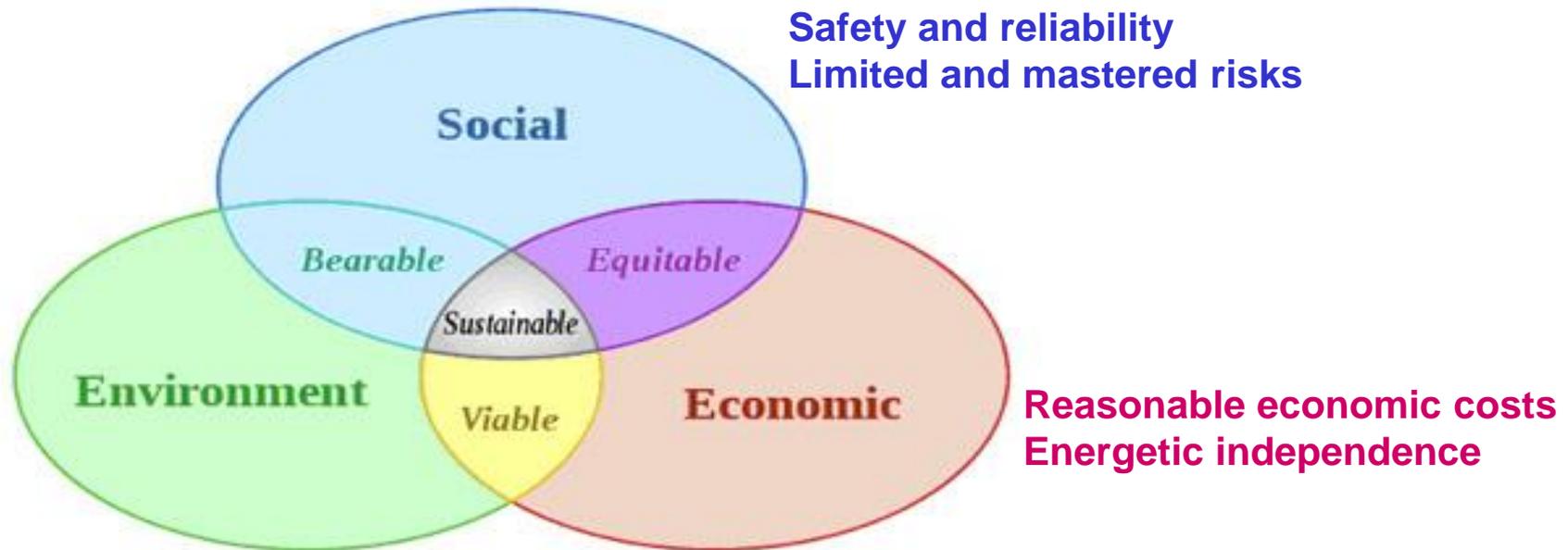


TOWARDS A SUSTAINABLE NUCLEAR ENERGY

« A development which meets the needs of the present,
without compromising the ability of future generations to
meet their own needs »
(G.Bruntland)



Environmental-friendly
Low-GHG emission
Resources preservation

Sustainability is a must !

CURRENT FRENCH Pu RECYCLING STRATEGY : THE RATIONALE

- **Saving uranium resources, still at low scale**
(#10% of French nuclear electricity from LWR MOX fuels)
- **Mastering the growth of plutonium inventory**
(Pu flux adequacy : Pu from processing = Pu refueled)
- **Safe and secure ultimate glass waste, without plutonium**
- **The plutonium available for future use is safely concentrated in MOX spent fuels (7 UOX -> 1 MOX)**
- **An already large industrial experience, operated under international safeguards**
(#25 000 tons SNF reprocessed, # 2000 tons MOX produced)

**to be pursued with Generation III and GEN IV reactors
and reprocessing plants**

NUCLEAR SYSTEMS: INCREASING SUSTAINABILITY...

no recycle (« once through »)

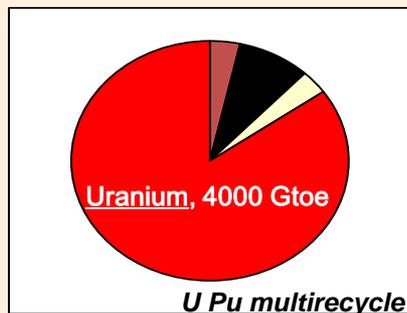
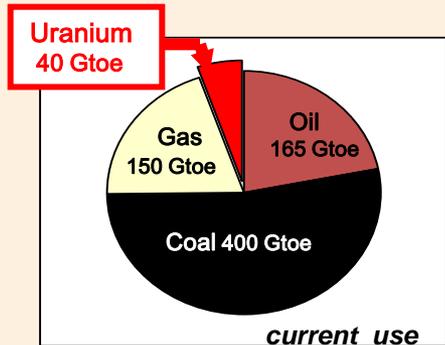
U Pu recycling in LWRs

U Pu multi-recycling in FRs

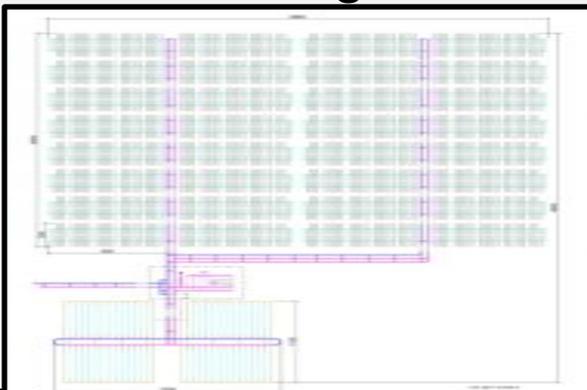
U Pu, MA (Am,...) recycling...

U RESOURCE EXTENSION

HA WASTE « VOLUME »

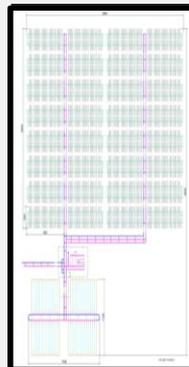


Once through



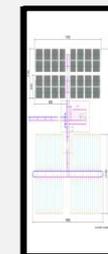
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Pu recycle



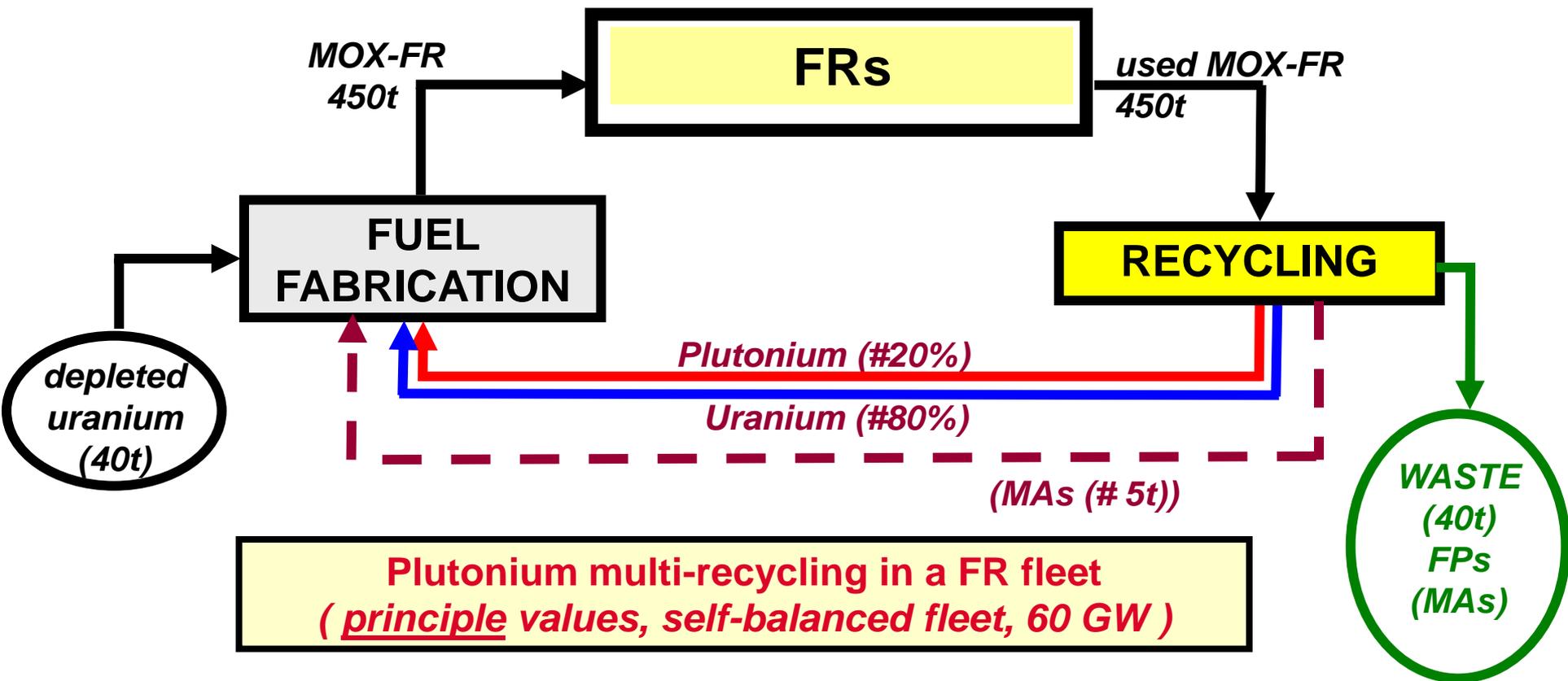
30

all-TRU recycle



<5

LONG TERM SUSTAINABLE NUCLEAR SYSTEMS : FAST NEUTRON REACTORS



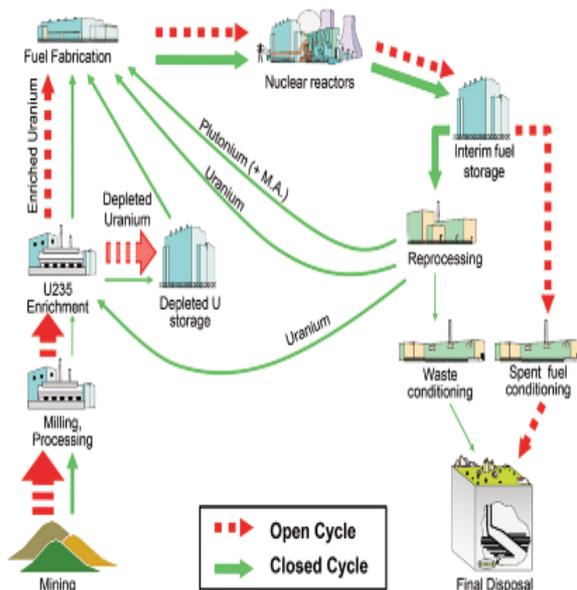
A progressive deployment ?

- FRs initially fueled with plutonium, coming from spent LWR MOX
- breeding gain could be adjusted (according to energy needs)
- plutonium coming from FRs could be re-used in LWR :

a symbiotic (LWR-FR) optimal fleet ?

TOWARDS SUSTAINABLE NUCLEAR ENERGY

- Nuclear energy, as a **GHG-free energy**, is anticipated to develop in the next century to answer the increase of energy needs and has to be **sustainable**
- **Current Pu mono-recycling with MOX in PWR** already contributes in France to decrease waste volume and toxicity, while saving U resources
➔ **first step to sustainability**



Sustainability (economic, environment, society) promotes the implementation of major (U,Pu) and minor (mainly Am) **actinides recycling by shifting stepwise towards fast reactor systems** in order to:

- **1st step** : **multi-recycle Pu and U** for saving resources
- **2nd step** : **recycle minor actinides** for stabilizing their inventories, reducing the waste toxicity, reducing the repository volumes and costs

... ➔ **strong implications for public acceptance**