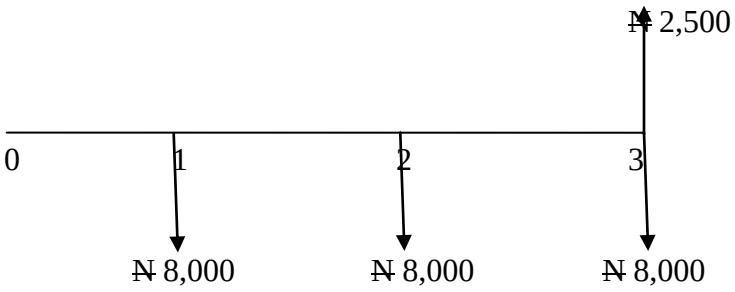
REPLACEMENT PROBLEM

Replacement problem is decision problem involving the replacement of existing obsolete and or worn-out assets. The continuation of operations is dependent on these assets. Failure to make an approximation decision results in a slowdown or shutdown of the operations. The question is when the existing equipment **(defender)** should be replaced with more efficient equipment **(challenger).**

Examples of mutually exclusive (either old or new machine but not both):

1. Example with equal lives and salvage value: The management of a company need to take decision either to replace the old machine or not. If the old machine is replaced now it can be sold for ₦ 10,000. Its operating cost per annum for the next three years is ₦ 8,000 and the salvage value is ₦ 2,500. The new machine costs ₦ 15,000 while the operating cost per annum is ₦ 6,000. The salvage value at the end of three years is ₦ 5,500. Advise management on the right decision if interest rate (i) is 12%.
   SOLUTION:

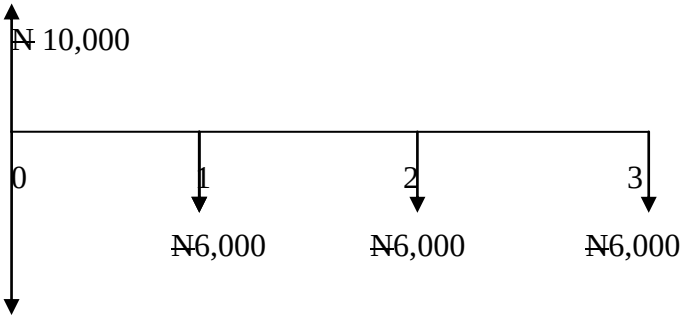


Option 1(Keep Defender): Find the net present value (NPV) for the cash stream of the defender.

NPV = (NPV of salvage value of defender - NPV of operating costs of defender)

$$NPV = 2{,}500(P/F,12,3) - 8{,}000(P/A,12,3)$$
$$= -N17{,}434.90$$
$$Annuity = NPV(A/P,12,3)$$

Option 2 (Replace Defender): Find the net present value (NPV) for the cash stream of the defender.



₦ 15,000

NPV = (NPV of salvage value challenger – cost basis/purchase cost of challenger + NPV of the selling price/book value of defender - NPV of operating costs)

$$NPV = 5{,}500(P/F,12,3) - 15{,}000 + 10{,}000 - 6{,}000(P/A,12,3)$$
$$= -N15{,}495.90$$
$$Annuity = NPV(A/p,12,3) = -N6{,}451.90$$

We select option 2 (replace defender) because it has the least net present value of costs. It is the same for the annuity.