2nd Workshop on Energy for Sustainable Science at Research Infrastructures

Report on Parallel Session A4: Energy Quality and Operation

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Roberto Visintini

Energy Quality and Operation – 1

High Temperature cooling of cryoplant and klystrons

(J. Jums – ESS)

- "4R-based" energy concept at ESS
- 40 MW of electrical power, most of it turned into waste heat
  $\Rightarrow$ recycle heat!
- Lund District Heat System = source and customer
- 71% of all & 100% of high grade heat: RF & Cryoplants
- Focus on RF & Cryoplants
- Balance the risk of klystron collector high temperature (80-90 °C) cooling with benefits from heat recovery
- There are risky choices but many benefits are possible

Energy Quality and Operation – 2

Three years of operation of the Elettra tri-generation plant

(R. Visintini – Elettra)

- At the Elettra Center the second tri-generation plant has started operation.

- About 6400 hours/year of operation

- Mains disturbances affect 1-2% of downtime (max allowed 5%)

- Elettra Storage Ring benefits from the increased power from UPS fully protecting its superconducting cavity

- More power is now available from TGP2

- Feasibility study for protecting additional critical plants, in the Storage Ring, in particular the 4 RF plants

Energy Quality and Operation – 3

Design and simulation of a SMES for grid primary control
(H-J. Eckoldt – DESY)

- Make use the many assets of DESY for a study on an innovative SMES (Superconductive Magnet Energy Storage)

- Large power & energy storage (+/- 40 MW – 25 MWh)

- Superconductive coil design derived from the one of ITER

- Notwithstanding its size, the energy capacity is relatively low

- Best application: regulation of grid frequency

- Simulation results confirm SMES feasibility as Primary Control Power

- Cost analysis: 14 years for amortization

Energy Quality and Operation – 4

Advanced Simulation tools in support of the design of the Power System architecture of the European Spallation Source (ESS)

(J. Tang– RWTH Aachen)

- 2-year project on ESS and Lund regional grids simulation
- Models for the regional Lund and internal ESS grids to evaluate mutual impact
- Use of Real-Time co-simulation software and hardware, complementary simulation tools (RTDS, Opal RT, MATLAB/Simulink)
- Various scenarios have been tested, in normal and fault conditions
- The simulation of two LINAC charging schemes show large impact on the quality of the Lund grid.