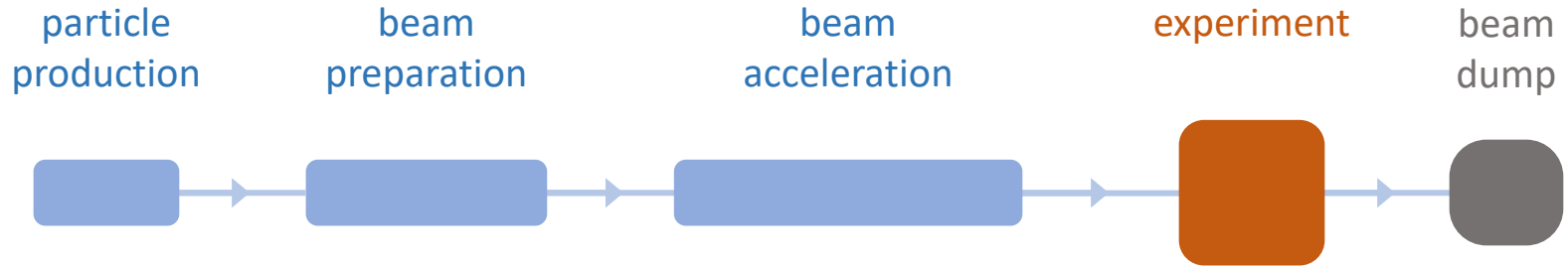
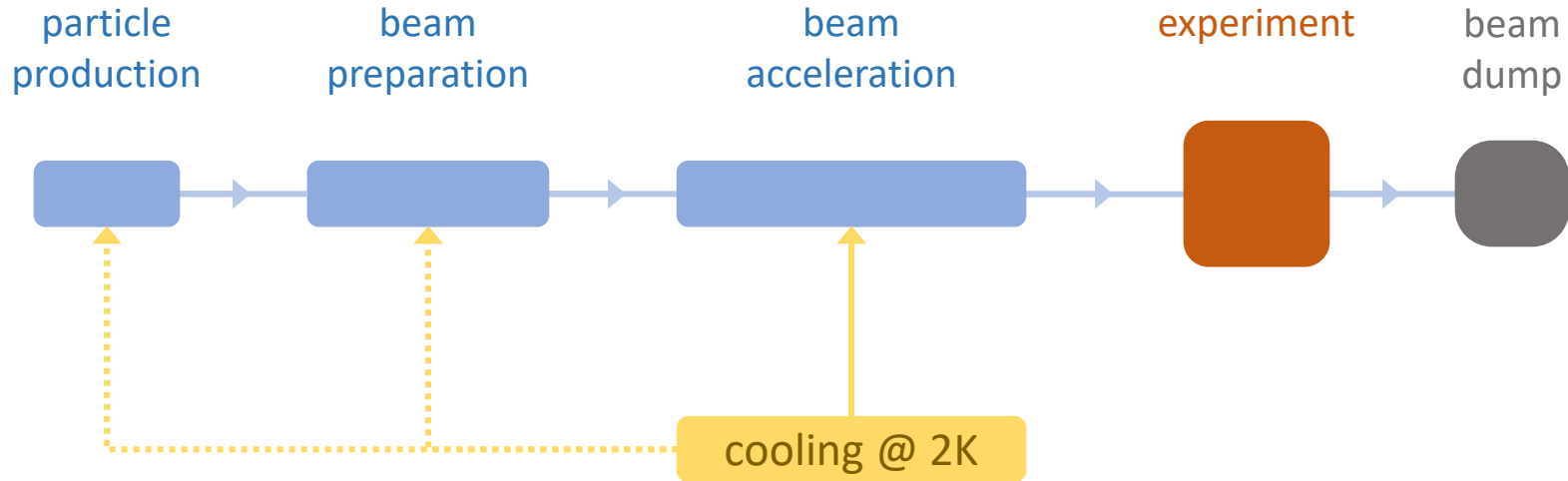


Where do accelerators use power ?

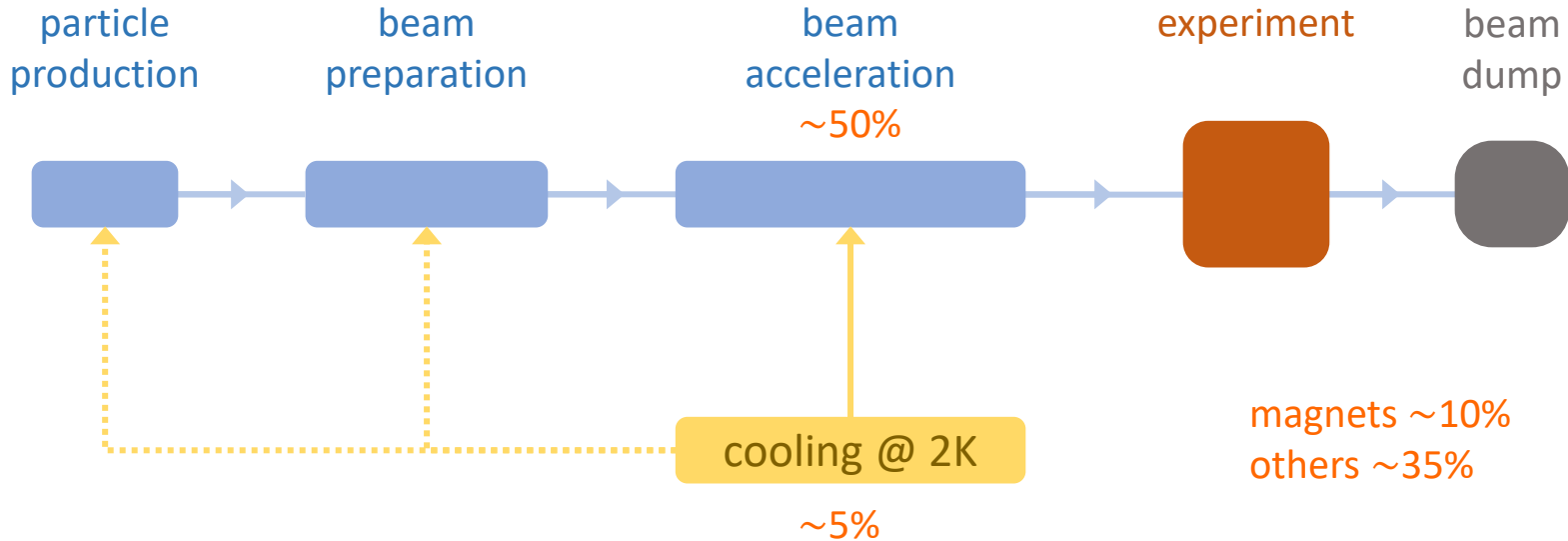
Basic structures of a particle accelerator



Basic structures of a particle accelerator

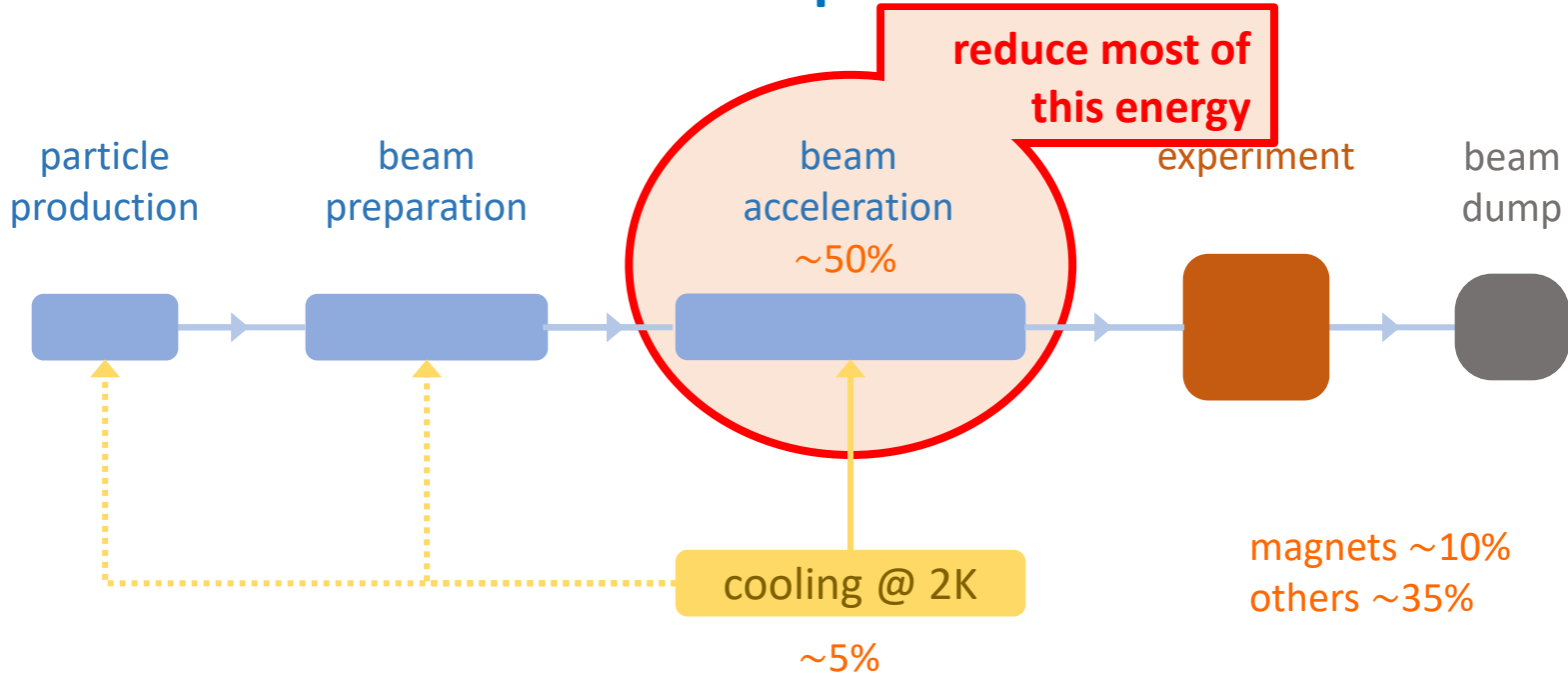


Basic structures of a particle accelerator



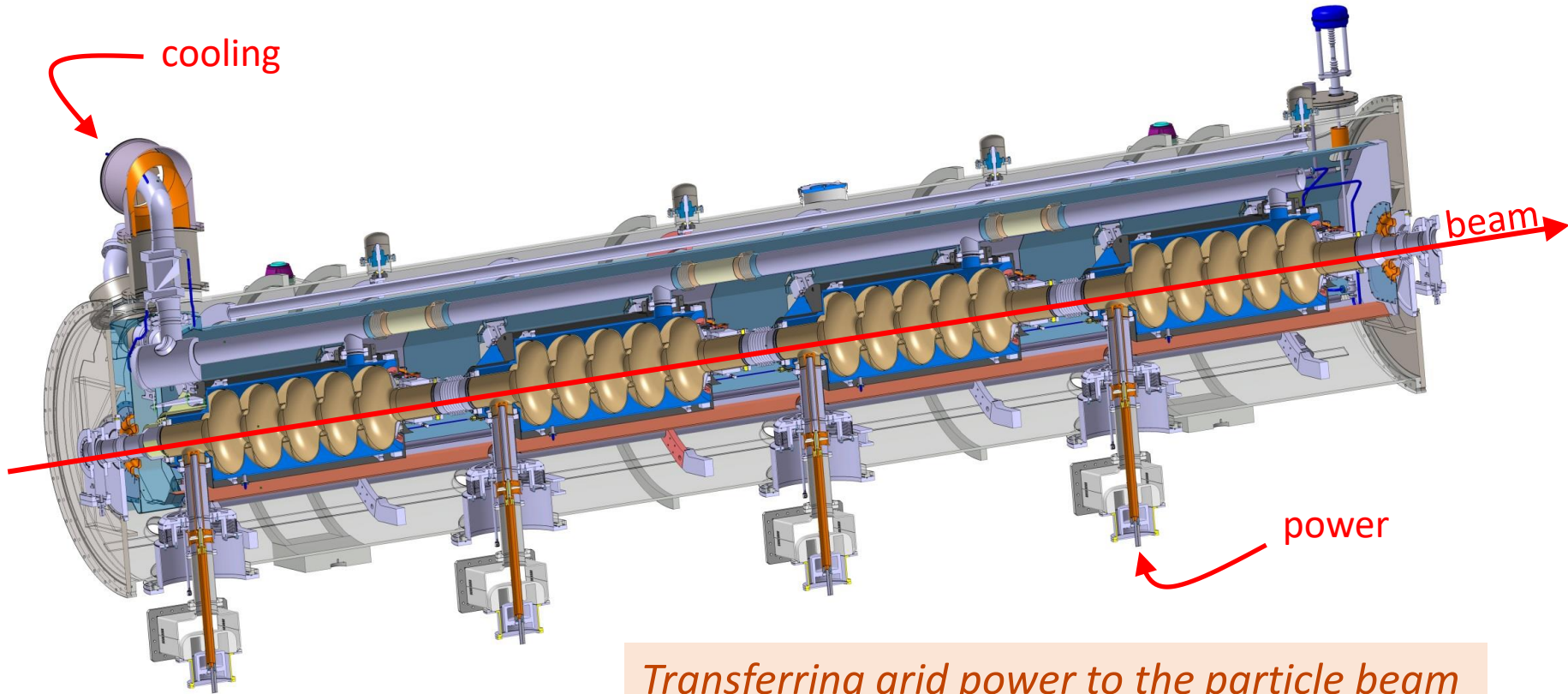
Example: typical power consumption for an electron-positron Higgs Factory
the highest priority next collider for particle physics

Basic structures of a particle accelerator



Example: typical power consumption for an electron-positron Higgs Factory
the highest priority next collider for particle physics

Key building block for beam acceleration: the SRF cryomodule

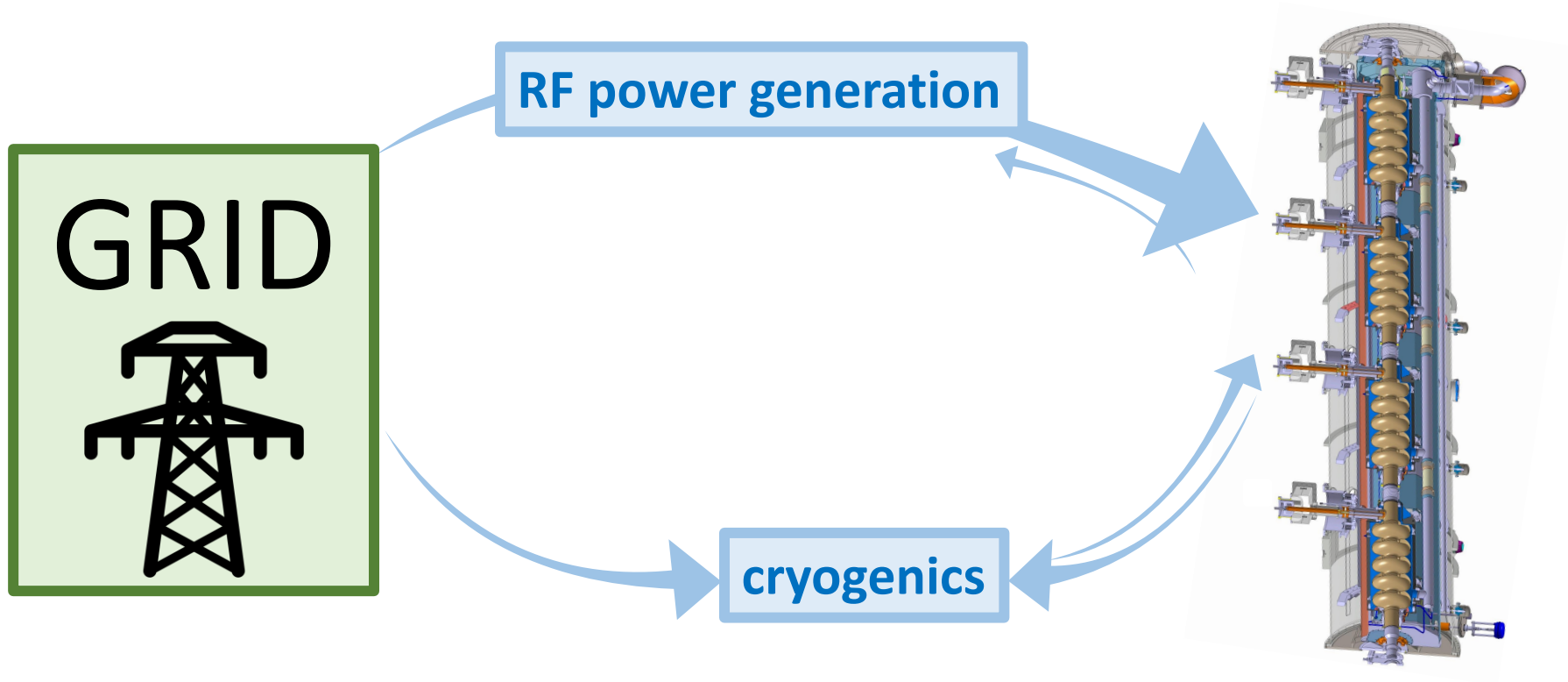


Transferring grid power to the particle beam

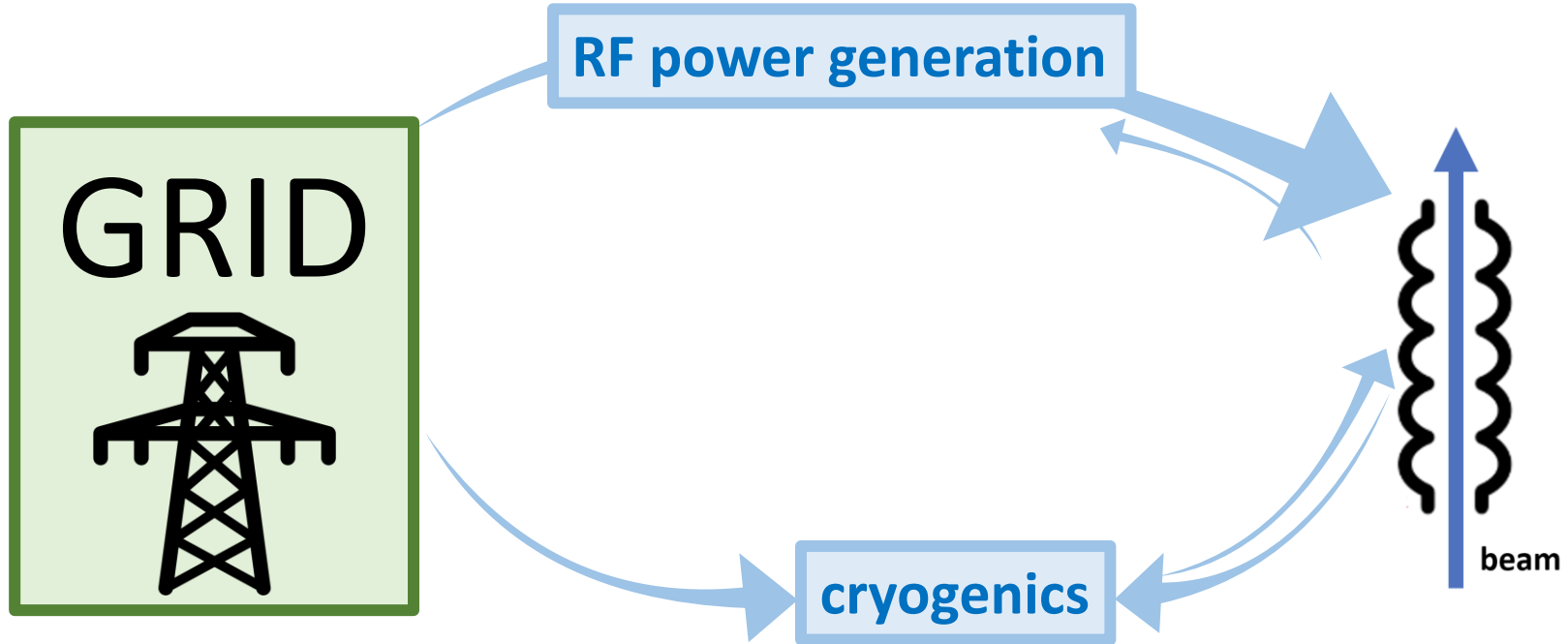
Superconducting Radio Frequency (SRF) is the enabling technology for modern accelerators

The main energy-saving technologies are universally applicable across SRF cryomodules and accelerators
(e.g., ESS, EuXFEL, HL-LHC, ...)

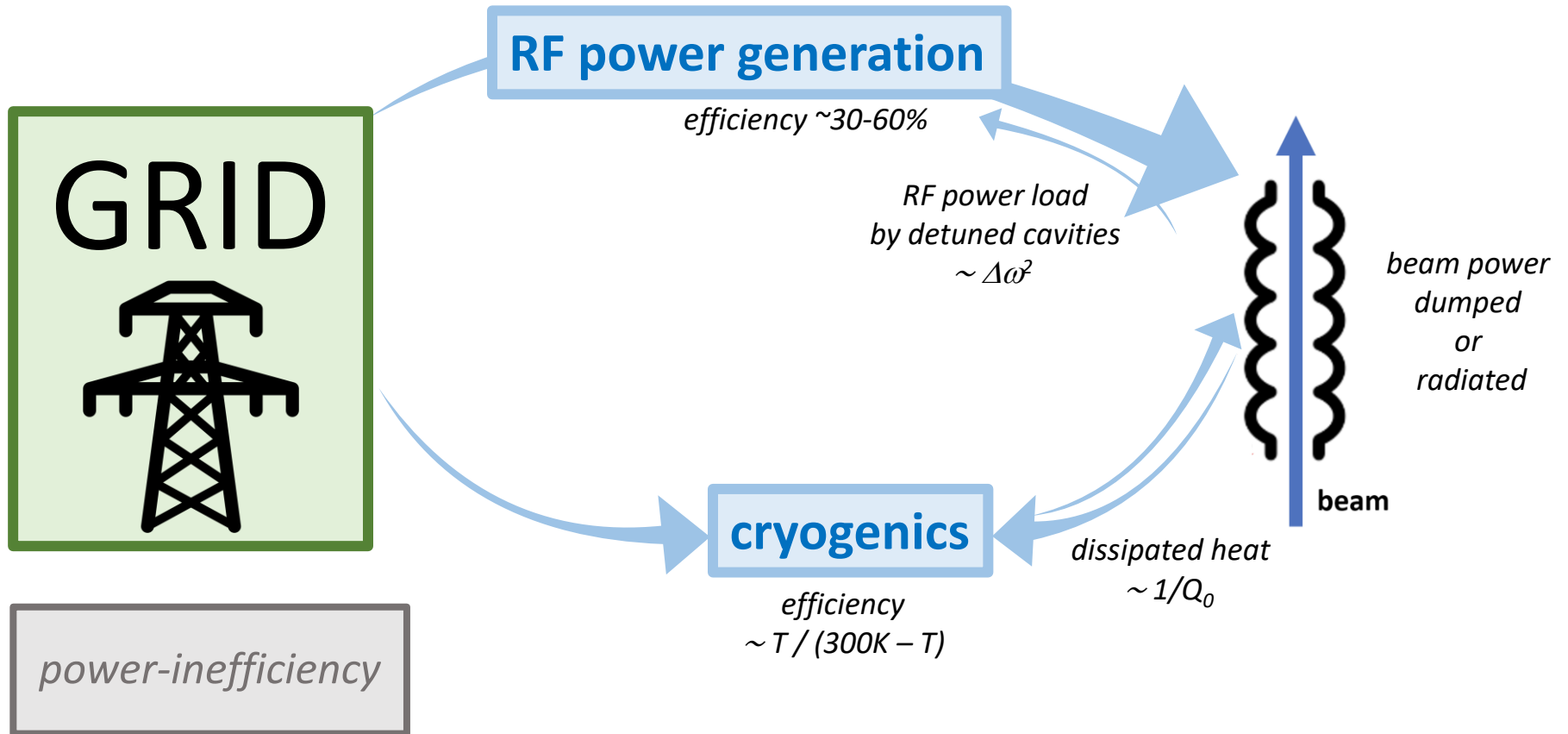
From Grid to Beam



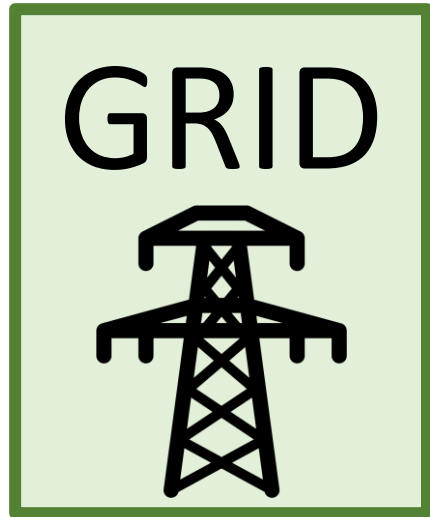
From Grid to Beam



From Grid to Beam



From Grid to Beam



mitigation with novel technologies

improve amplifier efficiency

e.g. solid state amplifiers for oscillating power demands

RF power generation

efficiency ~30-60%

*RF power load
by detuned cavities
 $\sim \Delta\omega^2$*

dealing with microphonics

e.g. Fast Reactive Tuners

recover the energy from the beam

*e.g. ERL reaching
100% recovery*



*beam power
dumped
or
radiated*

*dissipated heat
 $\sim 1/Q_0$*

cryogenics

*efficiency
 $\sim T / (300K - T)$*

operate cavities at higher T & improve Q_0 of cavities

e.g. Nb_3Sn from 2K to 4.2K \rightarrow 3x less cooling power needed

Three main iSAS Technology Areas

