Session 6 - posters

ID 6: TITLE: THORIUM FUEL CYCLES IN A VERY HIGH TEMPERATURE HYBRID SYSTEM

INSTITUTO SUPERIOR DE TECNOLOGÍAS Y CIENCIAS APLICADAS

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Thorium based fuel cycles

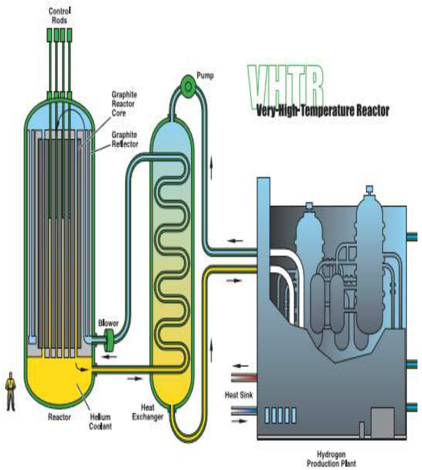
1. 94% ^{232}Th + 6% ^{233}U
2. 92% ^{232}Th + 8% ^{239}Pu
3. 40% ^{232}Th + 60% U enriched at the 8% in U^{235}

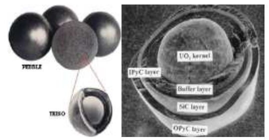
Aspects to be investigated

1. Variation of the isotopic composition.
2. Minor Actinides stockpile.
3. Nuclear fuel breeding.
4. Radiotoxicity of the long-lived wastes.
5. Others.

Very High Hybrid System

VHTR

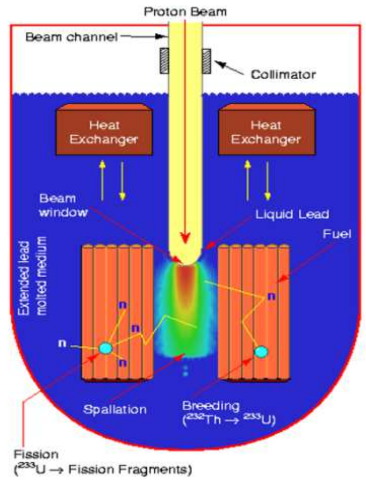


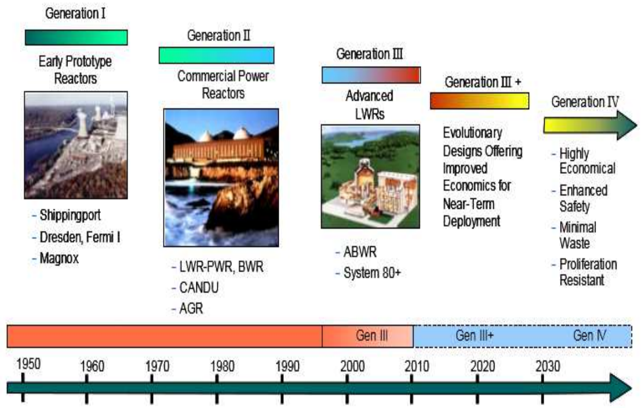


TRISO Particle

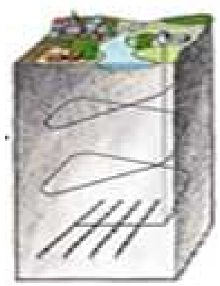
Fuel

ADS





Spent fuel



IAEA-CN-226-64 P

Design Strategies for Direct Recycling of ACR-700 Spent Fuel

Nader M. A. Mohamed, Atomic Energy Authority, ETRR-2, Egypt

- This work is focused on strategies for direct recycling of the 700 MWe Advanced CANDU Reactor (ACR-700) spent fuel in CANDU-6 reactor.
- ACR-700 discharges the fuel with a significant amount of fissile isotopes (U-235, Pu-239 and Pu-241).
- Three strategies are considered for recycling the spent fuel of ACR-700:

1. Recycling the ACR-700 spent fuel bundles directly in CANDU-6, since the two reactors have the same inner diameter of the fuel channel.
2. Removing the central pin (which has residual reactivity plenty of the Dysprosium fissionable poisons) from the ACR-700 spent fuel and re-fabricating the spent fuel bundle into CANDU-6 fuel bundles using dry processing such as the DUPIC fuel cycle.
3. Removing the outer fuel pins (which have the fewer amounts of fissile isotopes) and the central pin and re-fabricating the rest two fuel rings into CANDU-6 fuel bundles using the dry processing.

- The calculations using the MCNPX code showed that the recycled spent fuel in CANDU-6 gives burnup around 3, 6.75 and 13.3 MWd/kgU for the three strategies, respectively.
- Normalizing the burnup on the all fuel in the spent bundle, additional burnup of 3, 6.5 and 6.9 MWd/kgU can be obtained for the three strategies, respectively.
- This means that the third strategy gives the higher burnup from the spent fuel.
- Moreover in the third strategy, only half of the spent fuel bundle is re-fabricated into CANDU-6 fuel bundle which reduces the cost of re-fabrication.
- Knowing that ACR-700 burns fuel to 20.5 MWd/kgU, the third strategy can increase the burnup of fuel by about 34%.
- The calculations give acceptable power distributions on the fuel bundles for the three strategies and acceptable coolant void reactivity compared to reference CANDU-6.

Slide, summarizing the Poster

REMIX Nuclear Fuel Cycle as the optimal solution for the SNF management

by Mikhail Baryshnikov, Russia

- REMIX fuel is produced from the mixture of uranium and plutonium extracted in course of SNF reprocessing with adding of fresh uranium enriched. Thus, REMIX allows to multiply recycle all the quantity of uranium and plutonium contained in PWR/VVER fuel assembly.
- Dr.Baryshnikov presents the peculiarities of the REMIX approach to the Nuclear Fuel Cycle and Spent Fuel management. There are several intriguing conclusions. One of them is that the closure of the nuclear fuel cycle by REMIX-technology may be presented as a form of nuclear fuel leasing, which allows to get rid of the NPP operator's worries about the SNF fortune.
- Another conclusion that REMIX NFC seems to be the most efficient user of the fissile materials; it justifies SNF reprocessing. There are also interesting description of the REMIX Nuclear Fuel Cycle flexibility, embedded security, non-proliferation characteristics, and the current status.
- You can find Dr.Baryshnikov's presentation at the poster board No. CN-226-154 P