

Key technologies for energy efficient and sustainable accelerators: a survey from shareholders

F. Abusaiif¹, G. De Carne¹, M. Gasthuber² and Y. Kemp²

¹Karlsruher Institut für Technologie (KIT), 76131 Karlsruhe , Germany

²Deutsches Elektronen-Synchrotron (DESY), 22607 Hamburg , Germany

Abstract

Over the past few years, the accelerators operations energy consumption has caught the attention of the facilities operators. The increasing energy cost and the higher attention to sustainability highlighted the importance of implementing and operating efficient and sustainable technologies and systems.

The Horizon Europe project Research Facility 2.0 (RF2.0) envisions a common work of academia, large particle accelerator facilities and high-tech industries towards sustainable and energy-efficient large research infrastructures.

In this work we present a summary of the first results of the RF2.0 project, based on some dedicated surveys on energy solutions and systems with high sustainability potential, that were sent to both the RF2.0 project partners as well as to worldwide accelerator's facilities. The summary introduces a set of high level sustainability metrics developed for a performance assessment methodology for energy efficient solutions of research infrastructures as accelerators and data centers. These metrics consider not only the well-known factors of the energy consumption and energy costs, but they include also the impact of the raw material consumption and the carbon footprint during the accelerator's lifetime. In addition, inputs on components and systems with high energy saving potential prepared as a part of an assessment of existing materials, components and technologies for improving energy efficiency in accelerators will be discussed in conclusions.

Keywords— Sustainability metrics, Energy management, Large-research infrastructures