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Overview of specifications and issues of ADS-drivers

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I will recall some salient aspects of reactor physics to review pertinent requirements and main specifications for accelerators driving a hybrid nuclear system with significant thermal power.
I will try to put this into the perspective of the historical developments. Due to time constraints, the term "review"(assigned from the organizing committee), or "overview", as I have chosen for the title, is somewhat too ambitious.
The aim is to shine some light on the interplay between reactor physics (in a simplified way), spallation physics and accelerator physics (concentrating here on rather fundamental properties). I shall show the main differences between a classical critical reactor and a completely source-driven system that has at all times to exhibit subcriticality (i.e. with a safe margin).
The feature of being source-driven, however perfectly allows for fuel compositions that have too small delayed neutron fractions, e.g. for the incineration of minor actinide waste. On the other hand, it quests for extremely reliable accelerators since a beam trip corresponds to a very rapid and complete shut-down. In classical reactors that corresponds to a "scram"with the associated procedural issues for a restart and the necessity to consider the induced thermal stress.
These arguments obviously also hold true for a "breeding"ADS, e.g. when fertile Thorium fuel is used to breed 233U as in the energy amplifier.
The most efficient production method for fast neutrons is proton-induced spallation, I briefly describe this mechanism and the properties for the accelerator with respect to its required energy and intensity as function of the thermal power of the ADS and the adopted subcriticality.
From this I shall discuss the best options for the ADS-class accelerator, taken in particular into account the reliability requirement, the technical developments of recent years and the choices of the new neutron spallation sources.
The aim is to underline the importance of the required performance margins as well from a technical as a licensing standpoint.
For an efficiency considerations, I shall also show numbers in electricity production (and self-consumption) for a 1GWth ADS as one could imagine for a waste-burner suited either for accompanying nuclear phase-out or taking care of legacy waste from earlier generations in countries transitioning to GEN-IV reactor technology.

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