

PROJECT WORK

for

student Håkon Hornburg Løken

Autumn 2018

***Energy and economic balance analysis for a Net Zero Energy Building
with solar heating, cooling and PV electricity generation***

*Energi og økonomisk analyse av en netto nullenergi bygning
med utnyttelse av solenergi for oppvarming, kjøling og strømproduksjon*

Background and objective

Modern buildings are expected to cover their energy need with own onsite production based on renewable sources. In-depth research is expected for a net zero building for which the energy demand for heating, cooling and electricity are totally provided by building integrated solar thermal and PV systems. The energy and the economic aspects will be analyzed with mathematical model. The data may come from a real building in Shanghai.

The major part of the work should be performed as the Master thesis that is planned to be conducted at the SJTU during the coming spring semester. This collaborative assignment is realized as a part of the Joint Research Centre in Sustainable Energy of NTNU and SJTU.

The following tasks are to be considered:

1. Review of the state-of-the-art progress in development of solutions for buildings where the energy demand for heating, cooling and electricity could totally be provided by building integrated solar thermal and PV systems. This should also take into account previous works performed at SJTU and NTNU.
2. Critical analysis of the existing models and simulation tools for building integrated solar thermal and PV systems that could cover buildings entire demand for heating, cooling and electricity. Consider application of the simulation tools Energy Plus and TRNSYS in particular.
3. Build up an appropriate model for energy and economic balance analysis for a Net Zero Energy Building with solar heating, cooling and PV electricity generation
4. Conduct preliminary analysis of a real case building by use of the developed model.
5. Propose a detailed work plan to conduct energy and economic balance analysis for a Net Zero Energy Building with solar heating, cooling and PV electricity generation located in Shanghai. The plan should also include development of a scientific paper. The proposed work plan is to be performed during the Master thesis work in Shanghai.

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The project work comprises 15 ECTS credits.

The work shall be edited as a scientific report, including a table of contents, a summary in Norwegian, conclusion, an index of literature etc. When writing the report, the candidate must emphasise a clearly arranged and well-written text. To facilitate the reading of the report, it is important that references for corresponding text, tables and figures are clearly stated both places.

By the evaluation of the work the following will be greatly emphasised: The results should be thoroughly treated, presented in clearly arranged tables and/or graphics and discussed in detail.

The candidate is responsible for keeping contact with the subject teacher and teaching supervisors.

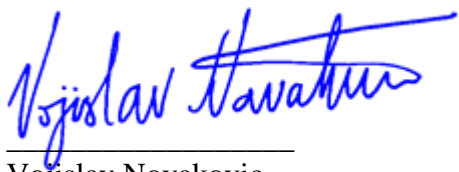
Risk assessment of the candidate's work shall be carried out according to the department's procedures. The risk assessment must be documented and included as part of the final report. Events related to the candidate's work adversely affecting the health, safety or security, must be documented and included as part of the final report. If the documentation on risk assessment represents a large number of pages, the full version is to be submitted electronically to the supervisor and an excerpt is included in the report.

According to “Utfyllende regler til studieforskriften for teknologistudiet/sivilingeniørstudiet ved NTNU” § 20, the Department of Energy and Process Engineering reserves all rights to use the results and data for lectures, research and future publications.

Submission deadline: 21 December 2018.

- ☐ Work to be done in lab (Water power lab, Fluids engineering lab, Thermal engineering lab)
☐ Field work

Department for Energy and Process Engineering, 20.08.2018



Vojislav Novakovic
Supervisor

Co-Supervisor(s):

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