Chair of Renewable and Sustainable Energy Systems
Department of Electrical and Computer Engineering
Technical University of Munich

Winter semester 2023/2024

Interdisciplinary Project Internship: Concept Development of a Renewable Energy System in a Developing Country

Description:

In the project, the focus will be on developing a sustainable energy infrastructure in a selected developing country's town or village to fulfill the energy demand of the region. This initiative responds to the critical need for reliable and clean energy access in these areas. This will be done in distinct phases including a literature review, evaluation of renewable energy installation in the areas under the study, and Life Cycle Assessment (LCA) implementation.
In line with the project milestones, understanding the energy demand profile is essential for the energy system design. Accordingly, the energy system infrastructure that can effectively fulfill the region's energy needs will be designed by analyzing historical consumption patterns and future growth projections. Using different tools for assessing renewable energy potential, for example, spatial analysis will be conducted to identify the best location of renewable energy installation concerning the relevant parameters (e.g., solar irradiance, wind speed, biomass availability, geothermal potential, etc.)
Energy system models that are developed should consider factors such as capacity expansion and unit commitment to devise an efficient energy mix that is both economically feasible and environmentally friendly. Finding the best renewable energy pathway adhering to economic and environmental objectives requires scenario modeling and sensitivity analysis to evaluate different technology combinations, capacity levels, and investment strategies. Apart from the energy system analysis, LCA methodology will be implemented as a standard tool to quantify the environmental profile of the projected scenario versus its current counterpart considering the most relevant environmental impacts such as global warming and resource use efficiency.
In line with the above-mentioned contexts, this internship project has been organized for interdisciplinary students who are interested in the energy sector and its sustainability assessment. Through active engagement in frequent meetings and collaborative teamwork, students will gain practical experience in energy systems modeling and quantifying the economic and environmental impacts of said systems. Moreover, they will enhance their

understanding of various renewable energy forms by comparing them and assessing their technical viability.
There will be four teams in this project internship; each group involves four to six students who develop and analyze the best-suited renewable infrastructure for an objective town. Objective towns are: 1- Leh, Ladakh State, India., 2- Suco Holarua, Manufahi District, Timor-Leste., 3- Gununa, Mornington Island, Queensland, Australia.; 4- A town in Kashmir, India. The following tasks should be done by the team members:

- Literature research
- Energy Services Cascade
- Energy Demand Profile
- Assessing Potentials for Renewable Energy Systems
- Modelling scenarios and sensitivity analysis
- Creation of a business concept of the alternative renewable system
- Quantifying environmental impacts by LCA methodology

Based on simplified assumptions, the assessment will provide a renewable and sustainable energy system for the developing community. The key performance factors are derived and presented in the form of a written and oral report.

Notes on registration

If you are interested in participating in this project internship, please do the following procedure:

1. Select the group team that is more relevant to you: Leh, Suco Holarua, Gununa or Kashmir.
2. Prepare a short text explaining your motivation for selecting the mentioned topic and your intended contribution to the group work based on the tasks listed above.
3. Get in touch with Andrea Cadavid at andrea.cadavid@tum.de, and send the topic of your choice and your motivation text, CV and transcript of records; only complete applications will be considered.
4. Applications will be evaluated as soon as they are received; early application is worthy, and the deadline for application is **October 12th, 2023**.
5. You may be required to participate in a short virtual interview (3-5 min); if so, the supervisors will contact you to schedule an interview time.
6. Please register in TUMonline on Thursday, **12 October 2023** at the latest.

7. By Monday, **16 October 2023,** at the latest, we will inform you whether and, if so, which topic you can work on for the project internship.

If you have questions concerning the organization of the lab course, please contact Andrea Cadavid (andrea.cadavid@tum.de).

Please pay attention!

In order to participate in the project internship, it is essential that you:

1. Write an **email with the topic selection, motivation, CV, and transcript of records** to Andrea Cadavid **AND**
2. register **in TUMonline for the course**.

If you do not meet one of the two requirements, you won't be included as one of the participants.

Organizational matters

Regular weekly meetings are **mandatory** for the project internship. Only in specific cases, it might be possible to use online platforms for organizing the work inside the group and for keeping in touch with the supervisors.