10 Appendix 2: Detector unit costs

Estimating the unit costs for each detector type is not straightforward. We can base our cost estimates on detectors that are currently under construction, or have recently been proposed. However, these example detectors have been proposed/costed at different times using different accounting systems in different currencies. To attempt to compare like–with–like we have started from the bare costs (M&S only), which we have corrected to include salaries (SWF). The resulting unit costs have then been corrected for inflation to correspond to FY01 dollars. Finally an estimate of overheads and contingencies (35%) has been included. Based on the fully loaded FY01 unit costs, for each detector type the mass of the detectors that could be built with a budget of $500M can be estimated. The results are summarized in Table 5.

The bare detector costs are based on the following:

(i) The UNO unit cost [27] is based on 355M$/450 kt (FY00 dollars), assuming 40% photomultiplier coverage in the middle region and 10% photomultiplier coverage in the external volume. This could possibly be reduced by about 80M$ if one assumes 10% photomultiplier coverage everywhere, giving 0.6 M$/kton. Note: 40% coverage is necessary for a proton decay experiment which is driving force behind this proposal.

(ii) The ICARUS unit cost is based on 26060 MLire per module, with 2200 Lire/Dollar (FY99 dollars). This gives 12M$ per module (FY00 dollars). Note that each module contains 1.9 kT of Liquid Argon. Assuming a loss of 10% from fiducial cuts this yields 1.6 kT per module [28].

(iii) The MINOS unit cost is based on 17.6M$ (FY98 dollars). This gives 18.8 M$ (FY00 dollars) for a 5.4 kt detector [6].

iv The BooNE unit cost is based on ...

Table 5: Detector cost estimates.

	Water Cerenkov (UNO)	Liq. Scintillator (BooNE)	Liq. Argon (ICARUS)	Steel/Scintillator (MINOS)
Bare Unloaded Unit Cost (M$/kt)	0.36	1.3	7.1	3.0
Unloaded Unit Cost (M$/kt) [a)]	0.57	1.75	11.2	4.7
FY for estimates	2000	2000	1999	1998
Loaded Unit Cost (M$/kt) [b)]	0.67	1.92	13.5	5.9
Mass (kt) per $500M	745	261	37	85
Medium density (g/cm^3)	1.0	0.9	1.8	3.5
Cavern cost (M$)	106	41	2.9	3.4

a) M&S + SWF + EDIA

b) FY01costs including overhead and 35% contingency