

# PhD in Energetics

## Research Title: The energy efficiency for a telco operator driven by data and artificial intelligence

### Artificial Intelligence for Energy Efficiency

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| <b>Funded by</b> | TIM S.p.A. |
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| <b>Context of the research activity</b> | <p>The research is funded by TIM S.p.A., the largest telecommunication operation in Italy. In the framework of the collaboration between TIM and Politecnico di Torino, the domain of energy efficiency in industrial facilities is assessed. Telco companies are heavy energy consumers. In Italy, TIM assets account for more than 2 TWh per year of electricity consumption. Hence, identifying and deploying better facility management strategies is relevant to increase energy efficiency and save energy. Artificial Intelligence (AI) algorithms can support the definition of new tools that can allow the automated detection of anomalies in the facility (electric) load profile and correct them. Also, AI can support the establishment of new clustering strategies of the various facilities and the prediction of load demand. Machine learning algorithms and clustering techniques can support the extraction of knowledge from measured data. A large data set of electric profiles of the telco facilities will be available to implement specific tools of data analysis and knowledge extraction.</p> <p>The research activity will be carried out in the context of the Energy Center of Politecnico di Torino. Here, a multi-disciplinary team of faculty members and research associates / PhD students work jointly on the topics that are relevant to energy transition.</p> |
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| <b>Objectives</b> | <p>The overarching goal of the activity is bringing innovation in the field of energy efficiency driven by data and artificial intelligence algorithms applied to telco operator dealing with heterogeneous environments and requirements.</p> <p>The first objective is to identify existing algorithms that can generate knowledge from an existing large data set of electric load profiles of telco facilities spread over the Italian territory. A variety of climatic conditions, occupancy profiles and usage category apply to the data set.</p> <p>The second step is to develop new protocols of data analysis relying both on existing codes and new/modified ones. The data analysis should include all the relevant steps: (i) data pre-processing; (ii) clustering; (iii) anomaly identification; (iv) prediction).</p> <p>The third and final step aims at developing case studies in which selected facilities are tested over a new control/management algorithm to improve its energy performance.</p> |
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| <b>Skills and competencies for the development of the activity</b> | <p>The candidate be familiar with all the aspects connected to final uses of energy in buildings and the technological systems for energy production and distribution within the same.</p> <p>The candidate should be familiar with Python programming language and related packages for data analytics. Knowledge of multi-energy-systems is encouraged. Furthermore, the candidate should be able to work in a multi-disciplinary context.</p> |
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