# The development of an application layer connected to a knowledge graph for the continuous calculation of energy performance indicators

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**Abstract**

Energy Management Systems (EMS) are used to monitor the energy consumption of buildings to determine whether they are functioning as expected and to take the necessary actions to ensure efficient operation. Our poster presents an approach comprising an application layer, knowledge graph, and ontological meta-model to calculate and analyse energy performance indicators for building energy performance monitoring. The flexible and dynamic nature of semantic technologies enables an efficient and interoperable method of handling calculations and assumptions based on disparate sources. This is useful given the complexity of factors that influence building energy performance. However, demonstrating how this knowledge can be harnessed is more effective than simply representing knowledge by conforming to ontologies. To achieve this, we demonstrate how the application layer and ontological meta-model work together to serve the calculation of energy performance indicators. These functional layers are part of a modular framework that enables inputs from data instances linked to established domain ontologies, e.g. Brick. It also allows the calculation to be combined with ontologies focused on formal descriptions of performance indicators, e.g. KPIOnto. The application layer is a collection of intermediary scripts that handle data processing and the integration of performance indicators into the knowledge graph. ISO 50006 introduces Energy Performance Indicators (EnPIs) to evaluate energy performance relative to an Energy Baseline (EnB). ISO 50008 details the management processes in implementing an EMS that incorporates EnPIs. Once EnPIs and their stakeholders are defined, they are used to evaluate energy targets consistent with an energy policy. The standard outlines the requirements of a data management plan to assist the energy planning process. Our approach could facilitate compliance with the requirements of this standard, which would be valuable for organisations and stakeholders involved in developing energy management policies. The poster is supplemented with an interactive application connected to a knowledge graph of a live demonstrator building. In this application, we will demonstrate how the calculation of performance indicators can be easily scaled across multiple buildings by linking to terms and properties defined in the Brick ontology. In the future, any deviations from expected or target performance could be used in diagnostics and to determine the necessary actions to ensure efficient operation.