

Abstract

- This research presents a methodology to support decision-making in extending the service life of ships in the Brazilian Navy. Addressing the dual challenge of operating an aging fleet within budgetary constraints. The analysis considered three life extension strategies based on the available data: reuse, refurbishment, and replacement.

Methods

- The framework shown in Fig. 1 seeks to combine technical with economic considerations. It is illustrated through a case study involving a ship within the Brazilian Navy fleet, the Multipurpose Aircraft Carrier (NAM) *Atlântico*.
- The technical module leveraged the Prioritization to direct resources towards the most vital areas, and the Weibull analysis for failure prediction. Economic quantification reveals the most cost-effective choice.

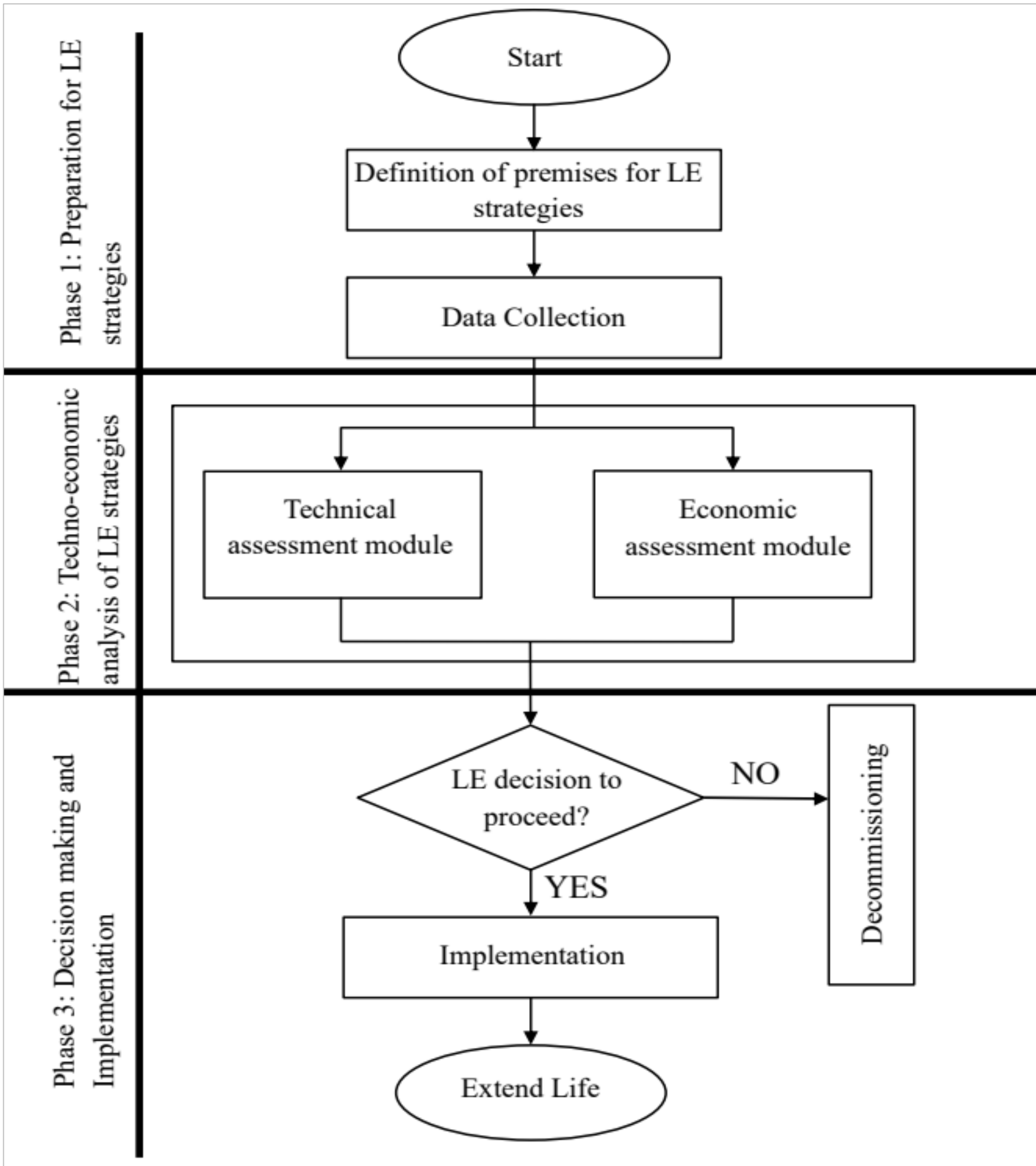


Figure 1: Framework for life extension strategies for ships.
Source: Adapted from Animah, et al. (2017).

Results & Their Impact

- The prioritization process focused on the diesel main engine and hull. Weibull analysis on the engine showed it is in the wear-out phase. Fig. 2 shows the cost components (Capital, Operational, Maintenance, Risk Expenditures) for each life extension strategy, with Risk Expenditures being the highest.
- Fig. 3 shows that replacement is more costly, while calculations confirm the reuse strategy, with a Benefit-Cost Ratio above 1, as the most viable strategy financially.

Recommendations

- Further research can be improved with the inclusion of different deterioration models and other life cycle costs and benefits elements. The inherent difficulties in valuing social and environmental benefits introduces further uncertainties into the economic evaluation and can be further explored in future researches.
- Extending the application of the model across other military branches would provide further evidence of its effectiveness.

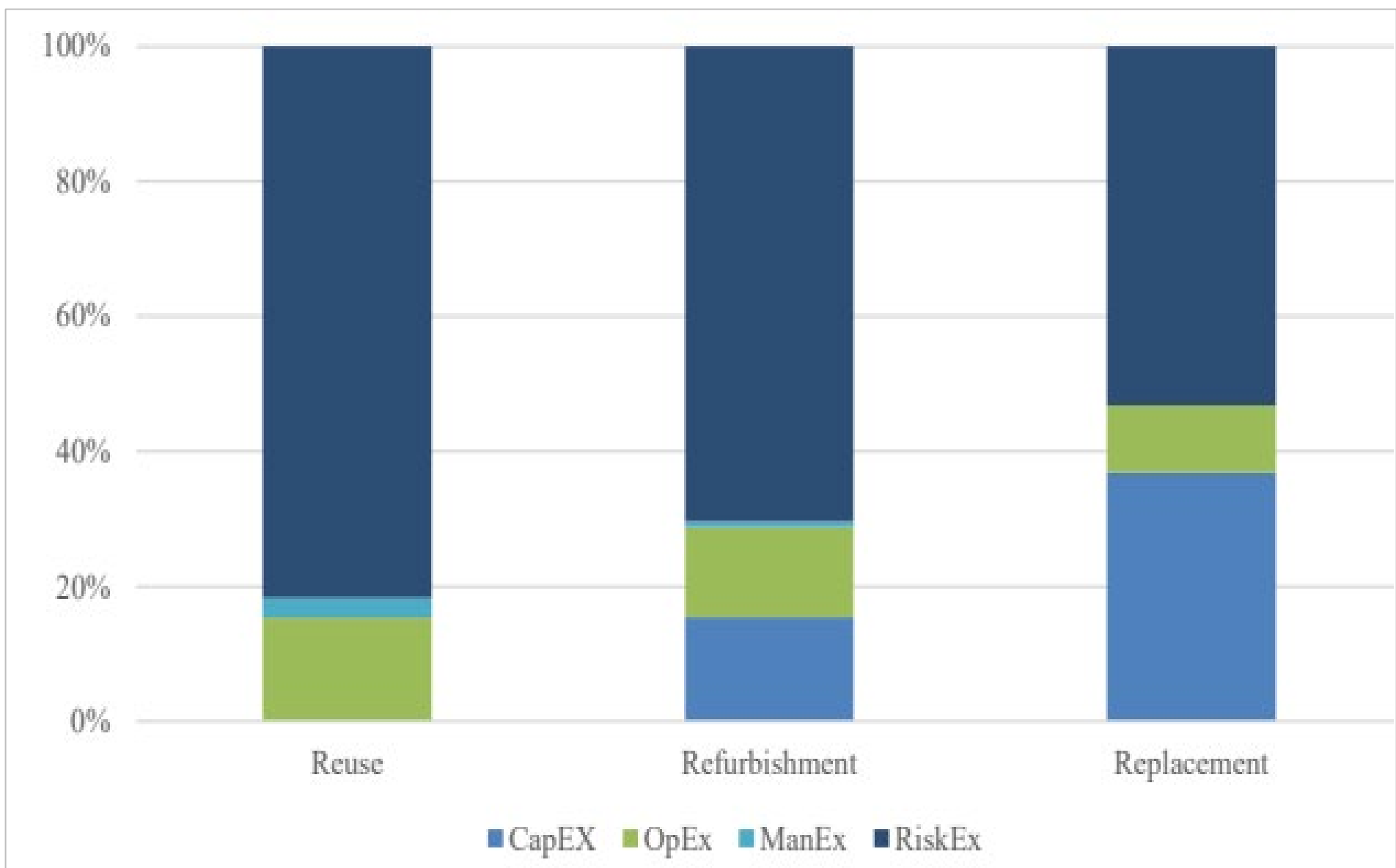


Figure 2: Contribution of cost element to total expenditure for each life extension strategy.

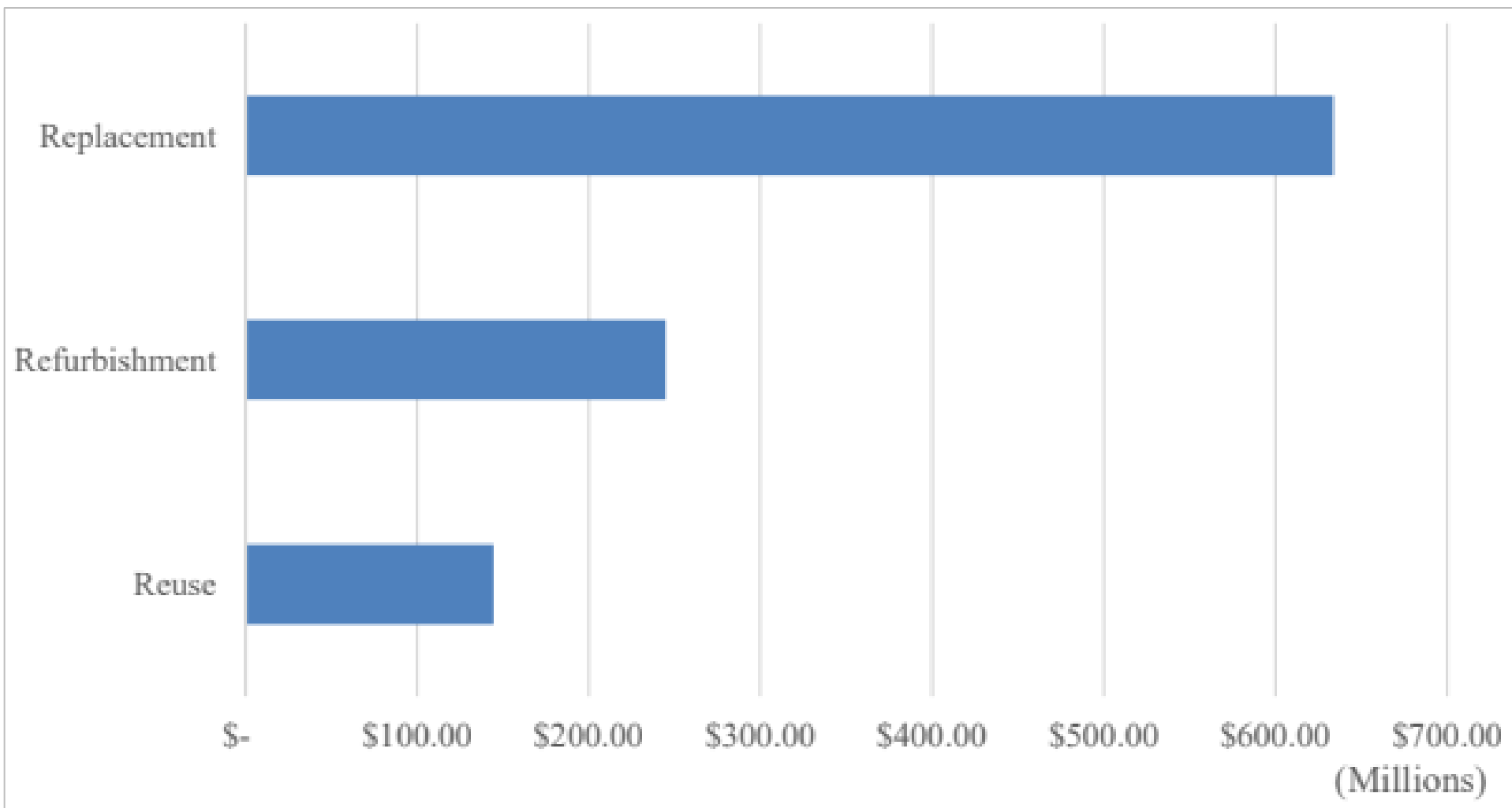


Figure 3: Total Net Present Value for each life extension strategy.