PhD Position : Simplification of energy network models through AI

1 - Context and funding

This research project is situated in an interdisciplinary partnership between 2 research laboratories (Lab-STICC and GEPEA) and in a French national program on artificial intelligence (AI@IMT). We propose to study the contributions of artificial intelligence in the topological simplification of district heating networks, in order to limit the complexity of the physical models used to represent them.

2 - Research project

In a first step, the goal is to identify, in district heating networks, the most relevant areas to aggregate based on previously defined simplification parameters (number of nodes to aggregate, inclusion or exclusion of energy systems in the areas to aggregate...). Then it will be important to identify the number of relevant nodes to represent the area to be aggregated, based on the complexity of the area. And finally the goal is to determine the temporal profiles of the physical variables of the aggregated node(s) so that their dynamic behavior is equivalent to that of the real network part. In particular, the values of these physical variables at the boundary of the zone will be constraints of the procedure. We will focus on explainable machine learning techniques, in order to be able to interpret the results, and validate them with the physical reality.

3 -Team supervision and PhD registration

The PhD candidate will be supervised by an interdisciplinar team (Bruno Lacarrière, Patrick Meyer, Pierrick Haurant) of the two laboratories Lab-STICC and GEPEA, from the technological university IMT Atlantique. They are specialized in the modelling of complex energy networks and the use of AI techniques.

4 - Candidate profile

The candidate must have a master's degree in energy with an interest for data-based models. He or she may also have a master's degree in computer science (or equivalent), but with an ability to integrate the

required energy concepts. The candidate should have skills in the use and development of machine learning algorithms. Ideally, he or she should have a strong background in Python. He or she should also have an advanced level of English, and a basic knowledge of French.

5 - How to apply

Send your application file (resume, list of publications, motivation letter and 2 recommendation letters) to bruno.lacarriere@imt-atlantique.fr and patrick.meyer@imt-atlantique.fr, before May 1st 2022.