll not only work toward earning your doctorate but also gain valuable experience that prepares you for a successful career in higher education and research, both within and beyond academia.

The position is in our research group, Sustainable Energy Systems. Read more about the group here.

Your immediate leader will be Professor Laurent Georges.

About the project

Buildings are energy-flexible in the sense that they can move their loads in time, typically to provide services to the electricity or district heating grids (also called demand response). For instance, one key objective can be to decrease energy use during peak hours of the grid while maintaining acceptable comfort for occupants. In cold climates, the space-heating is a dominant load, and advanced control can adapt this load by changing the indoor temperature in time. Model Predictive Control (MPC) is gaining increasing interest in performing this space-heating flexibility. While this solution has been extensively investigated using simulations (meaning “virtual experiments”), there are still limited examples where tailor-made MPC has been deployed and tested in a real building and over a long period. However, the road to scalable solutions still lies ahead. Firstly, the amount of measurement data can be limited and not properly structured, contextualized, or standardized. Secondly, the building may not be built and operated exactly as originally planned. Thirdly, physical phenomena may be more complex in reality than in simulation (such as the heating system and the occupant behaviour). Finally, the existing “legacy” automation system may not be suited for smart control. Therefore, this PhD aims to define a scalable MPC setup (or technical pathway) that can support some of these limitations and to test it in a real building. The final objective is to provide thorough documentation of the scalable MPC workflow and test case.

The supervision team is Prof. Laurent Georges (main supervisor) and Prof. Natasa Nord (co-supervisor) at NTNU.

Duties of the position

- Complete the doctoral education until obtaining a doctorate
- Carry out research of good quality within the framework described above
- Define and develop a scalable MPC setup suited for typical hydronic heating and ventilation systems in non-residential buildings.
- Test the MPC in one real building and monitor the performance of the controller.
- Document in detail the performance of the MPC setup and summarize the lessons learned in at least three international peer-reviewed journals.
- Academic publications and popular science dissemination
- Participate in the research group Sustainable Energy Systems

Be prepared for changes to your work duties after employment.

Required selection criteria

- You must have an academically relevant background within control, building, or HVAC engineering. A background in applied mathematics can also be relevant if there is a strong focus on data-driven modeling, machine learning, and control.
- Your course of study must correspond to a five-year Norwegian course, where 120 credits have been obtained at master's level. Master's students can apply, but the master's degree must be obtained and documented before starting the position.
- You must have a strong academic background from your previous studies and have an average grade from your Master's degree study, or equivalent education, which is equal to B or better compared to NTNU's grading scale. If you do not have letter grades from previous studies, you must have an equally good academic foundation. If you have a weaker grade background, you may be considered if you can document that you are particularly suitable for a PhD education.
- You must meet the requirements for admission to the doctoral program of the Faculty of Engineering.
- Excellent background in programming (ex. Python/Julia/Matlab).
- Excellent written and oral English.

The appointment is to be made in accordance with Regulations for the Universities and Colleges Act (university and colleges regulations) and Regulations for the degrees philosophiae doctor (ph.d.) and philosophiae doctor (ph.d.) in artistic development work at the Norwegian University of Science and Technology (NTNU) for general criteria for the position.

Preferred selection criteria

- Previous experience and strong interest in control and data-driven modeling. For instance, a previous experience with MPC, ideally applied to buildings (either using simulations or real cases).
- Knowledge or previous experience with building automation is a plus.
- Knowledge or previous experience with database management, modeling, or engineering is a plus.
- Previous experience in scientific writing (such as a journal article or conference paper).
- Knowledge of the Norwegian language is considered an advantage.

Personal characteristics

To complete a doctoral degree (PhD), it is important that you are able to:

- Work in a team and follow instructions.
- Be creative, pragmatic, and solution-oriented.
- Work independently, able to organize the research work, and take initiative.
- Work in a structured way, set goals, and make plans to achieve them.
- Be flexible and open to adjusting the plan for the project as needed.
- Excellent communication skills, both written and orally.
- Eager to disseminate knowledge, both nationally and internationally.

Emphasis will be placed on personal qualities.

We offer

- An exciting job with an important mission in society
- Developing tasks in a strong and international professional environment
- Career guidance and follow-up during the PhD period
- Open and inclusive working environment with committed colleagues
- Working capital that can be used to implement the project
- Mentor programme as a new employee at NTNU
- As a public employee, you have favourable benefits as a member of the Norwegian Public Service Pension Fund (SPK)

You will be employed as a PhD Candidate at NTNU and will have access to employee benefits and discounts.

The city of Trondheim has a population of 200 000. It is a modern European city with a rich cultural scene and is known as the tech capital of Norway. The Norwegian welfare state, including healthcare, schools, kindergartens and overall equality, is among the best of its kind in the world. Professional, subsidized day-care for children is easily available, as is children`s education (including two international schools). Trondheim has low crime rates, clean air quality, and offers great opportunities for enjoying nature, culture and family-life.

For practical information about working at NTNU, please visit this webpage.

Diversity

Diversity is a strength, and at NTNU we aim to be an employer that reflects the diversity in society and that makes use of the potential of the population's collective skills. Our vision is Knowledge for a better world and our values are creative, critical, constructive and respectful. We believe that an organization that is equal, diverse and gender-balanced is essential for us to achieve our goals.

We strive to attract employees with different skills, life experiences and perspectives to contribute to even better problem solving of our societal mission in research and education.

If you think this position is relevant and interesting, we encourage you to apply, regardless of gender, functional ability and cultural background, or whether you have been out of work for a period of time.

The Department of Energy and Process Engineering (EPT) has established **EPT Women in Science**. The group is focused on supporting female Research Assistants, PhD Candidates, Postdoctoral Fellows and permanent academic employees within the Department. This support aims to help develop the academic careers of female employees, and is also made visible to our student body, to encourage them to consider

an academic path. As part of the EPT Women in Science initiative we continue to build on our international network, inviting prominent female academics within and beyond the field of Engineering to speak at our events.

Salary and conditions

In the position of PhD Candidate, code 1017, your gross salary will normally be NOK 536 200,- per annum depending on qualifications and seniority. A 2% statutory contribution to the State Pension Fund is deducted from the salary.

The employment period is **3 years**.

For employment as a PhD Candidate, it is a prerequisite that you gain admission to the PhD programme in Engineering within three months of your employment contract start date, and that you participate in an organized doctoral program throughout the period of employment.

As an employee at NTNU, it is important that you keep yourself up to date with academic and organizational changes and adapt to them.

For the necessary academic and social interaction, it is a prerequisite that you are physically present and available to the institution on a daily basis.

The appointment is carried out in accordance with the principles of the State Employees Act, and Export control (legislation that regulates the export of knowledge, technology and services). Candidates who, after assessment of the application and attachments, are considered to bein conflict with the criteria in the latter act, will not be able to be employed.

About the application

The attachments (including a description of your scientific work) must accompany the application as these documents form the basis of the application assessment. The documents must be in Norwegian/a Scandinavian language or English.

Please note: the application will only be assessed on the basis of the information we have received by the application deadline. Therefore, make sure that your application clearly shows how your skills and experience meet the criteria described above. The application and all attachments must be sent electronically via Jobbnorge.no. If you are invited to an interview, you must bring certified copies of certificates

For us to evaluate your application, it must include the following:

- **Transcripts** and **diplomas** for Bachelor's and Master's degrees.
- **CV** and possibly **certificates**.
- A **cover letter** where your motivation to follow a PhD education, your interest, and your background for this specific PhD topic should be clearly explained (maximum 500 words)
- **Copy of Master's thesis**. If you have recently submitted your Master's thesis, you can attach a draft of the thesis. Documentation of a completed Master's degree must be presented before taking up the position.
- **Project outline** containing proposals for an overall description of research questions, theoretical perspectives, methodological design for the project, and progress plan (maximum 1500 words/4 pages). This is a mandatory input in the application. Project outlines mainly created using an AI-powered chatbot or other generative AI tools will not be considered valid.
- Name and contact information of **three referees**.
- If you have **publications** or other relevant research work, for each of them, describe your own contribution to the paper and the contributions/impact on the field.

If all, or parts, of your education has been taken abroad, we also ask you to attach documentation of the scope and quality of your entire education, both Bachelor's and Master's education, in addition to other higher education. If your institution uses “diploma supplement” (normal for most European institutions), you must attach this. A description of the documentation required can also be found here. If you already have a statement from Norwegian Directorate for Higher Education and Skills (HK-dir), please attach this as well.

Joint works will be considered. If it is difficult to identify your contribution to joint work, you must attach a brief description of your participation.

When assessing the best qualified, we emphasize necessary qualifications such as education, experience and personal suitability. Motivation for the position, ambitions and potential for research will also count when assessing the candidates.

NTNU recognizes a wide range of academic contributions and has committed itself to The San Francisco Declaration on Research Assessment and CoARA (responsible assessment of research and recognition of a greater breadth of academic contributions in accordance with NTNU's social mission).

General information

A public list of applicants with name, age, job title and municipality of residence is prepared after the application deadline. If you wish to be exempt from entry on the public applicant list, this must be justified. Assessment will be made in accordance with current legislation. You will be notified if the exemption is not granted.

If you think this position looks interesting and in line with your qualifications, you are welcome to apply.

If you have any questions about the position, please contact Professor Laurent Georges on telephone +47 73 59 24 84 or e-mail: laurent.georges@ntnu.no.

If you have any questions about the recruitment process, please contact HR consultant Renate Fjellheim on e-mail: renate.fjellheim@ntnu.no.

Application deadline: 15.07.2025

NTNU - knowledge for a better world

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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.

Department of Energy and Process Engineering

We conduct research and teaching covering the entire energy chain, from resources to the end-user. We look at how energy is produced and used by humans and machines in a sustainable way with regard to health, climate change and the resource base. The Department of Energy and Process Engineering is one of eight departments in the Faculty of Engineering.

Additional information

Contact persons:

- Laurent Georges, Professor
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- Renate Fjellheim, HR consultant
  Phone: | E-mail: renate.fjellheim@ntnu.no

Place of service:

Høgskoleringen 1 7491 Trondheim (Trondheim Municipality)