



The Paul Scherrer Institut (PSI) in Villigen, Switzerland hosted a [workshop](#) on the energy efficiency of proton driver accelerators in late February.

Proton driver accelerators have a broad range of applications, ranging from neutron sources over accelerator driven systems for transmutation to particle physics, muon and neutrino production. As these accelerators consume large amounts of electricity, improving their energy efficiency is crucial in addressing the economic and environmental concerns of both the public and research funding agencies.

The goal of the workshop was to bring together experts to collaborate and exchange ideas and research in pursuit of higher efficiency proton drivers. Over four sessions, the participants discussed four topics of particular interest: beam targets, RF generation, accelerator concepts and auxiliary systems..

The workshop identified several promising technologies for improving the energy efficiency on which future R&D should be focused:

**Neutron Spallation Targets** and associated components like moderators and neutron guides have a potential for efficiency improvements by large factors for certain applications. The studies on a second target station for SNS give an example for such optimizations.

**Magnetrons** as RF sources exhibit a high efficiency but currently aren't well suited for use in accelerators due to their instable phase and amplitude behaviour. Ongoing studies at Fermilab show promising results to overcome these problems. Eighty years after its invention the **Klystron** represents a matured and widely used concept. Nevertheless, new ideas on improving the electron beam dynamics in klystrons may boost the efficiency towards 90%.

The cryogenic systems used in continuous wave superconducting linacs represent a major contribution to the energy balance of the entire facility. The recent success in producing **High Qo Superconducting Cavities** may help to reduce the cryogenic power significantly.

**Energy Management** should be coordinated in a comprehensive way at larger research facilities. Important parts are cryogenic plants but also conventional cooling and air conditioning. With large fluctuations from sustainable power production flexible and intelligent operating scenarios may become important for energy intensive research facilities.

Mike Seidel, the workshop chair said: "A common meeting for experts on such diverse fields as beam targets, RF generation or conventional facilities was an experiment. But all these areas contribute to energy efficiency. We received a lot of positive feedback from the participants and finally one can say: the workshop was a success and the community will benefit from the outcome."

EuCARD-2

Energy Management

Neutron Spallation Targets

Magnetrons

issue 16