

Optimal Transmission Policies for Energy Harvesting Nodes with Partial Information of Energy Arrivals

Author(s) - Institution(s):

Alberto Zanella, IEIIT/CNR
Alessandro Bazzi, IEIIT/CNR
Barbara B. Masini, IEIIT/CNR
Gianni Pasolini, DEI/UniBO

Corresponding author email: alberto.zanella@ieiit.cnr.it

Corresponding WG group: WG2

Abstract:

When energy is harnessed by wireless nodes from renewable sources, its availability becomes uncertain and its use for communications must be carefully designed. While the optimal power allocation has been derived in previous works when energy availability is fully (a priori) known, practical algorithms are needed when only causal and statistical information is available. In this paper, we study the optimal transmission policy when only the statistical distribution of the energy arrival intervals is known and no information is available on the amount of energy that will be harnessed. We firstly obtain an exact solution for the case of a step-wise transmission power profile. This result is then extended to the time-continuous case. Within energy arrival intervals, the obtained power profile is shown to be non increasing as a function of time and non decreasing as a function of the residual energy. Numerical results are finally provided focusing on an exponentially distributed energy arrival process as a case study.