How to relate the IceCube Upgrade Basis of Estimates to the Cost Workbook

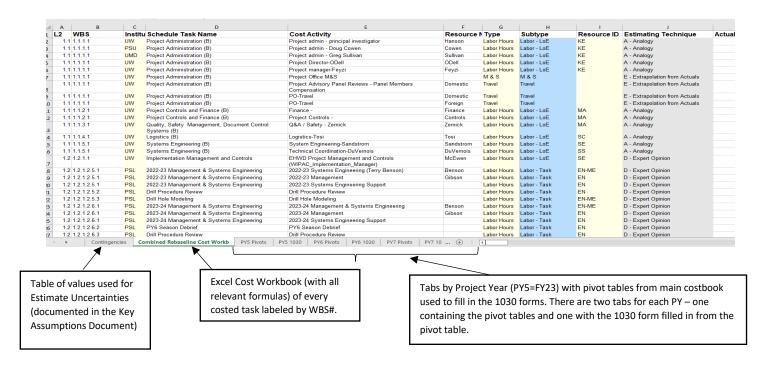
The basis of estimates are all of the same template. They briefly describe the scope of the element being costed, along with the WBS dictionary. There are three tables that form the heart of the BOE: one for Equipment (either Capital Expense – CapEx – or Materials and Supplies – M&S). Capitalized equipment does not have indirect charges, whereas M&S does. The WBS and Activity Columns can be found in the Cost Workbook.

Travel is divided into domestic and foreign. Deployment travel (to the South Pole) is considered foreign travel. The cost of travel is standardized as discussed in the "Key Assumptions Document" and backed up by analysis of recent travel ("Travel Analysis document").

Labor is estimated in hours in the BOEs. These hours are then recorded in the cost workbook and costs are calculated according to the labor rate, fringe, and indirect at the respective institution. You can find these rates in the respective columns in the cost workbook.

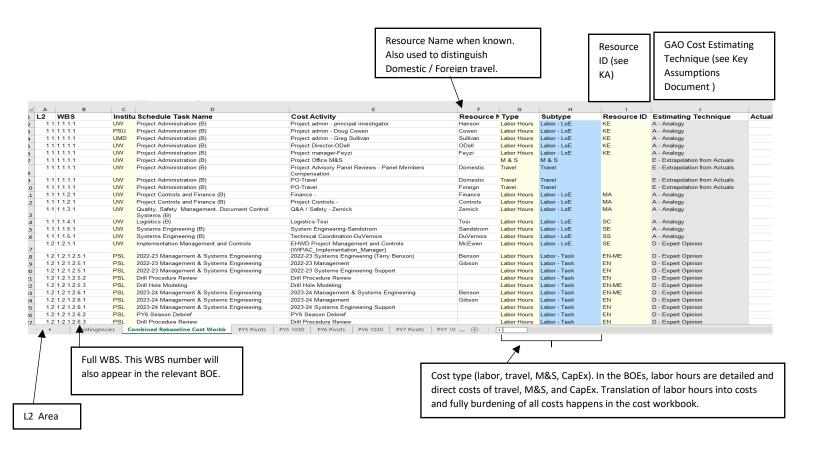
Where available, quotes or invoices are used to back up the numbers in the BOEs. These can be found either in the body of the BOE or in the directory that the BOE is found.

The cost workbook is an excel spreadsheet and the formulas are visible that are used for calculating total costs, including labor rates, fringes, and indirect costs. Various pivot tables are used to populate the year-by-year 1030 forms, which are separate tabs in the cost workbook. In addition, stand alone 1030's have been made that remove the reference to the cost workbook pivot tables for convenience. These numbers come directly from the 1030 tabs in the cost workbook, so the information can be easily traced from the 1030's through the cost workbook.



Below is a snapshot of the cost workbook and how to navigate it. First the different tabs:

Below is some detail on the first few rows. The BOE connects to the cost workbook via the WBS number – i.e. the BOE for 1.1 will describe WBS 1.1.1.1 – 1.1.1.5.1. Depending on how complicated the areas are, BOEs may be at L2 or L3, but they always describe all elements in the cost workbook.



Additional descriptions by column labels:

Column P is the contingency code added by the estimator and detailed in the BOEs. It is translated to a % using the midpoint of the contingency range for each contingency code (see the first contingency tab and the formula in the workbook).

Column R is the total estimate uncertainty according to the contingency code and the total PY5-PY8 burdened cost (EO). Column S is the Indirect portion of the Estimate Uncertainty for the total PY5-PY8 indirect costs (=Indirect rate column N times the total EU column S, unless the item is CapEx in which case there is no indirect cost. Note that PSL is "capitalized labor" which means that the indirect costs are zero – this is reflected in column N for the PSL labor).

For PY5:

Columns U – AF contains the monthly distributions of one of the following:

- Labor hours
- Direct M&S (\$)
- Direct Travel (\$)
- CapEx (\$)

[As shown above, column G defines what the item is in one of these categories].

Column AG contains the total number of hours for PY5. Column AH translates this into months (using 1 FTE-year = 1800 hours as stated in the Key Assumptions Document).

Columns AI-AT translate each monthly number into direct \$\$ -- for labor it takes the #hours x Actual Rate (column K) x (1+Fringe[column M])xEscalation[column EQ]. For all other items, it just copies the value as a \$\$ amount (i.e. no adjustment).

Column AU is the sum of all 12 months in PY5 of all the direct costs. Column AV is the indirect amount (=Column AU x Column N if not CapEx). Column AW is the total direct + indirect of PY5. Column AX is the Estimate Uncertainty on the direct cost (column Q x AU) and Column AY is the Estimate Uncertainty on the Indirect cost (column Q x AV).

This is repeated for PY6-8.

Column EO is the total direct+indirect of PY5-PY8. Columns EP – ET are the escalation factors for each year – EP is the current year (FY22) which our estimates were made in, so has an escalation factor of 1. Each subsequent year is escalated by 2.15% (see Key Assumptions Document). These factors are applied to labor only.

EU-EX are a summary of salary costs PY5-PY8 without Fringe. EY-FB are a summary of fringe costs for PY5-PY8. Finally FC is the Level 3 area.