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TECH
Radioactive Materials Management

Cost Estimates for Reactor-site Extended Storage Facility Alternatives for Used Nuclear Fuel

Alternatives for AECL's Chalk River and Whiteshell Reactor Sites

Report of a Study carried out for Ontario Power Generation, New Brunswick Power, Hydro-Québec and Atomic Energy of Canada Limited

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Preface

Currently, used nuclear fuel is stored at seven reactor sites in Canada, in both wet and dry storage facilities. The used fuel storage facilities are owned by four companies, and are located on the following reactor sites:

Ontario Power Generation	Pickering, Bruce and Darlington
New Brunswick Power	Point Lepreau
Hydro-Québec	Gentilly
Atomic Energy of Canada Ltd	Chalk River and Whiteshell

This cost estimate report addresses Reactor-Site Extended Storage (RES) alternatives for the Chalk River and Whiteshell sites. Implementation of a RES alternative would provide an extended dry storage facility on each site. In the context of this study extended storage means permanent or indefinite storage with the necessary maintenance and facility repeats. Cost information has been compiled for each of the three RES alternatives for the Chalk River and Whiteshell sites and are described in this report. Separate cost reports have been produced to describe the alternatives for consideration at the Pickering, Bruce and Darlington sites [1], and at New Brunswick Power's Point Lepreau site [2] and Hydro-Québec's Gentilly site [3].

AECL also stores fuel at the Bruce site (Douglas Point) and the Gentilly site (G1). The estimated costs for extended storage of these fuels are presented in other reports. In addition AECL stores research fuels at both the Chalk River and Whiteshell sites. However these fuels are outside of the scope of this report.

Other options for the long-term management of Canadian used nuclear fuel include extended storage at a central location (Centralized Extended Storage, CES) or isolation by encapsulation and placement in an underground repository (Deep Geologic Repository, DGR). Other reports describe the cost estimates for a CES facility [4] and the DGR facility [5].
The RES and CES design reports are available should more detailed information be required [6 and 7]. The information in the RES, CES and DGR reports will be used as possible input to a study of options described in the Nuclear Fuel Waste Act, to be carried out by the Nuclear Waste Management Organisation (NWMO). At the end of its study, the NWMO will be required to report to the Government of Canada, setting out its preferred approach for long-term management of used nuclear fuel.

Summary

This report presents cost estimates for Reactor-site Extended Storage facility alternatives under consideration which can accept used fuel currently stored on the Chalk River and Whiteshell sites. The estimates are based on the conceptual designs for the facility alternatives developed during 2002/2003.

The three alternatives considered for the Chalk River and Whiteshell sites are:
- Silos
- Silos in Storage Buildings (SSB)
- Silos in Shallow Trenches (SST)

The estimates include the cost of siting, design and construction of the Reactor Extended Storage facility, and the extended operation of the facility, which will include the periodic replacement of the storage complexes and the repackaging of the fuel bundles into replacement fuel containers. The cost estimates are for the establishment of stand-alone self-sufficient storage facility on an existing site. To allow comparison of costs for each alternative, costs have been compiled for siting, initial construction and operation, and for two major refurbishments and one fuel repackaging event. These activities span a nominal 300 years but in reality a RES facility would be required to operate in perpetuity.

Total costs for the three alternatives that can accept 4,853 fuel bundles at the Chalk River site (at 2002 constant dollar prices) are:
- Silos $0.72 B
- SSB $0.75 B
- SST $0.76 B

Total costs for the three alternatives that can accept 360 fuel bundles at the Whiteshell site (at 2002 constant dollar prices) are:
- Silos $0.71 B
- SSB $0.74 B
- SST $0.76 B

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1 Introduction

This report presents the cost estimates for the Reactor Extended Storage (RES) facility alternatives under consideration which can accept used fuel produced on the Chalk River and Whiteshell sites.

The estimates are based on RES conceptual designs that only receive CANDU used fuel bundles, generated or resident on the research sites, which are detailed in Ref. 6. The RES facilities have been developed to store the site inventories presented below:

Chalk River	4,853 fuel bundles
Whiteshell	360 fuel bundles

The fuel at the RES facilities would be in AECL-design fuel basket format, and will be stored long term in silo-based structures. The fuel presently lies within silo arrays at both research sites, which also contain non fuel items. The cost estimates provide for the replacement of an equivalent number of silos at each site, but exclude the costs of monitoring and managing the non fuel inventory.
The three alternatives costed for each site are:

- Silos
- Silos in Storage Buildings (SSB)
- Silos in Shallow Trenches (SST)

The estimates are based on the conceptual designs for the facility alternatives developed during 2002/2003.

The estimates include the cost of siting, design and construction of the RES facility, and the extended operation of the facility, which will include the periodic replacement of the storage complexes and the repackaging of the fuel bundles into replacement fuel containers.
The cost estimates are for the establishment of a stand alone self-sufficient storage facility.

In the case of the Silos and SSB alternatives, the cost estimates exclude all costs related to the silos-based dry storage facilities existing on the Chalk River and Whiteshell sites. It is assumed that the existing interim facilities are "inherited" and the RES estimates only include future costs for monitoring, maintaining and replacing storage facilities and repackaging fuel already in dry storage on each research site.
To allow comparison of costs, cost data have been compiled for siting, initial construction and operation, and for two major refurbishments and one fuel repackaging event. However the facility would be required to operate as long as the fuel is hazardous.

AECL also stores fuel at the Bruce site (Douglas Point) and the Gentilly site (G1). The estimated costs for extended storage of these fuels are presented in Refs. 1 and 3 respectively. To prepare a cost estimate for the extended storage of all AECL CANDU fuels, the costs would need to extracted from these two reports and combined with costs presented in this report.

1.1 PURPOSE OF COST ESTIMATE

The purpose of this report is to document the alternative estimates for an assumed program to site, develop, and operate standalone reactor-site extended storage facilities that will accept used fuel at the Chalk River and Whiteshell sites.

The cost estimate data in this report is intended to allow comparisons to be made with cost estimates for centralized extended storage, or with geologic disposal in an underground repository, which are the subjects of separate reports.

1.2 STORAGE OF USED FUEL

The used fuel for which AECL has responsibility is currently stored in concrete structures (dry storage). The specific storage locations are shown in Figure 1 (locations 1 and 5). Assumed total fuel inventory is presented in Section 2.2 of this report.

Figure 1: Existing Fuel Storage Locations in Canada

Relatively small quantities of AECL fuel are also stored on the Bruce and Gentilly sites, and will be administered alongside fuel inventories owned by Ontario Power Generation and Hydro-Québec respectively. The estimated cost for the extended storage of these fuel inventories is captured in other cost estimate reports (Refs. 1 and 3).

1.3 LEVEL OF COST ESTIMATION

The RES cost estimates have been developed by scaling or factoring costs from more detailed CES cost estimates documented in Ref. 4. Scaling provides a cost estimate that will

approximate a cost estimate based on more detailed estimating procedures; i.e. using estimates of equipment and material take-offs, labour estimates and unit costs.

It should also be noted that the CES conceptual cost estimates are based on incomplete design information, information about technology that is in the early stages of development, and many assumptions about the program and how it will executed (Ref. 4). As a result there is uncertainty associated with various elements of the CES cost estimates.

Therefore the RES cost estimates presented in this report are, at best, indicative of the expected cost to site, develop, construct and operate an RES facility on the Chalk River and Whiteshell sites. More accurate cost estimates could be developed based on estimates of labour and other resources and estimates of materials and equipment quantities taken from the conceptual designs documented in Ref 7.

2 Descriptions of RES Facility Alternatives

2.1 GENERAL

The RES facility is envisaged as a self-contained, standalone facility, located at the existing research site. The site is linked to the highway network by existing infrastructure. A breakdown of the fuel inventory is provided below.

Each RES facility alternative is briefly described in the following sections. Fuller descriptions of the receipt, fuel storage, facility repeats and repackaging events are given in Ref. 6.

2.2 DESCRIPTION OF USED FUEL INVENTORY

The cost estimates are based on the conceptual designs which assume each the facility is self-contained, with a capacity to accept the fuel inventory of the research site. Each of the RES facility alternatives comprises a fuel container storage complex. Table 1 summarises the assumed used fuel bundle inventory that each AECL research site will maintain in storage.

Table 1: Assumed Used Fuel Inventory for AECL Reactor Extended Storage Facilities

Location	Used Fuel Bundles	Percentage of Total (%)
Chalk River	4,583	92.7
Whiteshell	360	7.3
Total	**4,943**	**100**

2.3 SILOS FACILITY ALTERNATIVE

The Silos alternative comprises the storage of fuel bundles in stainless steel baskets within self-shielded silos. The concrete silos are arranged in an array on a concrete pad and do not have any weather protection. AECL is currently using silos for the dry storage of its used fuel at all storage locations including the Chalk River and Whiteshell sites. The Silos alternative is identified as the 'indigenous' fuel storage alternative for the two AECL sites.

2.4 SSB FACILITY ALTERNATIVE

The Silos in Storage Buildings (SSB) alternative comprises the storage of fuel bundles in fuel baskets confined in concrete silos. The silos are arranged within a storage building. The silo storage buildings use passive ventilation to provide cooling for the used fuel storage structures. This is achieved by allowing cooling air into the storage building through low level wall louvers and out through high level roof louvers.

The implementation of the SSB alternative would involve the construction of a storage building over the existing array of silos; i.e. there would be no transfer of baskets between silos. Then every 100 years the silos and buildings would be replaced and fuel baskets would be transferred from old silos into the new silos.

2.5 SST FACILITY ALTERNATIVE

The Silos in Shallow Trenches (SST) concept comprises the storage of fuel baskets confined in concrete silos. The silos will be housed in a chamber with concrete floor, walls and roof constructed and mounded over with earth cover. The chamber will be accessible by a ramp from ground level. The earthen cover will be applied over the roof and will be designed to protect the chamber structures against freeze/thaw and wetting and drying cycles, divert surface water, limit water infiltration, resist weathering, erosion and burrowing animals. The earthen cover will also lessen the visual impact and provide additional physical security to the storage complex.

Fuel baskets are transferred to the SST facility in the basket transfer flask. The basket transfer flask delivers the basket to the dedicated silo in the relevant storage chamber on a powered basket transfer flask transporter.

2.6 AUXILIARY FACILITIES

The CES design report (Ref. 7) provides detailed descriptions of the auxiliary facilities that would be required at a stand-alone facility for the centralized extended storage of fuel. The list of CES auxiliary facilities has been reviewed and assumptions have been made about the facilities that would be required to support RES operations on the Chalk River and Whiteshell sites. In particular the following list presents the assumptions about the construction of new auxiliary facilities or the refurbishment of existing facilities at the time when the research facilities are fully decommissioned and the RES facility is transitioning to a standalone operation on each site. The fundamental assumption is that the sites will be active and will have a large work force on site until the research facilities are fully decommissioned. Therefore buildings and infrastructure will be maintained and available for use by the RES facility at the time when it must be converted to a stand-alone facility.

Administration and Visitors Building	Building(s) exist on the research sites and new building(s) not required. Allowance for refurbishment.
Operations Support, Health Physics and Test Facility Building	Operations support and health physics will be housed in existing buildings and new buildings not required. One new test facility will be constructed and will serve two research sites.

Equipment Storage and Maintenance Building	Building exists on the research sites and new building not required. Allowance for refurbishment.
Store for Empty Baskets	Building exists on the research sites and new building not required. Allowance for refurbishment.
Active-Solid Waste Handling Building	Building not required until first repackaging event.
Active-Solid Waste Storage Building	Building not required until first repackaging event.
Active-Liquid Waste Treatment Building	Building not required until first repackaging event. One building will be constructed to serve two research sites.
Active-Liquid Waste Storage Building	Building not required until first repackaging event.
General Warehouse	Building exists on the research sites and new building not required. Allowance for refurbishment.
Guardhouse and Perimeter Security System	Building and security system exist on the research sites and new building and system not required. Allowance for refurbishment.
Truck Inspection/Wash Facility	Not required since not fuel is being transported off-site.
Utility Building	Building exists on the research sites and new building not required. Allowance for refurbishment.

An allowance is included in the cost estimate for initial refurbishment or construction of these buildings. Allowances are included under Operations Indirects (5xx-45-20-50) for the ongoing maintenance and replacement of these buildings.

In addition, a number of systems, features and areas would be required to support site activities.

- Fire Protection Systems
- Security and Communication Systems
- Electrical and Emergency Power
- Sanitary Sewer System
- Potable Water System
- Batch Plant and Construction Materials Storage Area
- Site Materials Storage Area
- Access Roads and Vehicle Compounds

It assumed that these services are available and would be "turned over" to the RES facility during transition to standalone operations. The exception is the batch plant, which does not exist on either research site and would not be constructed for RES facilities; i.e. concrete provided by off-site supplier. An allowance is included in the cost estimate for initial refurbishment of these services. Allowances are included under Operations Indirects (5xx-45-20-50) for the ongoing maintenance and replacement of these services.

3 Schedule Assumptions

3.1 OVERVIEW

The cost estimates for the RES facility alternatives have been phased in accordance with schedules developed for each facility alternative. For the purposes of comparison, each schedule is developed over approximately 300 years. This represents the cumulative time for the establishment of the site, the receipt of fuel and the timeframe for the extended storage and monitoring of the longest lived fuel containers employed by the alternative. Given the lesser service lives of some fuel container types, the schedule identifies time periods when repackaging events have been scheduled, within the extended monitoring timeframe. Detail schedules for each alternative are available on the CD in Appendix D.

3.2 SITING AND CONSTRUCTION

For cost estimating purposes it has been assumed that the RES program starts immediately following a government decision, which is assumed to be 1 July 2006 (Y1). A review of potentially suitable extended storage alternatives would start on 1 July 2006 and would be carried out over a 2.5-year period. At the end of the review process, in December 2008 (Y3), a decision would be made to either continue using the existing dry storage facilities for extended storage or to implement a new dry storage technology. In both scenarios there would be extensive consultation with the local communities during the 6-year period (i.e. Fall 2002 to 2008) leading up to a decision in December 2008. These two scenarios are described further below.

In the first scenario, the existing silo-based dry storage facilities would continue to operate as per existing CNSC operating licences (Silos alternatives). During the period of extended monitoring the storage facilities and fuel would be monitored, and the associated buildings and services would be maintained and refurbished as necessary. This regime of extended monitoring would continue until the silos reach the end of their 100-year service life. During this period of extended monitoring it is assumed that the nearby nuclear facility will be fully decommissioned and the RES facility would need to become a standalone facility (see Table 2 for assumed dates).

A new Environmental Assessment (EA) and Construction Licence approval would be sought for the transfer of the fuel when the existing silos-based storage systems reach the end of their service lives. Following receipt of all necessary approvals, facilities would be constructed for the storage of fuel into new silos. After all fuel bundles have been transferred into new storage silos, the entire facility would enter into another period of extended monitoring. The 100-year cycles of extended monitoring and fuel transfer would continue indefinitely. However, once every 300 years the fuel bundles would need to be transferred into new fuel baskets when old baskets reach the end of their service lives.

In summary the siting work for the Silos alternative will be completed during the following time periods:

Chalk River	Y1 to Y3 & Y76 to Y79
Whiteshell	Y1 to Y3 & Y74 to Y77

For Silos, the EA process and Construction Licensing process is assumed to occur at Chalk River from Y77 to Y79 and at Whiteshell from Y75 to Y77.

The second scenario, implementation of the SSB and SST alternative, would require an additional 7 years following December 2008 (Y3) to transition to the new dry storage systems on each of the research sites. Therefore the earliest in-service date for a new system is assumed to be January 2016 (Y11) on the Chalk River site and Whiteshell in Y13. For the purposes of this cost estimate it is assumed that the 7-year schedule would be comprised of following major activities:

1. Siting and conceptual design studies are carried out on each research site and would take one year to complete. When complete, letters of intent are sent to CNSC to prepare sites and to construct two (2) new storage facilities.
2. The federal EA process takes 3 years and involves two comprehensive studies; one each for the Chalk River and Whiteshell sites. AECL would be the proponent in each EA process.
3. Six months to finalise a site preparation and construction licence application for each site following EA approval. Site preparation and construction approval work would proceed in parallel with the EA approval process.
4. Facility construction would take about 2 years to complete and it would be followed by 6 months of commissioning work. Final design work could start in advance of this 2-year construction period.
5. The construction takes place in a rolling program with Chalk River coming into service first in 2016 (Y11), and Whiteshell in 2018 (Y13).

In summary the siting work for the SSB and SST alternative will be completed during the following time periods:

Chalk River	Y1 to Y7
Whiteshell	Y1 to Y9

For SSB and SST, the Construction Licensing and Environmental Assessment (EA) approvals process is scheduled from Y5-Y10 at Chalk River and Y7-Y12 at Whiteshell prior to construction of the new dry storage facilities

It is assumed that when the SST technologies are implemented on each research site, the silo-based interim dry storage facilities would continue to operate in parallel until all fuel stored in silos has been transferred to the new storage facilities. In the SST scenario the last basket would be transferred from interim storage to the SST storage chambers in Y11 on the Chalk River site, and Y13 on the Whiteshell site. After all fuel has been transferred the interim storage facilities would be decommissioned. At that time the SST facilities would enter into a period of extended monitoring. During this period the SST facility would undergo periodic facility refurbishment events occurring every 200 years, and repackaging events every 100 years.

The key dates in the assumed implementation schedules are summarised in Table 2. Also shown in these tables are the assumed dates when the facilities are decommissioned. After the dates when facilities are fully decommissioned it is assumed that the RES facility will not have access to some resources provided by the facility and will need to become stand-alone facility. At that time additional buildings and services would be acquired or existing building refurbished, and additional staff would be retained.

Due the relatively small inventories of fuel stored at the Chalk River and Whiteshell sites, it would be more cost effective to consolidate all fuel at one storage location or to combine the AECL fuel inventory with other waste owner's larger fuel inventory. However exploration of these options is outside the scope of this study.

Table 2: Key Assumed Dates for Implementation on Chalk River and Whiteshell sites

Milestone	Chalk River		Whiteshell	
	Nominal	Calendar	Nominal	Calendar
Government decision about preferred option and selection of the RES alternative	1	01Jul06	1	01Ju06
Review of RES alternatives for Chalk River and , Whiteshell research sites, and selection of preferred alternative	3	31Dec08	3	31Dec08
Implementation RES Alternative				
First basket loaded (Actual date)		1988		1986 (1)
Silos operational as RES	4	1Jan09	4	1Jan09
RES based on new dry technology becomes operational	11	1Jan16	13	1Jan18
Facility Decommissioning				
Research activities shutdown and the complete research site enters into safe-store mode. Some staff remains on site until research facility is completely dismantled.				
Last fuel removed from wet bay and all fuel now in dry storage				
Research facility buildings dismantled, site decommissioned, and dismantling staff is no longer present on the research site. RES facility becomes a stand-alone operation on the research site.	95	31 Dec 2100 (2)	55	31 Dec 2060 (3)

Notes:

1. The year when 360 bundles of Douglas Point fuel loaded into a silo on the Whiteshell site.
2. Chalk River Laboratories assumed to be fully decommissioned by 31 Dec 2100. However AECL has assumed that staff will be present on site for next 200 years from (Y1) to monitor and maintain various waste management facilities.
3. Whiteshell Laboratories assumed to be fully decommissioned by 31 Dec 2060. However AECL has assumed that staff will be present on site for next 200 years from (Y1) to monitor and maintain various waste management facilities.

3.3 SILO OPERATIONS

The Silos alternative schedule and cost estimate assume the fuel inventory is already held in storage, and therefore commences with a period of extended monitoring of the stored fuel. This includes intermediate facility repeat and repackaging events, when baskets will be removed from time served storage silos. Fuel in basket format will be transferred to new storage silos. Periodically, as baskets reach the end of the service lives, fuel will be transferred into replacement baskets, before being returned to replacement storage silos.

The dates for major events during Chalk River Silos operations are as follows:

Start of extended monitoring	Y4
Replace storage structures*	Y83 to Y84
Build repackaging facility**	Y281 to Y282
Repackaging event**	Y283

* Repeated every 100 years
** Repeated every 300 years

The dates for major events during Whitshell Silos operations are as follows:

Start of extended monitoring	Y4
Replace storage structures*	Y81 to Y82
Build repackaging facility**	Y279 to Y280
Repackaging event**	Y281

* Repeated every 100 years
** Repeated every 300 years

3.4 SSB OPERATIONS

The SSB alternative schedule and cost estimate assume the fuel inventory is already held in storage within a silo array. A storage building is then constructed over the silo array, then the facility enters a period of extended monitoring of the stored fuel. This includes intermediate facility repeat and repackaging events, when baskets will be removed from time served storage silos. Fuel in basket format will be transferred to new storage silos. Periodically, as baskets reach the end of the service lives, fuel will be transferred into replacement baskets, before being returned to replacement storage silos, within a replacement storage building.

The dates for major events during Chalk River SSB operations are as follows:

Construct storage building*	Y10
Start of extended monitoring	Y11
Replace storage structures*	Y109 to Y110
Build repackaging facility**	Y281 to Y282
Repackaging event**	Y283

* Repeated every 100 years
** Repeated every 300 years

The dates for major events during Whiteshell SSB operations are as follows:

Construct storage building*	Y12
Start of extended monitoring	Y13
Replace storage structures*	Y111 to Y112

Build repackaging facility**	Y279 to Y280
Repackaging event**	Y281

* Repeated every 100 years
** Repeated every 300 years

3.5 SST OPERATIONS

The SST alternative schedule and cost estimate assume the fuel inventory is transferred to storage below ground in storage chambers at an early date, followed by extended monitoring of the stored fuel. This period includes intermediate facility repeat and repackaging events, when time served storage silos are replaced within the storage chambers. Fuel in basket format will be transferred to new storage silos. Periodically, as baskets reach the end of the service lives, fuel will be transferred into replacement baskets, before being returned to replacement silos within the storage chambers.

The dates for major events during Chalk River SST operations are as follows:

Initial fuel receipts	Y11
Start of extended monitoring	Y12
Build replacement silos*	Y109 to Y110
Replace storage chambers**	Y209 to Y210
Build repackaging facility***	Y281 to Y282
Repackaging event***	Y283

* Repeated every !00 years
** Repeated every 200 years
** Repeated every 300 years

The dates for major events during Whiteshell SST operations are as follows:

Initial fuel receipts	Y13
Start of extended monitoring	Y14
Build replacement silos*	Y111 to Y112
Replace storage chambers**	Y211 to Y212
Build repackaging facility***	Y279 to Y280
Repackaging event***	Y281

* Repeated every !00 years
** Repeated every 200 years
** Repeated every 300 years

4 Cost Estimating Process

4.1 BASIS OF ESTIMATE

The cost estimates are based on the processes and activities considered necessary to establish and operate reactor extended storage facilities at the Chalk River and Whiteshell sites.
Each of the three conceptual designs is required to store used fuel arising at the Chalk River and Whiteshell. A separate cost estimate has therefore been established for each of the three RES alternatives, (Silos, SSB, and SST), giving 6 RES estimates in total.

Each cost estimate assumes the storage inventory appropriate to the site, and is accumulated over a defined period. Used fuel is to be stored at the RES facility indefinitely. To allow comparisons to be made between the facility alternatives, the estimates have been formulated over an extended period of time to capture costs associated with facility repeats and one repackaging event. Beyond the initial fuel receipt period, each estimate covers the activities considered necessary to maintain the facility over a nominal 300-year cycle, including a number of facility repeats and a repackaging event. This 300-year cycle is defined by the service life of the fuel containers (fuel baskets). This 300-year cycle of operational activities would be repeated indefinitely for each alternative.

4.2 WORK BREAKDOWN STRUCTURE

A work breakdown structure (WBS) was developed for each alternative and is based on the WBS developed for the CES alternatives.

The following prefixes have been used for the alternative specific WBS:

586 Chalk River Silos
587 Chalk River Silos in Storage Buildings (SSB)
588 Chalk River Silos in Storage Trenches (SST)

589 Whiteshell Silos
590 Whiteshell Silos in Storage Buildings (SSB)
591 Whiteshell Silos in Storage Trenches (SST)

4.3 METHODOLOGY

The RES cost estimates have been derived from the CES cost estimates (Ref. 4). Each CES cost estimate assumes the combined fuel inventory from all the fuel owners is stored at one location, in both storage cask (and module canister) and in basket format. To produce the RES estimates, the most appropriate CES cost estimates have been factored, to take account of the specific fuel inventory at the RES site. They have been further modified to consider only those costs relevant to storage of fuel in the format specific to each RES alternative.

To facilitate the factoring exercise, RES WBS schedules have been developed to an equivalent level to those for the CES WBS schedules. Each element on the WBS has been reviewed, and the contribution of the four cost categories (labour, material and equipment, other and contingency) has been considered in turn, and factored.

The scaling factors applied to develop the RES cost estimates consider:

- the reduced fuel inventory
- the reduced size of the storage complex
- the reduced number of fuel containers required for repackaging events
- the reduced quantities of fuel containers and building waste resulting from facility repeats and repackaging events
- reductions in personnel needed to operate the RES facilities

Some cost factors have been reduced to below unity, to reflect issues, such as a reduction in the size of the ancillary facility constructed for the RES facility, or the adoption of existing site services.

It is also recognised that some costs are incurred which are independent of the fuel inventory. The CES costs have therefore been included in full, such as repackaging buildings where similar processing rates to CES designs have been assumed to develop costs for equivalent facilities in the RES estimates.

In some instances, costs have been shared between the two AECL sites (such as fuel integrity monitoring, where a fuel test facility is constructed at only one site), appropriate cost contributions have allocated to site specific estimates. Similarly, where fuel owners adopt similar technologies, it is assumed they make cost contributions to facility designs such as basket repackaging facilities, rather than support such activities independently.

Some consideration has been given to whether each cost element can be considered as fixed, or step-fixed, and these are identified against each cost element line entry on the WBS schedules. The RES costs elements have been phased to the years identified for specific activities on the WBS schedules.

The structure for the cost estimates has been prepared by the development of the Work Breakdown Structures (WBS) for each alternative cost estimate (refer Figure 8, for typical WBS). Each element on the WBS has been broken down to the most appropriate level, to describe activities with sufficient accuracy for cost estimating purposes. The developed WBS is included in the appendix pertinent to each alternative. The developed cost estimate work elements have also been phased to years, to represent the timing within the cost estimate cycle, when these activities are scheduled.

The estimates are recorded in a series of Microsoft Excel Estimating Workbooks which include scope and cost information. Worksheets within the workbook represent the Level 2 Work Breakdown Structure. Each worksheet includes information on the estimated costs, the calculated contingency, cost categorisation, and the phasing to years for that cost element. The resultant costs are summarised on each worksheet, and carried forward to a summary of costs sheet. Hard copies of the Excel-based estimating workbooks for each alternative are presented in Appendices B and C and the electronic versions of the cost estimating data are presented on the CD in Appendix D.

Much of the cost estimating information for the processing of baskets, construction of surface storage buildings and the management of fuel inventories have been provided by OPG, on behalf of the fuel owners. The construction of concrete chambers is considered conventional from a civil engineering perspective.

4.4 MAJOR ASSUMPTIONS

Major high level assumptions are listed below. More detailed assumptions regarding each facility alternative are presented against each work element within the estimating workbooks in Appendices B to C respectively.

The major assumptions pertinent the RES program and the OPG site estimates are as follows:

- The system development costs (5xx-20) have been divided equally between the two AECL sites, since the development activities are considered to be identical, and largely independent of site considerations.

- The costs associated with the construction and maintenance of the 25-year fuel monitoring facility (5xx-45-20-70) have been allocated between the two AECL sites. The facility is assumed to be constructed at the Chalk River site, but will provide information on fuel integrity to the two AECL sites. However the cost of the staff required to carry out the fuel inspection work is shared between the 7 reactor sites.

- The program management function for the RES is administered centrally on behalf of the four fuel owning organisations. Regardless of the alternative selected by each fuel owner, each of the seven site estimates is assumed to make a contribution to this program management function.

- The estimate considers costs relating to the implementation of a stand-alone RES facility located on an existing research site.

- Detailed final design and the preparation of working drawings for the facility will commence immediately following EA approval and the acquisition of a CNSC Construction Licence.

- The estimate is based on RES designs that only receive CANDU used fuel bundles from AECL. The design capacity of the RES storage facilities is matched to the fuel inventories of the research sites.

- The scope of this cost study excludes consideration of non-standard fuels.

- The estimate is prepared and budgeted in current Canadian dollars, base January 2002, and is scheduled in elapsed time.

The RES alternative estimates have been scaled from the corresponding CES estimates in Ref 4. The reader is referred to this report for a more detailed description of the many assumptions that were made to develop the CES alternative estimates.

4.5 MAJOR EXCLUSIONS

The cost of interim storage on the Chalk River and Whiteshell sites and the cost of decommissioning of the interim storage facilities (except in Silos alternative estimates) are excluded from this cost estimate report. More specifically this report excludes the following:

1. The cost of operating and maintaining existing interim dry storage facilities, on the Chalk River and Whiteshell sites, as necessary, until the RES facilities become operational.

2. The cost of decommissioning redundant interim storage facilities after the RES facility has been brought into service and all fuel in interim storage has been transferred to the RES storage facility (except in Silos alternative estimates).

3. The cost of infrastructure support up to the point in time when research facilities are fully decommissioned. It is assumed that the Chalk River research facility will be fully decommissioned in Y95, and the Whiteshell research facility in Y55. Before the facilities are fully decommissioned, the RES facilities would have access to infrastructure support and services including security, site maintenance, administration building, visitor reception building, warehouse buildings, waste management buildings, utility buildings and the common fire protection, electrical, communication, water, and sanitary services. Following

research facility decommissioning, it is assumed that the RES facilities would inherit many of these infrastructure support and services in order to be stand-alone facilities on each research site.

5 Summary of Cost Estimates

The detailed cost estimates for the siting, construction, and extended operation of the three RES facility alternatives for each site are presented in Appendices B to C respectively.

For Chalk River, the total cost of each facility alternative than can accept 4,583 fuel bundles is approximately:
Silos $0.72 B
SSB $0.75 B
SST $0.76 B

For Whiteshell, the total cost of each facility alternative than can accept 360 fuel bundles is approximately:
Silos $0.71 B
SSB $0.74 B
SST $0.76 B

Figures 2 to 7 present the cumulative annual cash flow for the program to site develop, construct and operate each facility alternative over the first 145 years. The next three sections present cost estimates for each RES facility alternative by major work element, cost category and development phase, respectively. More detailed cost data is presented in the appendices.

Figure 2: Annual Cash flow projection and cumulative costs for Chalk River Silos Facility

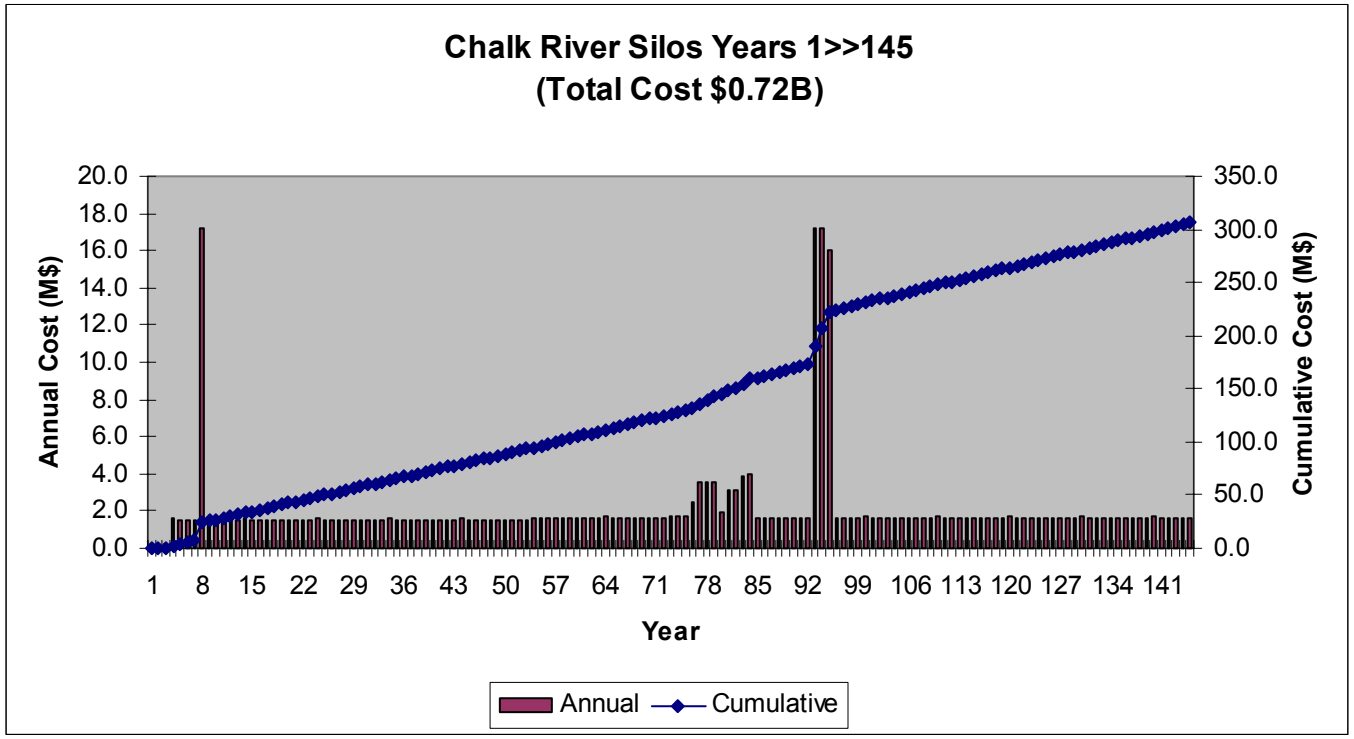


Figure 3: Annual Cash flow projection and cumulative costs for Chalk River SSB Facility

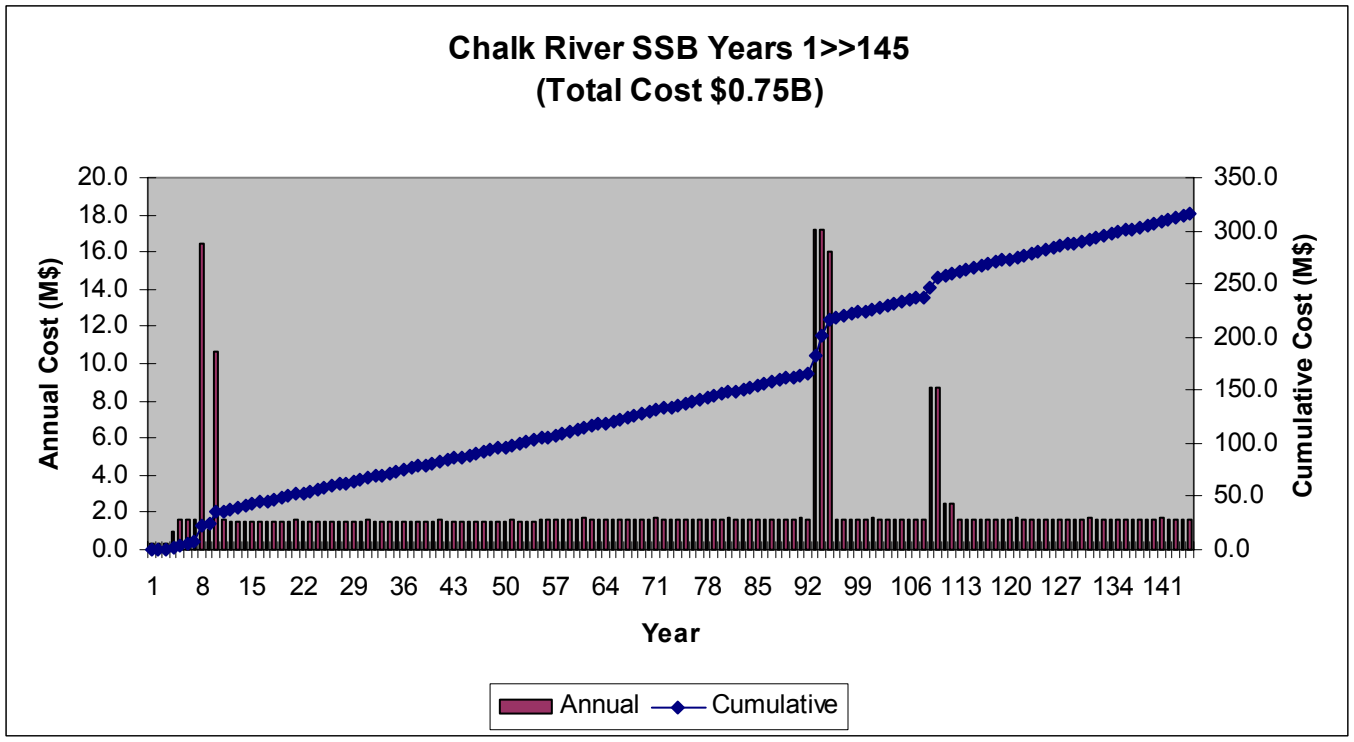


Figure 4: Annual Cash flow projection and cumulatative costs for Chalk River SST Facility

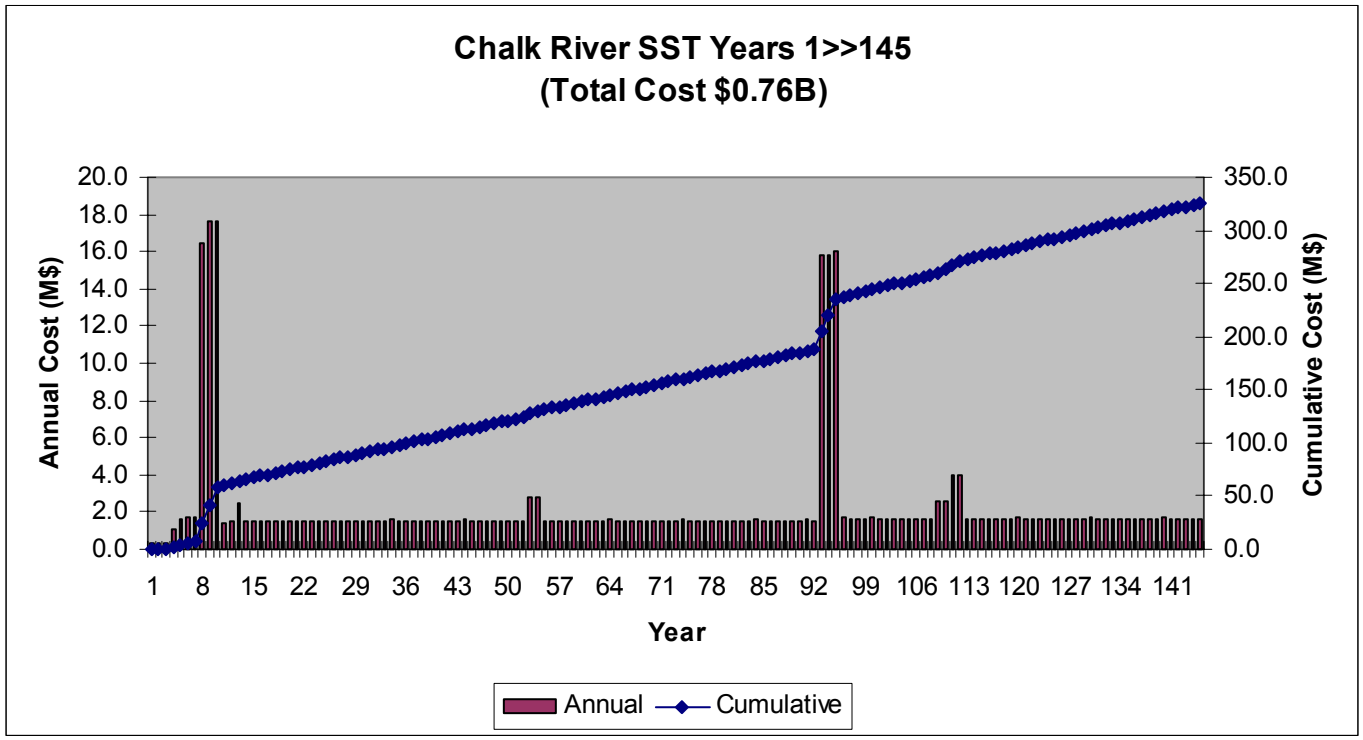


Figure 5: Annual Cash flow projection and cumulative costs for Whiteshell Silos Facility

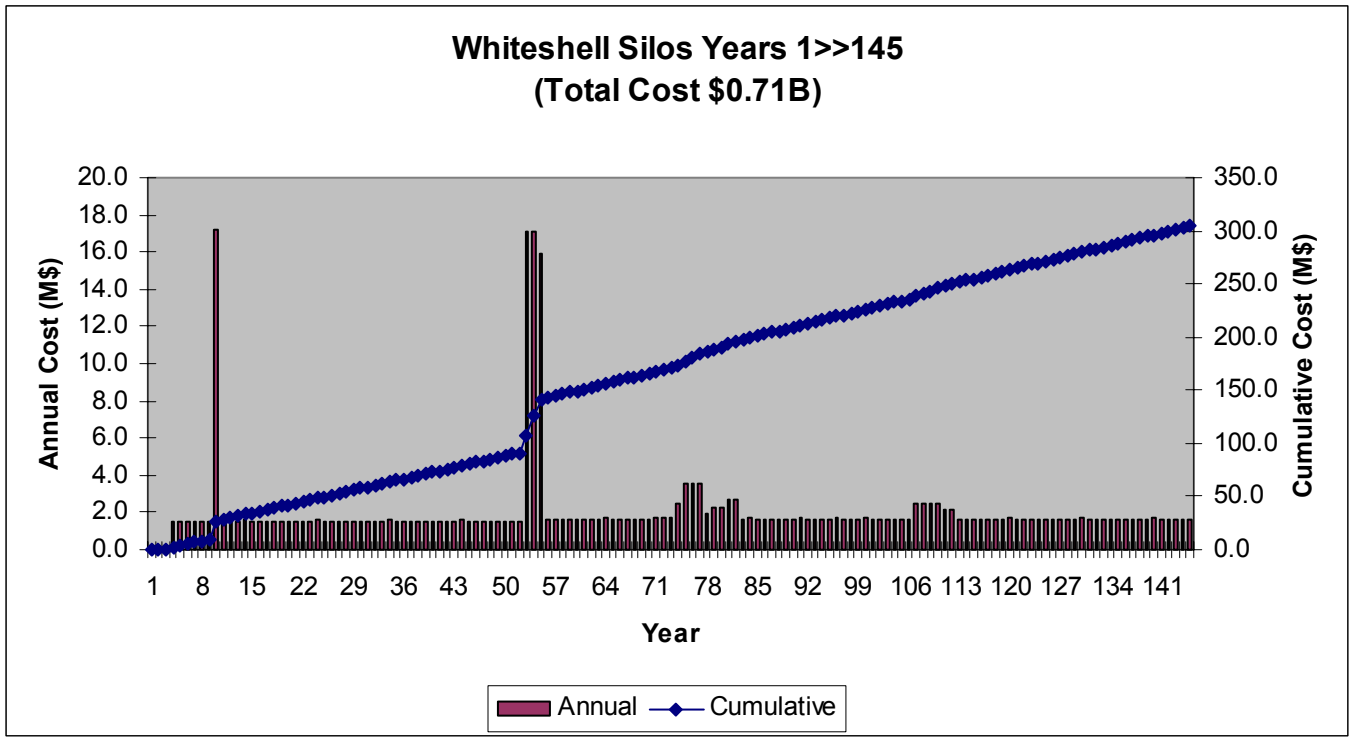


Figure 6: Annual Cash flow projection and cumulative costs for Whiteshell SSB Facility

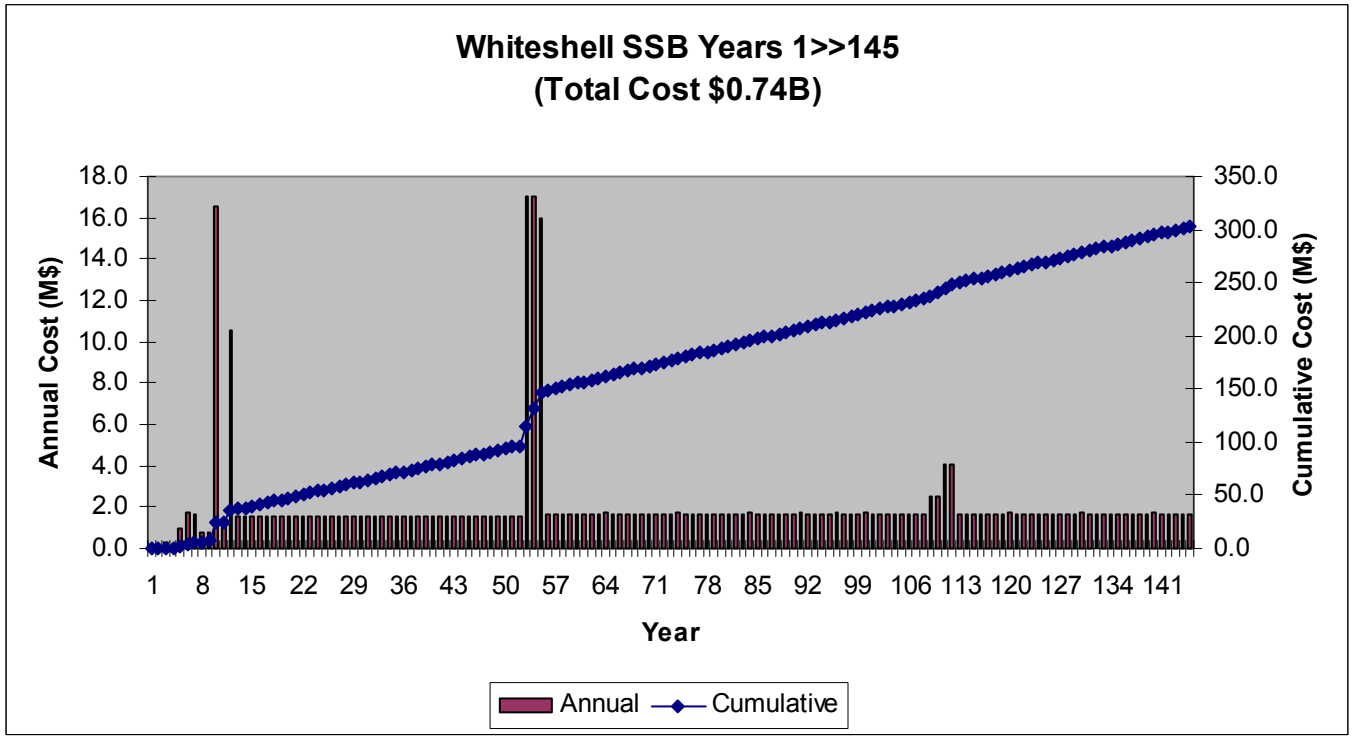


Figure 7: Annual Cash flow projection and cumulative costs for Whiteshell SST Facility

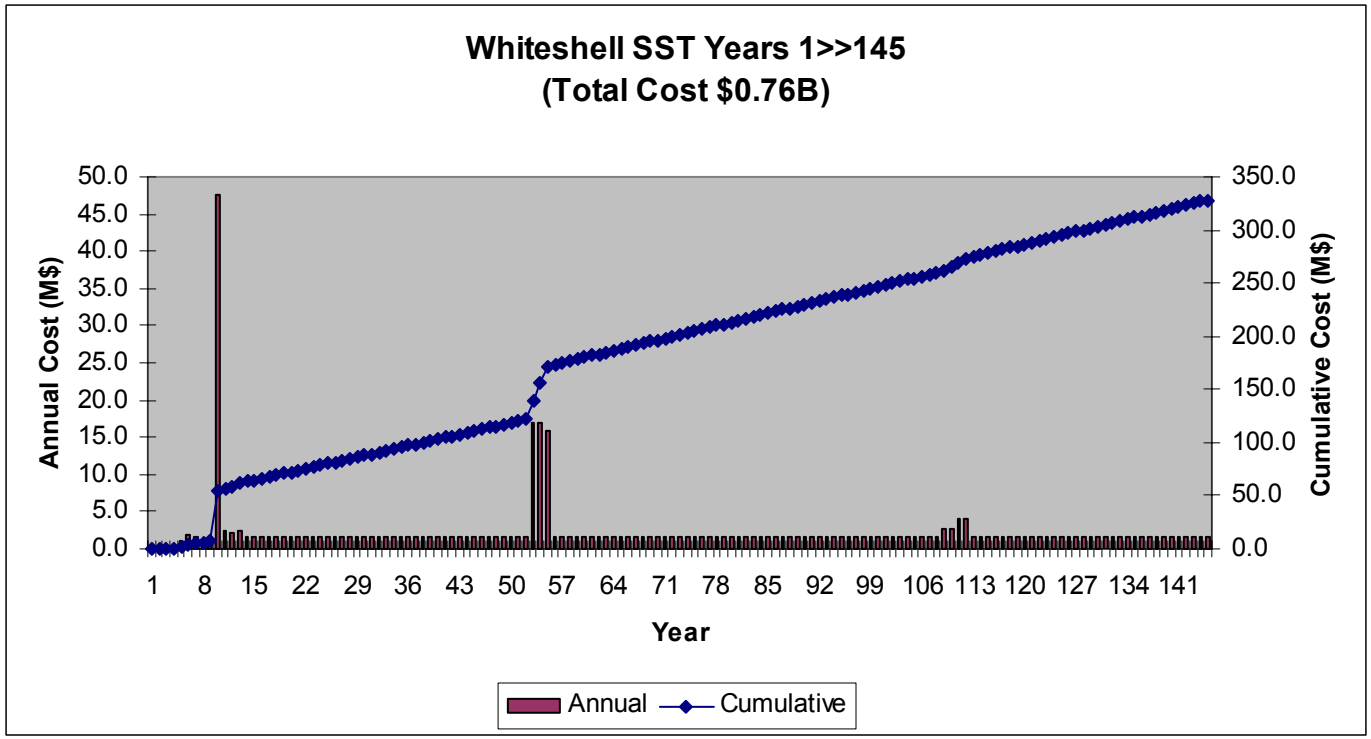


Figure 8: Typical Level 2 Work Breakdown Structure (5xx)

Reactor Extended Storage Facility Cost Estimate

Work Breakdown Structure, Coding and Estimating Responsibilities

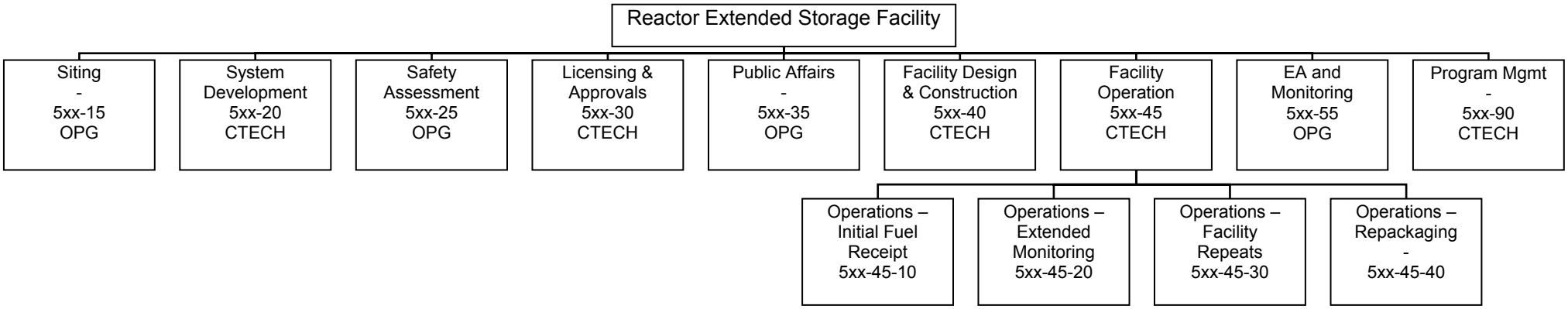


Table 3: Cost Estimates for Reactor Extended Storage Facilities by Level 2 Work Element

		Cost (2002 K$)					
		Chalk River			Whiteshell		
		586	587	588	589	590	591
WBS	**Description**	**Silos**	**SSB**	**SST**	**Silos**	**SSB**	**SST**
5xx.15	Siting	824	824	1,003	824	824	1,003
5xx.20	System Development	6,548	11,703	11,937	6,548	11,703	11,937
5xx.25	Safety Assessment	2,164	2,147	2,147	2,163	2,130	2,130
5xx.30	Licensing and Approvals	23,544	23,016	23,016	23,417	22,843	22,843
5xx.35	Public Affairs	1,718	1,718	1,718	1,718	1,718	1,718
5xx.40	Facility Design and Construction	20,520	30,081	51,389	20,520	30,081	51,509
5xx.45	Facility Operation	634,897	654,046	641,115	628,694	648,129	639,900
5xx.55	Environmental Assessment and Monitoring	25,844	25,685	25,685	25,795	25,454	25,454
5xx.90	Program Management	219	1,014	1,014	219	1,216	1,216
	Total Cost (K$)	**716,279**	**750,234**	**759,024**	**709,898**	**744,099**	**757,710**

Note:
Totals in tables may not equal summated values due to rounding arrangements within Cost Estimating Workbooks.

5.1 COSTS BY LEVEL 2 WORK ELEMENT

This section describes the work scope of work elements at Level 2 of WBS, irrespective of the RES alternative selected. Figure 8 shows the work elements at Level 2 of the program Work Breakdown Structure (WBS). This is a generic WBS and identified by the prefix number 5xx. There are 9 Level 2 work elements, which cover all the aspects of a program to site, develop and operate a reactor-site extended storage facility.

Table 3 presents total costs at Level 2 of the WBS for each of the alternatives. Separate appendices list all the work elements at the lowest level of the WBS and the costs associated with each of the alternatives are identified by the prefix numbers 586, 587 and 588 (Chalk River), and 589, 590 and 591 (Whiteshell) respectively

5xx-15 Siting

Siting includes all activities related to planning and implementing of a program to locate a suitable location for a RES facility on each of the research sites. Planning activities include development of a strategy to locate suitable sites for the RES facilities and public consultation. Implementation activities include site screening, environmental studies and site investigation, as required, at candidate locations on the two research sites.

5xx-20 System Development

System development includes all activities related to the optimisation of the conceptual design, and the development of the preliminary designs of the RES facility. The work activities include the preparation of drawings, descriptions, lists of materials, work force requirements, equipment requirements and associated calculations, and the output of these activities will get progressively more detailed as the facility design evolves. It provides design information necessary to support environmental assessments and site licence applications.

Specifically system development includes (where appropriate):

- Container system development work
- Preparation of geotechnical design and specifications
- Preparation of site-dependant designs during the siting process
- System applications including assessment of constructability, development and demonstrations of systems
- Development of performance specifications
- Security and safeguards

System development excludes final design for the RES facility. It also excludes engineering support during the construction and operation of the facility.

5xx-25 Safety Assessment

Safety Assessment includes all activities related to predicting the safety of RES facility and its potential impact. Safety assessments would be carried out through all phases of the development and operation of the RES facility. Safety assessments would be completed in support of licence applications. Safety Assessment includes the following work:

- Management of safety assessment work program up to the start of facility operations. After the start of operations the cost of managing the safety assessment program is included under Facility Operations.
- Safety assessment work during siting and construction including preparation of scoping assessment reports and the preparation of Preliminary Safety Assessment Report to support the Construction Licence application.
- Preparation of Final Safety Assessment Report to support the Operating Licence application.
- Updates of Safety Assessment Report, as required, to support Operating Licence renewals.

5xx-30 Licensing and Approvals

Licensing and Approvals includes interactions with all federal, provincial and municipal regulators, preparation and submission of licence applications for siting, construction and operation. Licensing and Approvals includes the following work:

- Liaison with the Canadian Nuclear Safety Commission (CNSC)
- Prepare and submit Construction Licence applications and ensure all necessary documents are submitted to support the applications.
- Establish approvals requirements and obtain all necessary federal, provincial and municipal approvals.
- Prepare and submit Operating Licence applications and ensure all necessary documents are submitted to support the applications.
- Renew and maintain the Operating Licences.

5xx-35 Public Affairs

Public Affairs work includes the development of a public affairs program to support the development and implementation of the public affairs strategy. The public affairs program is implemented through the development phases of the facility. A public affairs program provides information to key-decision makers, stakeholders, potential host communities, media and the general public.

The scope of the public affairs program would include the following:

- Public involvement program
- Impact management program
- Aboriginal affairs program
- Community information program
- Socio-economic impact assessment program
- Government relations program

5xx-40 Facility Design and Construction

Facility Design and Construction includes all activities that are required to prepare the detailed final design drawings of the RES facility. The scope of work includes the provision of facilities necessary to receive and store used fuel bundles, but excludes the on-going construction of storage capacity constructed during facility operations.

5xx-45 Facility Operation

Facility Operations comprises four activities:

- 5xx-45-10 Operations – Initial Fuel Receipt
- 5xx-45-20 Operations – Extended Monitoring
- 5xx-45-30 Operations – Facility Repeats
- 5xx-45-40 Operations – Repackaging

Initial fuel receipt covers the activities necessary to receive, condition and store fuel at the RES facility. For the Silos estimates, the fuel is already in storage, so this element is not addressed.

Extended monitoring covers the long-term management of the stored fuel inventory. Extended monitoring starts when the last storage container is initially placed into storage and continues indefinitely. Throughout the period of extended monitoring there is periodic refurbishment and replacement of storage structures and other buildings, and the periodic repackaging of the fuel.

Facility repeats covers the refurbishment or renewal of the storage complex facilities, which periodically reach the end of their service lives. Fuel bundles will be transferred from one storage structure to another, and the time served storage structure demolished (or refurbished) and replacement structures constructed, within the overall 'footprint' of storage complex.

Repackaging covers the periodic removal of fuel bundles from existing storage containers, which have reached the end of their service life. Fuel containers are transferred from the storage complex to a repackaging facility, where fuel bundles are transferred from an existing storage container to another.

5xx-55 Environmental Assessment and Monitoring

This includes the preparation of Environmental Assessment (EA) documents to support application for a Construction Licence and updates to the EA documents. It has been assumed that a federal EA would be triggered under any of the following conditions:

1. AECL sends letter of intent to CNSC to construct a new silo-based facility for storage of fuel baskets and to transfer fuel baskets from old silos into new storage silos (i.e. first 100-year transfer event in the Silos and SSB alternatives)
2. AECL sends letter of intent to CNSC to construct a new building structure over existing silo array (i.e. SSB alternative), or the transfer baskets into new structures (i.e. SST alternative).

EA-related work would include compilation of data, preparation of documents, document printing and attendance at a Hearing.

Environmental monitoring provides the tools and processes for monitoring the environmental performance of the RES facility. The monitoring program would be directed by the RES Environmental Management System (EMS) and the EMS would ensure that the implementing organisation's environmental policy is managed, implemented, checked and periodically reviewed within the overall context of continual improvement. It would provide both the process and assurance, to ensure that the policy is improving the environmental performance of the RES facility, while also demonstrating management's due diligence with respect to managing the corporation's environmental impacts.

The EMS would require monitoring and continually improving environmental performance. The EMS would encompass all environmental aspects of the RES facility.

The scope of environmental monitoring is restricted to monitoring the potential environmental impacts due to the day-to-day operations of the RES facility. The scope of this work element excludes specialised monitoring of the storage container and storage structure performance (included in 5xx-45).

5xx-90 Program Management

Program Management includes all necessary RES program support during the time period prior the start of facility operations. After the start of operations this function is subsumed into the work program captured under Facility Operations (5xx-45).

For the purpose of this cost estimate it has been assumed that the implementation of reactor-site extended storage at each of the seven sites will be managed by a single implementing organisation. Therefore the cost of Program Management is shared between the seven sites. It is assumed the implementing organisation is centrally located and would have the following functions:

- President's office
- Technical development program
- Quality management program
- Safety management program
- Finance and business services
- Human resources

The implementing organisation would receive technical support, as required, from an architect/engineering company throughout all phases of development, construction and operations of the RES facilities.

The estimate for each alternative includes the cost of program management staff overheads, taxes, insurance and legal fees within the various Program Management work elements.

For Silos alternatives it is assumed that the cost of Program Management is incurred over the period Y1 to Y3, leading to the start of extended monitoring on the research sites. The scope of the Program Management function would be relatively small during this period and work would be related to oversight and co-ordination of waste owner activities on the 7 reactor sites.

For the SSB and SST alternatives it is assumed that the cost of Program Management is incurred over a 10-year or 12 year period, starting in Y1 and until the last facility is brought into service on the Chalk River site in Y11 and the Whiteshell site in Y13 respectively.

5.2 COSTS BY COST CATEGORY

This section describes the four major cost categories that have been used in the cost estimate for each work element – namely labour, equipment and material, other and contingency. These categories are identical to those applied in the CES cost estimate (Ref. 4), and fuller descriptions are available in that document. A brief description of each categorisation is given below. Table 4 presents costs by category for each of the alternatives.

Labour cost is generally considered as salary costs plus labour burden and employee benefit. The labour cost may also include overheads, depending on the organisations involved in the project, or be defined within other work elements, such as 'indirect labour' costs.

Material and Equipment cost is the cost of acquiring materials for building construction and permanent equipment. The latter could include equipment used during operations, flasks, transporters, overhead cranes and similar. Material and equipment costs exclude the cost of installation.

Other costs include items such as consumables (fuel, utilities and non-permanent materials), permits and fees, taxes, communications costs, furniture, temporary monitoring equipment, and travel and accommodation expenses.

Contingency cost is included to improve the accuracy of a cost estimates to compensate for the inherent inaccuracies due to uncertainties in the RES program. The contingency should be large enough to compensate for the maximum range of inaccuracy associated with each estimate. The RES cost estimates are equal to the sum of all work element estimates and their associated contingencies.

Contingency has been assigned to the estimate by work element at the lowest level of the Work Breakdown Structure (WBS). This approach highlights any activities in the estimate subject to significant risk or estimating error, and enables future work to be more focused.

The contingency level applicable to each work element in the CES cost estimate has been assessed, to confirm its applicability to the RES cost estimates. In most instances, the same contingency level has been adopted for the RES estimate work elements. The overall percentage contingency levels for RES cost estimates and CES cost estimates are similar but not exactly the same, given that there are differences in the constituent parts of the cost estimates and certain activities, principally extended monitoring have differing durations.

Table 4: Cost Estimate for Reactor Extended Storage Facilities as Cost by Category

Cost Category	Cost (2002 K$)					
	Chalk River			Whiteshell		
	586	587	588	589	590	591
	Silos	**SSB**	**SST**	**Silos**	**SSB**	**SST**
Labour	329,243	345,031	352,382	327,728	342,143	353,394
Material and Equipment	125,033	134,599	134,315	124,570	133,954	133,710
Other	110,872	111,268	111,753	107,689	109,968	110,453
Contingency	151,131	159,337	160,574	149,911	158,033	160,152
Total Cost (K$)	**716,279**	**750,234**	**759,024**	**709,898**	**744,099**	**757,710**

5.3 COSTS BY MAJOR DEVELOPMENT ACTIVITY

The purpose of this section is to summarize the more detailed cost estimates presented in the appendices of this report. The costs have been grouped by major development activity; namely Siting, Construction, and Operation.

5.3.1 Siting

Activities carried out in Siting include development of a site location process, site screening, site evaluations, preparation of safety assessment and environmental impact assessment documents, system development work, a public affairs program, participation in public hearings and preparation of licence applications.

Most of the Siting work for Silos alternative is assumed to commence before the requirement for a new storage array, which must be established before the first 100 year facility repeat event. There would be some work in Y1 to Y3 related to the selection of a preferred alternative for the research site.

Table 5: Siting Costs for Silos Alternative (2002 K$)

Work Element	Description	Chalk River	Whiteshell
Siting	All costs captured under 5xx-15	824	824
EA& Construction Licence	Costs captured under 5xx-55-20	2,501	2,501
System Development	All costs captured under 5xx-20. Costs incurred prior to 300-year repackaging event and related to developing new technology for opening baskets and transferring fuel bundles to new baskets.	6,548	6,548
Safety Assessment	All costs captured under 5xx-25 except costs related SA work during Operations (5xx-25-50) and SA to support decommissioning activities (5xx-25-70)	682	682
Licensing and Approvals	All costs captured under 5xx-30 except costs related L&A work for renewal and maintenance of Operating Licence (5xx-30-70).	2,910	2,910
Public Affairs	All costs captured under 5xx-35.	1,718	1,718
Program Management	All costs captured under 5xx-90. Program management costs are incurred during years prior to start of extended monitoring;	219	219
Total (K$)		15,404	15,404

Table 6: Siting Costs for SSB Alternative (2002 K$)

Work Element	Description	Chalk River	Whiteshell
Siting	All costs captured under 5xx-15	824	824
EA& Construction Licence	All costs captured under 5xx-55-20	2,501	2,501
System Development	All costs captured under 5xx-20	11,703	11,703
Safety Assessment	All costs captured under 5xx-25 except costs related SA work during Operations (5xx-25-50) and SA to support decommissioning activities (5xx-25-70)	682	682
Licensing and	All costs captured under 5xx-30 except costs	2,910	2,910

Approvals	related L&A work for renewal and maintenance of Operating Licence (5xx-30-70)		
Public Affairs	All costs captured under 5xx-35	1,718	1,718
Program Management	All costs captured under 5xx-90. Program management costs are incurred during years prior to start of SSB operations.	1,014	1,216
Total (K$)		21,353	21,556

Table 7: Siting Costs for SST Alternative (2002 K$)

Work Element	Description	Chalk River	Whiteshell
Siting	All costs captured under 5xx-15	1,003	1,003
EA& Construction Licence	All costs captured under 5xx-55-20	2,501	2,501
System Development	All costs captured under 5xx-20	11,937	11,937
Safety Assessment	All costs captured under 5xx-25 except costs related SA work during Operations (5xx-25-50) and SA to support decommissioning activities (5xx-25-70)	682	682
Licensing and Approvals	All costs captured under 5xx-30 except costs related L&A work for renewal and maintenance of Operating Licence (5xx-30-70)	2,910	2,910
Public Affairs	All costs captured under 5xx-35	1,718	1,718
Program Management	All costs captured under 5xx-90. Program management costs are incurred during years prior to start of SST operations.	1,014	1,216
Total (K$)		21,766	21,969

5.3.2 Construction

The Construction work includes all initial work required to create a stand-alone RES facility with functional surface and underground facilities (if required by the alternative under consideration), and infrastructure are created for the purpose of used fuel storage. Most of the work begins following the receipt of regulatory (CNSC) approval to begin construction and ends when the "cold" and "hot" commissioning of the facilities are completed prior to receiving the first formal shipment of waste for storage operations. Note that construction, as an activity, will continue during the subsequent facility operations. Construction includes clearing of land, surface and/or underground excavation, construction of Processing Building and ancillary facilities, and construction of the first stage of the storage complex.

An overview of the assumed construction schedule is presented in Section 3.2 and the detailed schedules are presented in the appendices.

Table 8: Construction Costs for Silos Alternative (2002 K$)

Work Element	Description	Chalk River	Whiteshell
Transition to standalone RES facility	All site improvement and facility construction/refurbishment costs incurred at the time when the research facility is fully decommissioned and the RES must become a standalone operation	15,642	18,033
Prior to start of 100-year repackaging	Construction of new waste management facilities specifically required to support the first operations	4,878	2,487

event	during the first repackaging event. The cost of new processing building for 100-year repackaging event is captured under Operation costs		
Total (K$)		20,520	20,520

Table 9: Construction Costs for SSB Alternative (2002 K$)

Work Element	Description	Chalk River	Whiteshell
Initial construction	Initial construction of all facilities and services required for SSB operations.	25,203	25,203
Transition to standalone RES facility	All site improvement and facility construction/refurbishment costs incurred at the time when the research facility is fully decommissioned and the RES facility must become a standalone operation	4,878	4,878
Total (K$)		30,081	30,081

Table 10: Construction Costs for SST Alternative (2002 K$)

Work Element	Description	Chalk River	Whiteshell
Initial construction	Initial construction of all facilities and services required for SST operations.	46,510	46,630
Transition to standalone RES facility	All site improvement and facility construction/refurbishment costs incurred at the time when the research facility is fully decommissioned and the RES facility must become a standalone operation	4,878	4,878
Total (K$)		51,389	51,509

5.3.3 Operation

Following initial fuel receipts the facility enters into an indefinite period of extended monitoring. Activities during this period include routine monitoring of fuel, environmental monitoring, facility maintenance, security, and Operating Licence maintenance and renewal. During extended monitoring there are periods of increased activity, when fuel storage facilities will be replaced or refurbished, and fuel storage containers are periodically repackaged. It is assumed that the fuel will be transferred to new silo arrays every in all alternatives. Once every 300 years there would be a major repackaging event were the fuel would be transferred to new baskets.

The estimates for SST facility operation work are structured so that there is first stream of costs related to initial fuel receipts. This is followed by a series extended monitoring costs that would occur in perpetuity. During the extended monitoring program it will be necessary to periodically replace storage structures and to repackage fuel into new storage containers. The costs for these activities are not part of the extended monitoring program and they are incremental to the series of on-going extended monitoring costs.

All AECL estimates for Silos and SST alternatives do not have any initial fuel receipt costs and therefore the Operation costs for this alternative begins with a series extended monitoring costs.

An overview of the assumed operation schedule is presented in Section 3 and the detailed schedules are presented in the appendices.

5.3.3.1 Operations - Initial Fuel Receipt

The initial fuel receipt is the period in the life cycle of the RES facility when fuel is received and conveyed to the storage complex. In the case of the Silos and SSB alternatives, the fuel is already in an appropriate storage complex at the research sites and therefore the Silos and SSB estimates exclude any costs for initial fuel receipt. For SST alternatives, the fuel will be transferred from existing silo facilities into silos in storage chambers, once constructed.

5.3.3.2 Operations – Facility Repeats

The facility repeat events occur periodically given that the storage facilities and principal containment structures have a finite life span. Thus it will be necessary to move fuel baskets, from an ageing storage complex to new facilities. Depending on the alternative under consideration, this may be achieved by the staged building of additional storage capacity on the site, permitting the transfer of fuel containers from one storage location to another. Once the used fuel has been transferred and the storage unit has been emptied, the redundant building will be demolished, and a replacement unit is constructed at the same location.

5.3.3.3 Operations – Repackaging

Depending on the requirements of the alternative, the used fuel repackaging facility will perform functions relevant to the specific alternative under consideration. It is assumed that the repackaging facility will comprise a shielded cell complex, housed within a large building, configured to perform the activities required by the repackaging event.

The repackaging event, occurring every 300 years based on the service life of baskets requires the removal and transfer of fuel bundles to fresh baskets as required.

The shielded cell complex configured for the 300-year repackaging event is capable of allowing the opening of the baskets, and the withdrawal of the fuel bundles within. The fuel bundles are inserted into 'fresh baskets', and the basket assembly seal welded.

Table 11: Operations - Facility Repeat and Repackaging Costs for Silos Alternative (2002 K$)

Work Element	Description	Chalk River	Whiteshell
Storage structure (silos) repeats – 100 yrs	All costs captured under 5xx-45-30-20. Includes the cost of demolition of old storage structures, disposal of waste materials and construction of new structures.	1,865	2,106
Storage structure (silos) repeats – 200 yrs	All costs captured under 5xx-45-30-30	1,865	2,106
Storage structure (silos) repeats – 300 yrs	All costs captured under 5xx-45-30-40	1,780	2,007
Repackaging basket to basket – 300 yrs	All costs captured under 5xx-45-40-40. Includes the construction of new processing building, repackaging operations, acquisition of new baskets and disposal old baskets.	204,308	203,623
Program Management in support of periodic facility repeats and repackaging events	All costs captured under 5xx-45-40-05. These costs are incremental to ongoing Program management costs captured under Program Management during extended monitoring (5xx-45-20-05)	10,651	10,651

Total (K$)		220,469	220,493

Table 12: Operations - Facility Repeat and Repackaging Costs for SSB Alternative (2002 K$)

Work Element	Description	Chalk River	Whiteshell
Storage structures (silos) repeats – 100 yrs	All costs captured under 5xx-45-30-20. Includes the cost of demolition of old storage structures, disposal of waste materials and construction of new structures.	1,865	2,106
Storage structures (silos) repeats – 200 yrs	All costs captured under 5xx-45-30-30	1,865	2,106
Storage structures (silos) repeats – 300 yrs	All costs captured under 5xx-45-30-40	1,854	2,007
Storage building repeats – 100 yrs	All costs captured under 5xx-45-30-50. Includes the cost of demolition of old storage structures, disposal of waste materials and construction of new structures.	9,561	9,561
Storage building repeats – 200 yrs	All costs captured under 5xx-45-30-60	9,561	9,561
Storage building repeats – 300 yrs	All costs captured under 5xx-45-30-70	9,561	9,561
Repackaging basket to basket – 300 yrs	All costs captured under 5xx-45-40-40. Includes the construction of new processing building, repackaging operations, acquisition of baskets and disposal old baskets.	204,308	203,623
Program Management in support of periodic facility repeats and repackaging event	All costs captured under 5xx-45-40-05. These costs are incremental to ongoing Program management costs captured under Program Management during extended monitoring (5xx-45-20-05).	10,651	10,651
Total (K$)		249,225	249,174

Table 13: Operations - Initial Fuel Receipts, Facility Repeat and Repackaging Costs for SST Alternative (2002 K$)

Work Element	Description	Chalk River	Whiteshell
Initial Fuel Receipts	All costs captured under 5xx-45-10. Includes operations to package fuel and place into storage, and to construct additional storage structures. Includes cost of Program Management to support these operations.	4,511	4,511
Storage structures (silos) repeats – 100 yrs	All costs captured under 5xx-45-30-20. Includes the cost of demolition of old storage structures, disposal of waste materials and construction of new structures	1,865	2,106
Storage structures (silos) repeats – 200 yrs	All costs captured under 5xx-45-30-30	1,865	2,106
Storage structures (silos) repeats – 300	All costs captured under 5xx-45-30-40	1,780	2,007

yrs			
Storage chamber repeats – 200 yrs	All costs captured under 5xx-45-30-50. Includes the cost of demolition of old storage structures, disposal of waste materials and construction of new structures.	16,217	16,217
Repackaging basket to basket – 300 yrs	All costs captured under 5xx-45-40-40. Includes the construction of new processing building, repackaging operations, acquisition of new basket and disposal old baskets.	204,308	203,623
Program management during repackaging events	All costs captured under 5xx-45-40-05. These costs are incremental to ongoing Program management costs captured under Program Management during extended monitoring (5xx-45-20-05).	12,063	12,063
Total (K$)		242,610	242,633

5.3.3.4 Operations – Extended Monitoring

Extended monitoring is the period in the life cycle of the RES facility when fuel and storage structures are monitored and effectively commences at the end of initial fuel receipts and continues indefinitely. During this period there are periodic facility repeats and repackaging events.

For the purposes of these cost estimates it is assumed that the extended monitoring program spans a nominal 300-year time period. The extended monitoring program would include monitoring and surveillance activities at the storage structures, a fuel integrity monitoring program, environmental monitoring activities, building and services maintenance activities, work related to maintenance and renewal of the Operating Licence, site security and other site support staff, and a program management function.

It was assumed that the extended monitoring program for each alternative had the following duration:

<u>Silos</u>
Chalk River 280 years
Whiteshell 278 years

<u>SSB</u>
Chalk River 273 years
Whiteshell 269 years

<u>SST</u>
Chalk River 272 years
Whiteshell 268 years

Tables 14 to 16 summarize the extended monitoring costs for each alternative on the Chalk River and Whiteshell sites. The scope of each of the cost elements in these tables is described below. More detailed descriptions of scope can be found in the CES estimate report under the equivalent work elements.

Tables 17 and 18 present the data that were use to generate the extended monitoring costs. Table 17 shows the staffing model that was assumed to develop the labour estimates. Table 18

shows the assumed annual costs for material, equipment and other costs that would be incurred during an extended monitoring program on each reactor site. These annual expenses were assumed to be the same for all alternatives on each reactor site. The total cost for the labour and expenses varies between alternatives on the same reactor site due to differences in the assumed duration of the extended monitoring program.

Table 14: Operations - Extended Monitoring Costs for Silos Alternative (2002 K$)

Work Element	Description	Chalk River	Whiteshell
Program Management	All costs captured under 5xx-45-20-05	117,785	113,847
Monitoring & Surveillance	All costs captured under 5xx-45-20-40	560	430
Operation Indirects	All costs captured under 5xx-45-20-50	265,182	263,288
Common Ancillary Services Operations	All costs captured under 5xx-45-20-60	28,344	28,097
Fuel Integrity Monitoring	All costs captured under 5xx-45-20-70	2,557	2,538
Safety Assessment – Facility Operation & Decommissioning	All costs captured under 5xx-25-50 & -70	1,482	1,481
Operating Licence Renewal	All costs captured under 5xx-30-70	20,634	20,507
Environmental Monitoring	All costs captured under 5xx-55 except the costs associated with Environmental Assessment and Construction Licensing work (5xx-55-20)	23,343	23,293
Total (K$)		459,887	453,481
Annual Cost	Total cost of extended monitoring divided by duration of 280 years for Chalk River, 278 years for Whiteshell	$1.64M/a	$1.63M/a

Table 15: Operations - Extended Monitoring Costs for SSB Alternative (2002 K$)

Work Element	Description	Chalk River	Whiteshell
Program Management	All costs captured under 5xx-45-20-05	114,840	113,157
Monitoring & Surveillance	All costs captured under 5xx-45-20-40	546	416
Operation Indirects	All costs captured under 5xx-45-20-50	258,553	254,765
Common Ancillary Services Operations	All costs captured under 5xx-45-20-60	28,344	28,097
Fuel Integrity Monitoring	All costs captured under 5xx-45-20-70	2,538	2,520
Safety Assessment – Facility Operation & Decommissioning	All costs captured under 5xx-25-50 & -70	1,464	1,448
Operating Licence Renewal	All costs captured under 5xx-30-70	20,106	19,933
Environmental Monitoring	All costs captured under 5xx-55 except the costs associated with Environmental Assessment and Construction Licensing work (5xx-55-20)	23,184	22,952
Total (K$)		449,576	443,288
Annual Cost	Total cost of extended monitoring divided by duration of 273 years for Chalk River, 269	$1.65M/a	$1.65M/a

	years for Whiteshell		

Table 16: Operations - Extended Monitoring Costs for SST Alternative (2002 K$)

Work Element	Description	Chalk River	Whiteshell
Program Management	All costs captured under 5xx-45-20-05	114,419	112,737
Monitoring & Surveillance	All costs captured under 5xx-45-20-40	548	415
Operation Indirects	All costs captured under 5xx-45-20-50	257,606	253,817
Common Ancillary Services Operations	All costs captured under 5xx-45-20-60	23,393	28,097
Fuel Integrity Monitoring	All costs captured under 5xx-45-20-70	2,538	2,201
Safety Assessment – Facility Operation & Decommissioning	All costs captured under 5xx-25-50 & -70	1,464	1,448
Operating Licence Renewal	All costs captured under 5xx-30-70	20,106	19,933
Environmental Monitoring	All costs captured under 5xx-55 except the costs associated with Environmental Assessment and Construction Licensing work (5xx-55-20)	23,184	22,952
Total (K$)		443,259	441,599
Annual Cost	Total cost of extended monitoring divided by duration of 272 years for Chalk River, 268 years for Whiteshell	$1.63M/a	$1.65M/a

5xx-45-20-5 Program Management (during extended monitoring)
For the purposes of these cost estimates it is assumed that the program management function is located at a central location (Waste Management Organization) and will service the 7 reactor sites.

Table 17 shows the number of full-time equivalent staff numbers that would be dedicated to the Chalk River and Whiteshell RES facilities. The WMO is assumed to have 11 full-time staff and 0.8 of these staff are dedicated to servicing each of the AECL RES facilities. The remainder of the staff will service the RES facilities on the other 5 reactor sites. By comparison the CES estimate has 8 full-time staff in the WMO during extended monitoring.

In addition to labour costs, there are other costs related public affairs expenses, overheads, insurance, community offsets and benefits, and legal fees. For the purposes of this cost estimate it is assumed that an RES facility on the Chalk River and Whiteshell sites will not be subject to provincial sales tax (PST) and property tax payments. The assumed annual costs for each of these other cost items are listed in Table 18.

5xx-45-20-40 Monitoring and Surveillance
Monitoring and surveillance of the baseline conditions within the storage complex including maintenance of the monitoring systems and evaluation of engineered barriers against performance criteria. Activities include the collection of monitoring data, evaluation of the data and reporting. Includes monitoring of the mimic fuel in a test facility.

It is assumed that 0.5 full-time staff could carry out all required tasks at the Chalk River and Whiteshell RES facilities. Material and equipment costs are assumed to be $1K/a for each site.

5xx-45-20-50 Operations Indirects

Operation indirects covers all activities and costs to maintain storage buildings, repackaging buildings and secure the RES facility during extended monitoring. Includes cost of local site management and administrative staff, a regular maintenance crew for the storage complex and ancillary facilities, and security staff. Where possible the labour would be shared between reactor sites.

Other costs are included for material and equipment during refurbishment and replacement work programs for the ancillary facilities ($75K/a), armed response capability ($50K/a) and energy consumption ($3K/a) per site.

It is assumed that all seven reactor sites will be monitored from one central secure monitoring room. There would be local security staff at each site that could respond to an incident at the site.

5xx-45-20-60 Common Ancillary Facility Operations

This work element covers the cost of periodic refurbishment of the common ancillary facilities and ensuring that all facilities are available for use during the period of extended monitoring. Includes the cost of a major refurbishment of the facilities every 30 years. The cost for replacement of facilities every 100 years is captured elsewhere in the estimate.

5xx-45-20-70 Fuel Integrity Monitoring

It is assumed that the fuel bundles need to be inspected every 25 years to confirm that that the bundles are maintaining their integrity. The cost estimate assumes that a crew of 8 people would be used to carry out this inspection work and the same crew would inspect fuel at each of the 7 reactor sites. This estimate includes the construction, operation and maintenance of a monitoring facility to inspect the integrity of a small number of fuel bundles from baskets on a 25-yearly program. Cost of the fuel integrity-monitoring program is shared between the 7 reactor sites. It is assumed that one of the three cask sites and one of the four basket sites would be inspected every 25 years.

In order to inspect the fuel a shielded cell must be available. The CES cost estimate assumes the processing building shielded cell can house monitoring facility up to the100-year repackaging event and the repackaging cell can house the monitoring equipment up to the 200 and 300 year repackaging events. In the case of Silos, SSB and SST there is no processing building shielded cell available until the 300 year repackaging event, so an additional allowance (relative to CES) is included for a cell on Chalk River and Whiteshell site cost estimates.

5xx-25-50 Safety Assessment – Facility Operations

Safety assessment work would be carried out support periodic renewal of the facility operation licences. It is assumed that this work would be carried out a central location which would lead to cost savings due to sharing of knowledge and information between reactor sites.

5xx-30-70 Operating Licence Renewal

The operating licenses for the storage facilities will be need to be maintained and renewed during periods of extended monitoring. The extended monitoring operating licence would have

longer terms, fewer conditions and a reduced fee relative to the operating licence for a facility when the fuel is being handled. For the purposes of this cost estimate it is assumed that one WMO staff would be dedicated to license renewal work for the 7 reactor sites and the cost of this person would be shared amongst the seven sites**.**

It is assumed the annual fee for Operating Licenses for the Chalk River and Whiteshell RES facilities will be $100K/a (about 0.33 fte/a of CNSC staff time) or $50K per site.

5xx-55 Environmental Monitoring

The monitoring program encompasses all environmental aspects of the RES facility including monitoring of radiological and non-radiological emissions to:

- Air
- Surface water and groundwater
- Soil
- Flora and Fauna
- Produce

The program would also include on-going monitoring of human health of the population in the vicinity of the RES.

Table 17: Staffing Model for Extended Monitoring Program (FTE/a)

Staff Function	Pickering	Bruce	Darlington	Point Lepreau	Gentilly	Chalk River	Whiteshell	RES Total	CES Total
5xx-45-20-5 Program Management (WMO staff during extended monitoring)									
President	0.2	0.2	0.2	0.1	0.1	0.1	0.1	1	1
Public Affairs	0.1	0.1	0.1	0.05	0.05	0.05	0.05	0.5	1
Procurement	0.1	0.1	0.1	0.05	0.05	0.05	0.05	0.5	0.33
Quality Assurance	0.1	0.1	0.1	0.05	0.05	0.05	0.05	0.5	0.33
Safety	0.1	0.1	0.1	0.05	0.05	0.05	0.05	0.5	0.33
Finance & Business Services	1	1	1	0.25	0.25	0.25	0.25	4	3
HR & Payroll	1	1	1	0.25	0.25	0.25	0.25	4	3
Subtotal	*2.6*	*2.6*	*2.6*	*0.8*	*0.8*	*0.8*	*0.8*	*11*	*9*
5xx-45-20-40 Monitoring & Surveillance									
Monitoring & surveillance of storage structures	1	1	1	0.5	0.5	0.5	0.5	5	5
5xx-45-20-50 Operation Indirects									
Site Management	1	1	1	0.5	0.5	0.5	0.5	5	3
Security (5 shifts)	10	10	10	5	5	5	5	50	17
Central Secure Monitoring Room (5 shifts)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	5	
Administration (invoicing, records, clerical)	0.3	0.3	0.3	0.1	0.1	0.1	0.1	1.6	4
Maintenance of	0.3	0.3	0.3	0.2	0.2	0.2	0.2	1.6	3

Staff Function	Pickering	Bruce	Darlington	Point Lepreau	Gentilly	Chalk River	Whiteshell	RES Total	CES Total
storage structures									
Maintenance of site infrastructure	0.7	0.7	0.7	0.4	0.4	0.4	0.4	3.4	7
Subtotal	*13*	*13*	*13*	*7*	*7*	*7*	*7*	*67*	*34*
5xx-45-20-60 Common Ancillary Services Operations									
Maintenance & 30-yr refurbishment of ancillary facilities	3	3	3	1	1	1	1	13	5
5xx-45-20-70 Fuel Integrity Monitoring									
8 staff x 10 events over nominal 300 years – same crew for 7 sites. Staff shown as equivalent annual numbers	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.7	0.5
5xx-25-50 Safety Assessment – Facility Operation (support O/L Renewal)									
Staff at central location servicing 7 sites	0.25	0.25	0.25	0.08	0.08	0.08	0.08	1	1
5xx-30-70 Operating Licence Renewal									
Staff at central location servicing 7 sites	0.25	0.25	0.25	0.08	0.08	0.08	0.08	1	1

Staff Function	Pickering	Bruce	Darlington	Point Lepreau	Gentilly	Chalk River	Whiteshell	RES Total	CES Total
5xx-55 Environmental Monitoring									
Program Mgt (shared)	0.5	0.5	0.5	0.1	0.1	0.1	0.1	2	2
Ground Water	0.2	0.2	0.2	0.02	0.02	0.02	0.02	0.68	0.6
Rad Biosphere	1	1	1	0.1	0.1	0.1	0.1	3.4	3.3
Non-rad Biosphere	0.2	0.2	0.2	0.05	0.05	0.05	0.05	0.8	0.8
Human Health	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.15	0.17
Subtotal	*1.93*	*1.93*	*1.93*	*0.29*	*0.29*	*0.29*	*0.29*	*7*	*7*
Total	**22**	**22**	**22**	**10**	**10**	**10**	**10**	**106**	**62**

Note:
1. Sums may not equal to totals due to rounding.

Table 18: Annual Expenses During Extended Monitoring Program (2002 K$/a)

Cost Item	Pickering	Bruce	Darlington	Point Lepreau	Gentilly	Chalk River	Whiteshell	RES Total	CES Total
5xx-45-20-5 Program Management (WMO expenses)									
Public Affairs Expense	30	30	30	15	--	15	15	135	100
Overheads	296	296	296	118	118	118	118	1360	926
Insurance	123	123	123	50	50	50	50	569	135
Community Compensation	50	50	50	50	50	50	50	350	68.5
Legal Fees	100	100	100	25	25	25	25	400	400
PST	6	6	6	--	--	--	--	18	16.8
Property Tax – Repackaging Building	336	336	336	157	--	--	--	1165	208
Property Tax – Storage Buildings & Ancillary Facilities	1149	1562	1145	797	--	--	--	4653	818
Subtotal	*2,090*	*2,503*	*2,086*	*1,212*	*243*	*258*	*258*	*8,650*	*2,672.3*
5xx-45-20-40 Monitoring & Surveillance									
Material & Equipment for Monitoring & surveillance of storage structures	1	1	1	1	1	1	1	7	2
5xx-45-20-50 Operation Indirects									
Material & Equipment	150	150	150	75	75	75	75	750	288
Armed Response	300	300	300	50	50	50	50	1100	1,312

Cost Item	Pickering	Bruce	Darlington	Point Lepreau	Gentilly	Chalk River	Whiteshell	RES Total	CES Total
Energy Consumption	30	30	30	5	5	3	3	106	82
Subtotal	*480*	*480*	*480*	*130*	*130*	*128*	*128*	*1,956*	*1,682*
5xx-45-20-80 Common Ancillary Services Operations									
No expenses	--	--	--	--	--	--	--	--	--
5xx-45-20-70 Fuel Integrity Monitoring									
Material & Equipment for fuel integrity monitoring program	3.3	3.3	3.3	2.5	2.5	2.5	2.5	20	10
Other costs for fuel integrity monitoring program	0.7	0.7	0.7	0.5	0.5	0.5	0.5	4	2
Subtotal	*4*	*4*	*4*	*3*	*3*	*3*	*3*	*24*	*12*
5xx-25-50 Safety Assessment - Facility Operation (support O/L Renewal)									
Expenses	1	1	1	0.5	0.5	0.5	0.5	5	4
5xx-30-70 Operating Licence Renewal									
CNSC fees	70	70	70	50	50	50	50	410	200
Travel expenses	2	2	2	1	1	1	1	10	4
Subtotal	*72*	*72*	*72*	*51*	*51*	*51*	*51*	*420*	*204*
5xx-55 Environmental Monitoring									
Program Mgmt - Other	3	3	3	1.5	1.5	1.5	1.5	15	10
Ground Water –	6	6	6	3	3	3	3	30	15.3

Cost Item	Pickering	Bruce	Darlington	Point Lepreau	Gentilly	Chalk River	Whiteshell	RES Total	CES Total
M&E									
Ground Water - Other	4	4	4	2	2	2	2	20	11
Rad Biosphere – M&E	18	18	18	9	9	9	9	90	54.2
Non-rad Biosphere – M&E	6	6	6	3	3	3	3	30	14
Human Health - Other	1	1	1	0.5	0.5	0.5	0.5	5	2.2
Subtotal	*38*	*38*	*38*	*19*	*19*	*19*	*19*	*190*	*106.7*
Total (K$)	**2,686**	**3,099**	**2,682**	**1,416.5**	**447.5**	**460.5**	**460.5**	**11,252**	**4,683**

Notes:

1. Sums may not equal to totals due to rounding.
2. Program management (WMO), fuel integrity monitoring and operating licence renewal staff are assumed to centrally located.
3. Overheads for centrally located program management staff are assumed to be $45K/staff and costs are shared between 7 sites. Facility based staff overheads are assumed to be $8K/staff (see CES DETS for 561-90). For example Pickering has 3.2 centrally located staff and 18.9 facility-located staff leading to $296K/a in overhead costs.
4. Insurance based on premiums paid for a WWMF-type facility when handling fuel - conventional is $175K/a and nuclear is $65K/a (see ED026 in Annex 1 of Ref. 5). Assumed 50% reduction of conventional and nuclear liability insurance premiums during extended monitoring when facility is essentially dormant. Vehicle insurance is $600/vehicle/a where there is 5 vehicles at OPG facilities and 2 vehicles at other facilities.
5. OPG property tax based on an assessment of 4.08% on repackaging building and 2.87% on other buildings. During active fuel handling the assessed value of buildings is assumed to be 50% of the construction cost (see ED020 in Annex 1 of Ref. 5) and during extended monitoring assessed value is assumed to be 15% of construction cost. The construction costs for the various buildings are summarized in Section 5.3.2 and 5.3.3. The property tax values for repackaging buildings and storage buildings and ancillary facilities are average values for the three alternatives at each site. Calculated values for each alternative have been included in the cost estimates.

   NBP property tax values based on an assessment of 2.6% on all buildings. During active fuel handling (facility repeats (15 years total) and basket repackaging events (5 years)) the assessed value of buildings is assumed to be 50% of the construction cost and during extended monitoring assessed value is assumed to be 15% of construction cost. The construction costs for the various buildings are summarized in Section 5.3.2 and 5.3.3. The property tax values for the repackaging building and storage buildings and ancillary facilities are average values for the three alternatives. Calculated values for each alternative have been included in the cost estimates.

   It is assumed that there is no property tax on facilities located on the Gentilly, Chalk River and Whiteshell sites.

6. One team carries out fuel integrity monitoring program at 7 sites. One basket site and one cask site are inspected every 25 years. Costs are shared between the sites.
7. Operating licence renewal is assumed to occur every 10 years but the costs are annualized.

6 Estimation of Long-term Costs

The RES study has been assumed that the facilities would need to operate indefinitely. In order to do so the RES facilities would be refurbished on a regular basis and the fuel would need to be periodically repackaged when fuel containers reach the end of their service life. These refurbishment and repackaging activities would be carried out indefinitely.

This estimate report presents costs in the first 320 years of the RES facility operations for each facility alternative. The last 300 years of this time period represents a complete cycle of facility refurbishment and repackaging for all RES facility alternatives. Should it be necessary to define the costs beyond Y320 then the costs for this 300-year period can simple be repeated as required to generate costs, say, for 620, 920 years and so on.

7 References

1 Cost Estimates for Reactor-site Extended Storage Facility Alternatives for Used Nuclear Fuel. Alternatives for Pickering, Bruce and Darlington Reactor Sites.
CTECH Report No: 1105/MD18084/REP/16 - December 2003

2 Cost Estimates for Reactor-site Extended Storage Facility Alternatives for Used Nuclear Fuel. Alternatives for New Brunswick Power's Point Lepreau Reactor Site.
CTECH Report No: 1105/MD18084/REP/17 - December 2003

3 Cost Estimates for Reactor-Site Extended Storage Facility Alternatives for Used Nuclear Fuel. Alternatives for Hydro-Québec's Gentilly Reactor Site.
CTECH Report No: 1105/MD18084/REP/18 - December 2003

4 Cost Estimates for Four Centralized Storage Facility Alternatives for Used Nuclear Fuel.
CTECH Report No: 1105/MD18084/REP/11 - September 2003

5 Cost Estimate for a Deep Geologic Repository for Used Nuclear Fuel.
CTECH Report No: CTECH Report No: 1106/MD18085/REP/02 - September 2003

6 Conceptual Designs for Reactor-Site Extended Storage Facility Alternatives for Used Nuclear Fuel, Alternatives for AECL's Chalk River and Whiteshell Reactor Sites.
CTECH Report No: 1105/MD18084/REP/15 - April 2003

7 Conceptual Designs for Four Centralized Extended Storage Facility Alternatives for Used Nuclear Fuel. CTECH Report No: 1105/MD18084/REP/08 - April 2003.

APPENDIX A

Glossary of Terms

Assumption – a statement or hypothesis made concerning unknown factors and data that are required to accomplish the cost analysis. Assumptions should be clearly identified in all cost estimating documents.

Activity – a basic element of work or task that must be performed in order to complete a project. An activity occurs over a given period of time.

Allowances – additional resources included in estimates to cover the cost of known but undefined requirements for an individual activity or work item.

Conceptual design cost estimate – an estimate made with conceptual engineering data. This type of estimate should be accurate within +50% or -30% of the most probable final cost.

Constant dollars – current, and future costs that reflect the level of prices of a base year. Constant dollars have the effects of inflation removed.

Contingency – a separately planned amount used to allow for future situations which may be planned for only in part (sometimes referred to as "known unknowns"). Contingencies are intended to reduce the impact of missing cost or schedule objectives. Contingencies are normally included in the project's cost and schedule baselines. Contingencies usually exclude changes in scope, quality or unforeseeable major events such as strikes, earthquakes, etc.

Cost – the amount measured in money, cash expended, or liability incurred, in consideration of goods and/or services received.

Cost Estimating – the determination of quantity and the prediction or forecasting, within a defined scope, of the costs required to provide services, construct and equip a facility, to manufacture goods, or to furnish a space. Costs are determined utilising experience and calculating and forecasting the future cost of required resources, methods, and management within a scheduled time frame. Included in these costs are an assessment and evaluation of risks and uncertainties.

Equipment cost – is the cost of acquiring permanent equipment such as heavy equipment (trucks, forklifts, cranes) to be used during operations, container fabrication equipment, and laboratory and office equipment. Equipment cost does not include the labour cost for installing the equipment.

Fixed cost – is a cost that is <u>not</u> sensitive to total quantity of waste being shipped or stored, or to facility or system throughput capacity. For example, most development costs, all siting costs, safety assessment, licensing and approval costs, environmental monitoring costs, many infrastructure costs (roads, surface facilities, utilities), program costs (program management, public affairs, administration) are not sensitive to total

quantity of waste or the facility or system throughput capacity. Fixed costs are generally unavoidable costs and must be paid irrespective of total waste quantity or throughput capacity.

Indirect costs – (1) in construction, all costs which do not become a final part of the installation, but which are required for the orderly completion of the installation and may include, but are not limited to, field administration, direct supervision, capital tools, start-up costs, contractor's fees, insurance, taxes, etc.; (2) in operations, costs not directly assignable to the end product or process, such as overhead and general purpose labour, or costs of outside operations. Indirect operating cost may include insurance, property taxes or grants in lieu of taxes, maintenance, depreciation, warehousing and loading.

Labour cost – the salary plus labour burden. Labour cost may not include overhead costs, which are estimated separately.

Life cycle costs – the inclusion of all costs incurred during the total life (from project initiation through to decommissioning) of a facility and/or system, or aggregation of facilities and/or systems. Life cycle cost estimates would include, where applicable, costs for development, siting, licensing, construction, operation, extended monitoring and decommissioning.

Material cost – refers to the cost of permanent materials only, consumables are listed under "other costs". When the purchase cost includes installation (e.g. of building materials) the estimator will be requested to provide a cost breakdown indicating separately the material cost and the installation labour cost.

Milestone – an important or critical event and/or activity that must occur when scheduled in the project cycle in order to achieve the project objective(s).

Other costs – includes items such as consumables (fuel, utilities and non-permanent materials), permits and fees, taxes, duties, licences, royalties, communication costs, furniture, temporary monitoring equipment, and travel and accommodation expenses.

Program management – includes all activities in the implementing organization that cannot be identified with work, products or assets within the organization. Program management activities within the implementing organization would include senior management support and direction, administrative and clerical services, financial and business services, quality engineering services, safety program, human resources and payroll services, records management, and procurement services. Program management would include overheads such as the following: taxes or grants in lieu of taxes, insurance, communication services, office space, office furniture, office supplies and general expenses.

Project management – labour comprising the implementing agency staff who are directly involved in the administration or execution of scientific and engineering work.

Step-Fixed Cost - is a type of fixed cost that is sensitive to changes in total quantity of waste shipped or stored, or to the waste throughput capacity of the facility or system. If the total quantity of waste changes or the waste throughput capacity changes, then the size or number and the associated cost of some infrastructure or capital-cost items will change. Examples of step-fixed costs are the following:

- Waste processing, conditioning and packaging facilities

- Waste package handling equipment
- Storage buildings.

Work breakdown structure (WBS) – a hierarchical grouping of work elements, which organises and defines the total scope of the facility or system. Each descending level represents an increasing detailed definition of the work.

APPENDIX B

B1 Estimating Workbooks for Chalk River Site

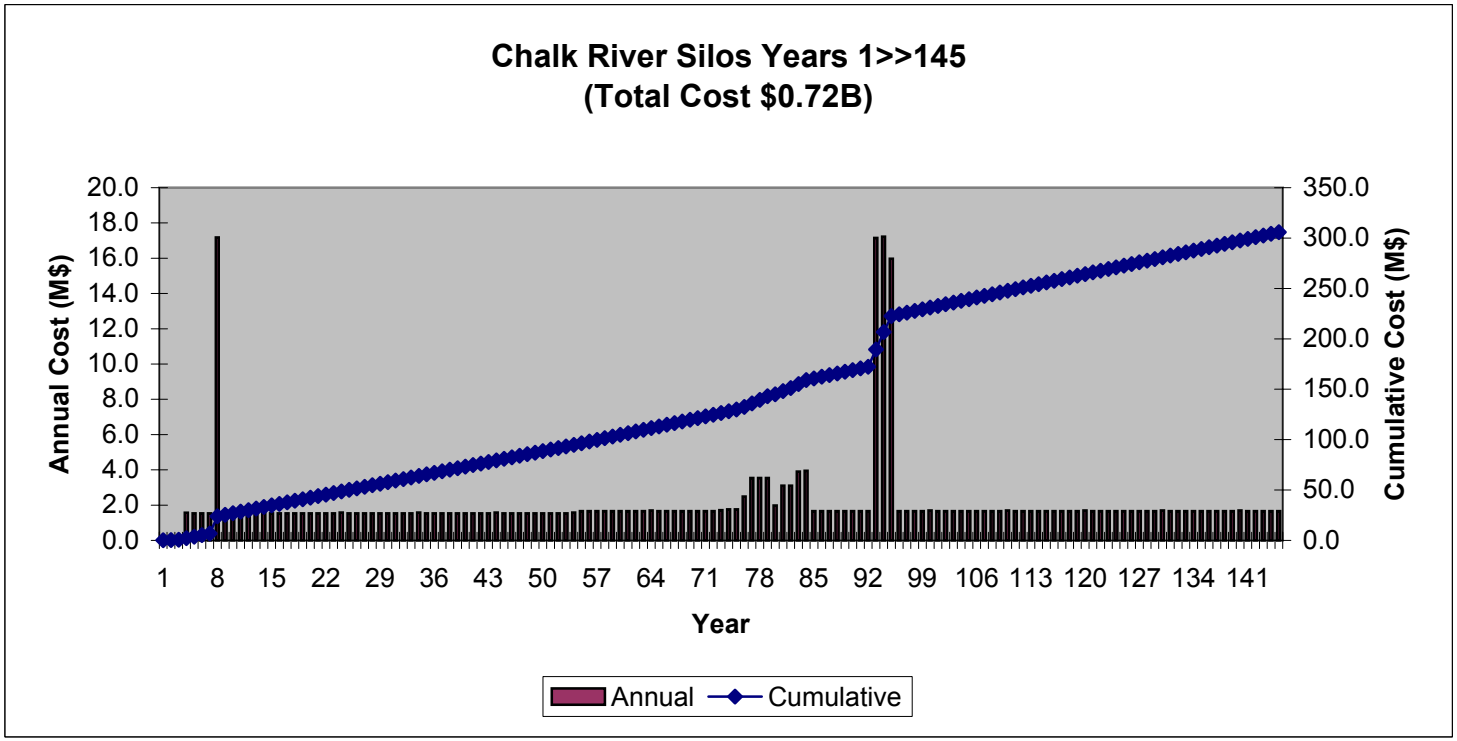
WBS No 586 – Silos
WBS No 587 – SSB
WBS No 588 – SST

Estimating Workbooks are presented in this section and are also available on the CD.

RES ALTERNATIVE **FUEL OWNER** **AECL**
WBS No 586
CHALK RIVER
SILOS

Lev 2	WBS Name	Sheet Totals ($k)
15	Siting	824
20	System Development	6,548
25	Safety Assessment	2,164
30	Licensing & Approvals	23,544
35	Public Affairs	1,718
40	Facility Design & Construction	20,520
45	Facility Operation	634,897
55	Environmental Assessment and Monitoring	25,844
90	Program Management	219
	Total Cost ($k)	**716,279**

Chalk River Silos Alternative	**716,279**
Siting Phase	**15,404**
Siting	824
EA	2,501
System Development	6,548
SA	682
L&A	2,910
Public Affairs	1,718
Program Mgmt	219
Construction Phase	**20,520**
Transition to Standalone	15,642
Before 100-yr Repackaging	4,878
Operations Phase	**680,355**
Repeat & Repackaging	*220,469*
Silos - 100 yrs	1,865
Silos - 200 yrs	1,865
Silos - 300 yrs	1,780
Repackaging B to B - 300 yrs	204,308
PM for Repeats & Repackaging	10,651
Extended Monitoring	*459,887*
Program Mgmt	117,785
Monitoring Surveliance	560
Operation Indirects	265,182
Common Ancillary Services Ops	28,344
Fuel Integrity Monitoring	2,557
SA - Ops & Decommissioning	1,482
L&A - Ops Licence Renewal	20,634
Environmental Monitoring	23,343


Chalk River Silos Years 1>>145
(Total Cost $0.72B)
Annual Cost (M$)
Cumulative Cost (M$)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
1 8 15 22 29 36 43 50 57 64 71 78 85 92 99 106 113 120 127 134 141
Year
Annual
Cumulative

REACTOR EXTENDED STORE — SILOS — 0

ACTIVITY SUMMARY TO DATA TRANSFER — CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
586	15	0	0	0	0	0	0	Siting	Labour	STEP	OPG	RJH	1	79	7	0	0	NO DATA TO FILL	452.2
586	15	0	0	0	0	0	0	Siting	Materials and Equipment	STEP	OPG	RJH	1	79	7	0	0		0.0
586	15	0	0	0	0	0	0	Siting	Other	STEP	OPG	RJH	1	79	7	0	0		97.0
586	15	0	0	0	0	0	0	Siting	Contingency	STEP	OPG	RJH	1	79	7	0	0		274.6

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
		0%	
Labour	452	*0.0*	452.2
Materials and Equipment	0	*0.0*	0.0
Other	97	*0.0*	97.0
Contingency	274.6	*0.0*	274.6
Total	824	*0.0*	824

INSTRUCTIONS

										A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																						**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																
586	15							**Siting**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
586	15	10						SITING MANAGEMENT																
								RES is 7 yrs vs 13 yrs for CES and shared amongst 7 sites due to efficencies of multiple sites assume a factor of 0.05	Labour	0.05	4897.7	0.05	244.885											245	
									Materials and Equipment	0.05				0	0.05	0								0	1
									Other	0.05							1,300	0.05	65				65	
									Contingency	50%										50%	1.0	154.9	155	
586	15	70						PREFERRED SITE																
586	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING																
								Assume cost is 10% of a CES greenfield site	Labour	0.1	588.3	0.1	58.83											59	2
									Materials and Equipment	0.1				0	0.1	0								0	
									Other	0.1							120	0.1	12				12	
									Contingency	50%										50%	1.0	35.4	35	
586	15	70	30					PREFERRED SITE - CHARACTERISATION																
								Assume cost is 10% of a CES greenfield site	Labour	0.1	1484.8	0.1	148.48											148	3
									Materials and Equipment	0.1				0	0.1	0								0	
									Other	0.1							200	0.1	20				20	
									Contingency	0.5										50%	1.0	84.2	84	

Total	**824**
Check: Should = 0	**0**

Total	452	Total	0	Total	97	Total	274.6		
Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0		

BASIS OF ESTIMATE NOTES - Insert references and notes

1

2

3

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
586	20							System Development	Labour	STEP	CTECH	AM	276	282	7			NO DATA TO FILL	4140.5
586	20							System Development	Materials and Equipment	STEP	CTECH	AM	276	282	7				430.0
586	20							System Development	Other	STEP	CTECH	AM	276	282	7				163.4
586	20							System Development	Contingency	STEP	CTECH	AM	276	282	7				1814.2

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost
Labour	4141
Materials and Equipment	430
Other	163
Contingency	1814.2
Total	6548

Check: Total minus budget Should = 0

Budget costs to Years by %

Check total	Total Cost $k
	4140.5
	430.0
	163.4
	1814.2
	6548

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
586	20							**System Development**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
586	20	2						SYSTEM DEVELOPMENT MANAGEMENT																
								Assume smaller size management team as for CES 50%, but shared between Whiteshell (WL) and Chalk River(CRL), with a 5% allowance for operating on both sites. Also for resident storage option selected as future storage method an additional 50% is deducted.	Labour	0.13	6690.40	0.13	878.12										878
								No entry in CES alternative cost category	Materials and Equipment															
								Assume smaller size management team as for CES 50%, but shared between Whiteshell (WL) and Chalk River(CRL), with a 5% allowance for operating on both sites. Also for resident storage option selected as future storage method an additional 50% is deducted.	Other	0.13							300.00	0.13	39.38				39
								Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	275.2	275
586	20	5						SYSTEM OPTIMIZATION																
								Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 30%	Labour	0.18	3303.70	0.18	607.05										607
								No entry in CES alternative cost category	Materials and Equipment															
								Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 30%	Other	0.18							120.00	0.18	22.05				22
								Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.00	188.73	189
586	20	20						PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)																

			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Labour	0.08	20750.10	0.08	1634.07										1,634
			Allow reduction due to no cask related feasibilty studies and no fuel container dismantling techniques carried out in this RES alternative, and shared between WL and CRL	Materials and Equipment	0.10				4300.00	0.10	430.00							430
			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Other	0.08							895.00	0.08	70.48				70
			Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.00	1067.28	1,067
586	20	30	STORAGE SYSTEM ENG'NG															
			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Labour	0.08	8143.20	0.08	641.28										641
			No entry in CES alternative cost category	Materials and Equipment														
			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Other	0.08							200.00	0.08	15.75				16
			Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.00	164.26	164
586	20	40	SECURITY & SAFEGUARD ENG'NG															
			Divide between WL and CRL Assume additional documentation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Smaller site than CES therefore a further factor of 50% is included	Labour	0.26	1447.70	0.26	380.02										380
			No entry in CES alternative cost category	Materials and Equipment														
			Divide between WL & CRL. Assume additional documentation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Smaller site than CES therefore a further factor of 50% is included	Other	0.26							60.00	0.26	15.75				16
			Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	118.7	119

Total	**6,548**
Check: Should = 0	

Total	4,141	Total	430	Total	163	Total	1,814.2
Check: Should = 0		Check: Should = 0		Check: Should = 0		Check: Should = 0	

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
586	25							Safety Assessment	Labour	STEP	OPG	RJH	1	283	40			1303.5
586	25							Safety Assessment	Materials and Equipment	STEP	OPG	RJH	1	283	40			
586	25							Safety Assessment	Other	STEP	OPG	RJH	1	283	40			242.5
586	25							Safety Assessment	Contingency	STEP	OPG	RJH	1	283	40			618.4

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %
Check total	**Total Cost $k**	

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost		
Labour	1303		1303.5
Materials and Equipment			
Other	243		242.5
Contingency	618.4		618.4
Total	2164		2164

INSTRUCTIONS

										A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																						**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																
586	25							**Safety Assessment**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
586	25	10						SAFETY ASSESSMENT MANAGEMENT																
								RES = 11 yrs vs CES = 17 yrs. Share costs over 7 sites. Thus factor is 0.08. However due to inefficencies of multiple sites increase to 0.2	Labour	0.05	5218.2	0.05	260.91											261	
									Materials and Equipment	0.05				0.05											1
									Other	0.05						850	0.05	42.5					43	
									Contingency	40%									40%	1.0	121.4		121	
586	25	30						SA - SITING																
									Labour		2287.5													2
									Materials and Equipment															
									Other							3,850								
									Contingency	40%									40%	1.0				
586	25	40						SA - OPERATING LICENSE																
									Labour	0.1	1540.5	0.1	154.05									154	3
									Materials and Equipment	0.1				0.1									
									Other	0.1						300	0.1	30				30	
									Contingency	40%									40%	1.0	73.6	74	
586	25	50						SA - FACILITY OPERATIONS																

			RES spans Y4 to Y283 or 280 yrs vs 330 yrs for CES. RES has 0.08 staff and CES has 1 staff. Factor is 280/330 x 0.08/1 = 0.067	Labour	0.067	9604.8	0.067	643.5216											644
				Materials and Equipment	1				1										
			Expenses at $0.5K/a x 280 yrs	Other	1						140	1	140						140
				Contingency	40%									40%	1.0	313.4			313
586	25	70	SA - DECOMMISSIONING (Processing Facilities)																
			RES has 1 decommissioning events - while CES has 3. Costs can be shared between sites with similar technology; thus factor to 0.15	Labour	0.1	2449.9	0.1	244.99											245
				Materials and Equipment	0.1				0.1										
				Other	0.1						300	0.1	30						30
				Contingency	40%									40%	1.0	110.0			110

Total	**2,164**
Check: Should = 0	

Total	1,303	Total		Total	243	Total	618.4
Check: Should = 0		Check: Should = 0		Check: Should = 0		Check: Should = 0	

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
586	30							Licensing & Approvals	Labour	STEP	OPG	RJH	4	283	280			NO DATA TO FILL	3114.3
586	30							Licensing & Approvals	Materials and Equipment	STEP	OPG	RJH	4	283	280				
586	30							Licensing & Approvals	Other	STEP	OPG	RJH	4	283	280				15721.2
586	30							Licensing & Approvals	Contingency	STEP	OPG	RJH	4	283	280				4708.9

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check: Total minus budget Should = 0	Check total	Total Cost $k	Budget costs to Years by %
Labour	3114		*0.0*	3114.3	
Materials and Equipment					
Other	15721			15721.2	
Contingency	4708.9		*0.0*	4708.9	
Total	23544			23544	

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
586																								
586	30							**Licensing & Approvals**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
586	30	30						LIAISON WITH CNSC																
								Duration 4 yrs vs 10 yrs in CES and cost shared between 7 sites. Thus factor is 0.057. However due to inefficiencies of multiple sites increase to 0.2	Labour	0.2	555	0.2	111									111	
									Materials and Equipment	0.2				0.2										1
									Other	0.2							40	0.2	8				8	
									Contingency	0.25										25%	1.0	29.8	30	
586	30	50						CNSC CONSTRUCTION LICENCE																
									Labour	0.2	2631	0.2	526.2										526	2
								Some inefficiencies gained due to multiple sites	Materials and Equipment	0.2				0.2										
									Other	0.2							6,264	0.2	1252.8				1,253	
									Contingency	0.25										25%	1.0	444.8	445	
586	30	60						OTHER GOVN'MT APPROVALS																
586	30	60	10					APPROVAL REQUIREMENTS																

				Duration 4 yrs vs 10 yrs in CES and cost shared between 7 sites. Thus factor is 0.057. However due to inefficiencies of multiple sites increase to 0.2	Labour	0.2	337	0.2	67.4									67
					Materials and Equipment	0.2				0.2									
					Other	0.2					0.2								
					Contingency	0.25								25%	1.0	16.9			17
586	30	60	30	FEDERAL APPROVALS															
					Labour	0.2	133	0.2	26.6										27
					Materials and Equipment	0.2				0.2									
					Other	0.2					0.2								
					Contingency	0.25								25%	1.0	6.7			7
586	30	60	40	PROVINCIAL APPROVALS															
					Labour	0.2	133	0.2	26.6										27
					Materials and Equipment	0.2				0.2									
					Other	0.2					0.2								
					Contingency	0.25								25%	1.0	6.7			7
586	30	60	50	MUNICIPAL APPROVALS															
					Labour	0.2	133	0.2	26.6										27
					Materials and Equipment	0.2				0.2									
					Other	0.2					0.2								
					Contingency	0.25								25%	1.0	6.7			7
586	30	65		CNSC OPERATING LICENCE (Initial Application)															
					Labour	0.2	513	0.2	102.6										103
					Materials and Equipment	0.2				0.2									
					Other	0.2					902	0.2	180.4						180
					Contingency	0.25								25%	1.0	70.8			71
586	30	70		CNSC OPERATING LICENCE (Maintenance & Renewal)															
				CES duration is 330 years. Costs incurred in RES during period Y4 to Y283 or 280 years. RES has 0.08 staff vs CES with 1 staff. Factor is 280/330 x 0.08/1 = 0.068	Labour	0.068	32754	0.068	2227.272									2,227
					Materials and Equipment	1				1									
				Expenses at $51K/a x 280 yrs	Other	1					14,280	1	14280						14,280
					Contingency	0.25								25%	1.0	4,126.8			4,127

Total	**23,544**
Check: Should = 0	

Total	3,114	Total		Total	15,721	Total	4,708.9
Check: Should = 0		Check: Should = 0		Check: Should = 0		Check: Should = 0	

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
586	35							Public Affairs	Labour	STEP	OPG	RJH	1	82	10			683.8
586	35							Public Affairs	Materials and Equipment	STEP	OPG	RJH	1	82	10			
586	35							Public Affairs	Other	STEP	OPG	RJH	1	82	10			461.8
586	35							Public Affairs	Contingency	STEP	OPG	RJH	1	82	10			572.8

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %
Check total	**Total Cost $k**	

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost		
Labour	684		683.8
Materials and Equipment			
Other	462		461.8
Contingency	572.8		572.8
Total	1718		1718

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
586	35							**Public Affairs**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
586	35	45						PUBLIC AFFAIRS - PREFERRED SITE																
									Labour	0.05	3046.2	0.05	152.31										152	
									Materials and Equipment	0.05				0.05										
									Other	0.05							600	0.05	30				30	
									Contingency	50%										50%	1.0	91.2	91	
586	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL																
									Labour	0.05	4569.3	0.05	228.465										228	
									Materials and Equipment	0.05				0.05										
									Other	0.05							1,450	0.05	72.5				73	
									Contingency	50%										50%	1.0	150.5	150	
586	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION																
									Labour	0.05	2528.9	0.05	126.445										126	
									Materials and Equipment	0.05				0.05										
									Other	0.05							800	0.05	40				40	
									Contingency	50%										50%	1.0	83.2	83	
586	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT																
									Labour	0.05	3530.8	0.05	176.54										177	

				Materials and Equipment	0.05			0.05								
				Other	0.05					170	0.05	8.5				9
				Contingency	50%								50%	1.0	92.5	93
586	35	120	Community Offsets & Benefits													
				Labour	0.15	0.15										
				Materials and Equipment	0.15			0.15								
				Other	0.15					2,072	0.15	310.8				311
				Contingency	50%								50%	1.0	155.4	155
															Total	**1,718**
															Check: Should = 0	
					Total	684	Total			Total		462	Total		572.8	
					Check: Should = 0		Check: Should = 0			Check: Should = 0			Check: Should = 0			

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
586	40							Facility Design & Construction	Labour	STEP	CTECH	AM	8	282	275			NO DATA TO FILL	5778.9
586	40							Facility Design & Construction	Materials and Equipment	STEP	CTECH	AM	8	282	275				8467.3
586	40							Facility Design & Construction	Other	STEP	CTECH	AM	8	282	275				36.6
586	40							Facility Design & Construction	Contingency	STEP	CTECH	AM	8	282	275				6237.4

INSTRUCTIONS

Check: Total minus budget Should = 0 | Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	5779		5778.9
Materials and Equipment	8467		8467.3
Other	37		36.6
Contingency	6237.4		6237.4
Total	20520		20520

INSTRUCTIONS

									A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																					**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**				**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8															
586	40							**Facility Design & Construction**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
586	40	10						SITE IMPROVEMENTS																
								a 10% allowance of the CES costs, applied to the site improvements	Labour	0.10	45,930.4	0.1	4,593.0										4,593
									Materials and Equipment	0.10				58,350.0	0.1	5,835.0								5,835
								no property acquisition required	Other								3,375.0							
								Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	5,214.0		5,214
586	40	30						COMMON ANCILLARY FACILITIES																
586	40	30	10					ADMIN AND SUPPORT FACILITIES																
586	40	30	10	1				ADMIN AND VISITOR RECEPTION BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in	Labour		486.3										comment 7			
									Materials and Equipment					784.2										
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0			
586	40	30	10	2				OPS SUPPT & HEALTH PHYSICS BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in	Labour		1,294.8										comment 7			
									Materials and Equipment					1,612.6										
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0			

586 40	30	10	3	EQUIP STORAGE AND MAINT'CE BLDG																	
				Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in	Labour		1,262.1										comment 7				
					Materials and Equipment					1,675.0											
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0				
586 40	30	10	5	ACTIVE SOLID WASTE HDLG BLDG																	
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	459.9	0.3	138.0												138
					Materials and Equipment	0.3				1,135.0	0.3	340.5									341
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	143.5			144
586 40	30	10	6	SOLID WASTE STORAGE AREA																	
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	458.8	0.3	137.6												138
					Materials and Equipment	0.3				437.5	0.3	131.3									131
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	80.7			81
586 40	30	10	7	ACTIVE LIQ/W TRT'MT BLDG																	
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	359.4	0.3	107.8												108
					Materials and Equipment	0.3				1,727.0	0.3	518.1									518
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	187.8			188
586 40	30	10	8	LOW LVL LIQ/W STRG BLDG																	
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	373.7	0.3	112.1												112
					Materials and Equipment	0.3				1,426.0	0.3	427.8									428
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	162.0			162
586 40	30	10	9	WAREHOUSE BLDG																	
				Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour		470.9											comment 7				
					Materials and Equipment					550.0											
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0				
586 40	30	10	10	GUARDHOUSE AND SECURITY FENCE																	
				Building and security exist therefore new building and fence not required. Allowance for refurbishment covered in ***/45/20/50	Labour		631.2											comment 7				
					Materials and Equipment					553.7											
					Other																
				Increased contingency than CES due to RES facility footprint size not confirmed and therefore length of fence, not yet known	Contingency	20%										20%	1.0				
586 40	30	10	11	TRUCK INSP'N / WASH STATION																	
				not req'd as no fuel transported off site	Labour		872.2											comment 7				
					Materials and Equipment					1,075.0											
					Other							389.4									

				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0				
586 40	30	10	12	UTILITY BLDG																	
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	1,023.2	0.3	307.0												307
					Materials and Equipment	0.3				1,257.0	0.3	377.1									377
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	205.2			205
586 40	30	10	13	TEST FACILITY																	
				Taken as being independent of fuel inventory stored. Same size bldg as CES, facility will be shared by Whiteshell and Chalk River , therefore cost will be 50% of CES costs.	Labour	0.5	766.8	0.5	383.4												383
					Materials and Equipment	0.5				1,675.0	0.5	837.5									838
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	244.2			244
586 40	30	20		OTHER SITE SYSTEMS																	
586 40	30	20	1	FIRE PROTECTION SYSTEMS																	
				assumed aailable and turned over to RES during transition	Labour		1,022.2											comment 7			
					Materials and Equipment					676.2											
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0				
586 40	30	20	2	SECURITY AND COMMUNICATION SYSTEM																	
				assumed aailable and turned over to RES during transition	Labour		607.5											comment 7			
					Materials and Equipment					600.0											
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0				
586 40	30	20	3	ELECTRICAL AND EMERGENCY POWER																	
				assumed aailable and turned over to RES during transition	Labour		1,939.6											comment 7			
					Materials and Equipment					1,932.0											
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0				
586 40	30	20	4	SANITARY SEWER SYSTEM																	
				assumed aailable and turned over to RES during transition	Labour		339.2											comment 7			
					Materials and Equipment					310.5											
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0				
586 40	30	20	5	POTABLE WATER SYSTEM																	
				assumed aailable and turned over to RES during transition	Labour		371.6											comment 7			
					Materials and Equipment					148.0											
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0				
586 40	30	20	6	RETENTION/SEDIMENTATION POND																	
				assumed aailable and turned over to RES during transition	Labour		874.4											comment 7			

				transition	Materials and Equipment			189.6						
				No entry in CES alternative cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	30%						30%	1.0	
586	40	30	20	7	STORM WATER DETENTION POND									
				assumed aailable and turned over to RES during transition	Labour		387.8						comment 7	
					Materials and Equipment			93.5						
				No entry in CES alternative cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	30%						30%	1.0	
586	40	30	20	8	CONST'N MAT'L STOCKPILE AREA									
				not req'd, concrete brought in as req'd from off-site	Labour		1,039.2						comment 7	
					Materials and Equipment			625.0						
				No entry in CES alternative cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	15%						15%	1.0	
586	40	30	20	9	SITE MATERIALS STORAGE AREA									
				assumed aailable and turned over to RES during transition	Labour		1,169.5						comment 7	
					Materials and Equipment			655.0						
				No entry in CES alternative cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	15%						15%	1.0	
586	40	30	20	10	ACCESS ROADS AND VEHICLE COMPOUNDS									
				assumed aailable and turned over to RES during transition	Labour		1,319.9						comment 7	
					Materials and Equipment			1,866.9						
				No entry into cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	25%						25%	1.0	
586	40	30	30		CONST'N INDIRECTS ANCILLARY FACILITIES									
				assumed aailable and turned over to RES during transition	Labour		4,406.4						comment 7	
					Materials and Equipment			6,610.9						
				No entry into cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	25%						25%	1.0	
586	40	650			ENERGY CONSUMPTION									
				No entry into cost category	Labour									
				No entry into cost category	Materials and Equipment									
				consumption for the construction of storage chamber and ancillary buildings	Other	0.10			366.3	0.1	36.6			37
				Contingency included in cost (built into power consumption calculation)	Contingency								1.0	

								Total	**20,520**
								Check: Should = 0	
				Total	5,779	Total	8,467	Total	37 Total 6,237.4
				Check: Should = 0		Check: Should = 0		Check: Should = 0	Check: Should = 0

BASIS OF ESTIMATE NOTES - Insert references and notes

1
2
3

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K	Year001
586	45							Facility Operation	Labour	STEP	CTECH	AM	4	283	280			299511.6	
586	45							Facility Operation	Materials and Equipment	STEP	CTECH	AM	4	283	280			111935.4	
586	45							Facility Operation	Other	STEP	CTECH	AM	4	283	280			92545.2	
586	45							Facility Operation	Contingency	STEP	CTECH	AM	4	283	280			130904.6	

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost
Labour	299512
Materials and Equipment	111935
Other	92545
Contingency	130905
Total	634897

Check total	Total Cost $k
	299511.6
	111935.4
	92545.2
	130904.6
	634897

cost split to

INSTRUCTIONS

Insert lower level WBS numbers as required	Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A Use appropriate CES cost	B Apply Factor	C Calc RES cost value	D Use appropriate CES cost	E Apply Factor	F Calc RES cost value	G Use appropriate CES cost	H Apply Factor	I Calc RES cost value	J Use appropriate CES cost	K Apply Factor	L Calc RES cost value	M Total Cost is calculated	Add Basis of estimate Note Ref Number	
ACTIVITY DETAIL ESTIMATE																TOTAL		
WBS LEVEL	WBS Description / Detail	Cost Category	Factor	Labour			Materials and other Equipment			Other			Contingency			Cost $k		
1 2 3 4 5 6 7 8																		
586 45	**Facility Operation**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES			
586 45 20	OPERATIONS - EXTENDED MONITORING																	
586 45 20 5	PROGRAM MANAGEMENT																	
	Entries in CES DET applicable to RES but duration 280 years RES & 300 years CES therefore280/300 = 0.933. Program management spread over 7 sites with Chalk River assumed to have 0.8 staff vs 9 in CES. Thus combined factor	Labour	0.083	312,354.0	0.1	25,913.8										25,914	6	
	No entry in CES alternative cost category	Materials and Equipment																
	Annual cost = $258/a x 280yrs	Other	1.00							72,240.0	1.0	72,240.0				72,240	4,5	
	Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	19,630.8	19,631		
586 45 20 40	MONITORING AND SURVEILLANCE -EXTENDED MONITORING																	
	CES monitoring and surveillance duration was 300 yrs for 4717 baskets, RES is 280 years for 95 baskets. Chalk River assumed to have 0.5 staff for RES vs 5 in CES. Combined factor based on duration, fuel inventory and staffing levels.	Labour	0.0019	49,716.0	0.0	93.5										93	6	
	annual costs = $1k/a x 280 years	Materials and Equipment	1.00				280.0	1.0	280.0							280	7	
	No entry in CES alternative cost category	Other																
	Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	186.7	187		

586	45	20	50		OPERATION INDIRECTS (EXTENDED MONITORING)																
					Entries in CES DET applicable to RES but duration 280years RES & 300 years CES. Staff for RES = 7 vs 34 in CES. Combined factor = 280/300 x 7/34. M&E costs are $75k/a x 280 years Armed response = $50k/a + energy costs at $3k/a. total = $53k x 280 years	Labour	0.19	875,048.0	0.2	168,146.5								168,146	6
						Materials and Equipment	1.00				21,000.0	1.0	21,000.0					21,000	7
						Other	1.00							14,840.0	1.0	14,840.0		14,840	7
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	61,195.9	61,196	
586	45	20	60		COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)																
					RES has duration 229 years, CES has 300 years. RES staff is 1 vs 5 in CES. Factor is 229/300 x 1/5	Labour	0.15	148,529.0	0.2	22,675.4										22,675	6
					No entry in CES alternative cost category	Materials and Equipment															
					No entry in CES alternative cost category	Other															
					Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	5,668.9	5,669	
586	45	20	70		FUEL INTEGRITY MONITORING (25 YEARLY)																
					RES has duration 280 years, CES has 300 years. RES staff is 0.1 vs 0.5 in CES. Factor is 280/300 x 0.1/0.5	Labour	0.2	4,631.0	0.2	864.5										864	6
						Materials and Equipment	1.0				700.0	1.0	700.0					700	7
						Other	1.0							140.0	1.0	140.0		140	7
					Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	852.2	852	
586	45	30			OPERATIONS - FACILITY REPEATS																
586	45	30	20		SILOS 100 YEAR REPLACEMENT																
586	45	30	20	10	DEMOLISH EXISTING STORAGE SILOS																
					costs taken from CES basket vault demolition, rated at $104 per tonne of reinforced concrete. Each silo = 115 tonne x 14 silos =1,610Te. Split 50/50 labour/materials	Labour	805.00	0.104	805.0	83.7										84	3
						Materials and Equipment	805.00				0.104	805.0	83.7					84	3
					No costs in this category	Other															
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	50.2	50	
586	45	30	20	20	SILO CONSTRUCTION																
					Assume same costs as for initial construction of the storage silos. 14 silos constructed at this point to house standard and non standard fuelcost per silo = $60K. Allow 67% labour 33% materials.	Labour	9.38	60.0	9.4	562.8										563	1
						Materials and Equipment	4.62				60.0	4.6	277.2					277	1
					No costs in this category	Other															
					Percentage for contingency for silos construction assumed same as for CES basket vaults construction	Contingency	30%										30%	1.0	252.0	252	
586	45	30	20	30	TRANSFER OPERATIONS																
					Smaller fuel inventory for RES = 14 silos in total - 11 silos with 9 baskets each, 1 spare silo and 2 silos with non standard waste/fuel. Assume transfer ops based on fuel only ie 95 baskets therefore ratio = 95/4717. Labour costs reduced, existing site staff will undertake operations for first 200 years.	Labour	0.005	990.0	0.01	5.1										5	
					No costs in this category	Materials and Equipment															

					Armed response included at rate of $50k/a based on 2 years duration - see note 8.	Other	1				100.0	1.0	100.0				100	8
					Percentage for contingency assumed same as for CES	Contingency	30%							30%	1.0	31.5	32	
586	45	30	20	40	WASTE DISPOSAL													
					No costs in this category	Labour												
					No costs in this category	Materials and Equipment												
					Costs taken from CES basket vault waste disposal, rated at $200 per tonne of reinforced concrete. Each silo = 115 tonne x 14 silos =1,610Te.	Other	1610				0.2	1,610.0	322.0				322	3
						Contingency	30%							30%	1.0	96.6	97	
586	45	30	30		SILOS 200 YEAR REPLACEMENT													
					assumed same as 100 yr replacement	Labour			651.6								652	
					assumed same as 100 yr replacement	Materials and Equipment				360.9							361	
					assumed same as 100 yr replacement	Other							422.0				422	
					assumed same as 100 yr replacement	Contingency										430.3	430	
586	45	30	40		SILOS 300 YEAR REPLACEMENT													
					assumed same as 100 yr replacement	Labour			666.5								667	
					assumed same as 100 yr replacement	Materials and Equipment				360.9							361	
					assumed same as 100 yr replacement	Other							322.0				322	9
					Percentage for contingency assumed same as for CES	Contingency										430.3	430	
586	45	40			OPERATIONS - REPACKAGING													
586	45	40	5		PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)													
						Labour	0.02	389,170.0	0.0	8,875.8							8,876	
					Entries in CES DET applicable to RES but duration 13 years RES 100yr=(2 license+2 const/ops 109-112) + 200yr=(2 license+2 const/ops 209-212)+ 300yr=(2 license+2 const'n+1 ops 277-283) compared to 114 years CES therefore13/114 of labour costs spread project management over 7 sites and acknowledge inefficiency use 20% factor													
					No entry in CES alternative cost category	Materials and Equipment												
					see note 4. no property tax assumed this site	Other												4
					Percentage for contingency assumed same as for CES	Contingency	20%							20%	1.0	1,775.2	1,775	
586	45	40	10	40	COMMON ANCILLARY FACILITIES (REPLACEMENT)			comment 7										
					only require full ancillary buildings (13) at 300yr RPBB event, for 100 & 200yr facility repeats, the replacement of 7 ancillary buildings is required. Therefore combined factor = ((7/13)*2) + 1	Labour	2.1	21,056.2	2.1	43,732.1							43,732	
						Materials and Equipment	2.1				29,785.1	2.1	61,861.4				61,861	
					No entry in CES alternative cost category	Other												
					Percentage for contingency assumed same as for CES	Contingency	22%							22%	1.0	23,230.6	23,231	
586	45	40	10	600	30 ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)													
					duration 7 years RES compared to 30 years CES. Factor =7/30	Labour	0.2	11,882.0	0.2	2,772.5							2,772	2
					No entry in CES alternative cost category	Materials and Equipment												
					No entry in CES alternative cost category	Other												
					Percentage for contingency assumed same as for CES	Contingency	25%							25%	1.0	693.1	693	

586	45	40	40				BASKET TO BASKET 300 YEAR REPACKAGING										
586	45	40	40	05			CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)										
							assumed same facility as CES therefore factor = 1	Labour	1.0	476.1	1.0	476.1					476
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0			354.6	1.0	354.6			355
							assumed same facility as CES therefore factor = 1	Other	1.0					228.4	1.0	228.4	228
							same contingency as for CES	Contingency	30%						30%	1.0	317.7	318
586	45	40	40	10			PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)										
586	45	40	40	10	20		RPBB EQUIP. DESIGN, SUPPLY & INSTALL										
586	45	40	40	10	20	10	RECEIPT & TRANSFER (EQUIP)										
							assumed same facility as CES therefore factor = 1	Labour	1.0	70.8	1.0	70.8					71
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0			1,415.0	1.0	1,415.0			1,415
							assumed same facility as CES therefore factor = 1	Other	1.0					74.3	1.0	74.3	74
							same contingency as for CES	Contingency	30%						30%	1.0	468.0	468
586	45	40	40	10	20	20	BASKET TO BASKET FUEL TRANSFER										
							assumed same facility as CES therefore factor = 1	Labour	1.0	2,319.4	1.0	2,319.4					2,319
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0			11,597.0	1.0	11,597.0			11,597
							assumed same facility as CES therefore factor = 1	Other	1.0					695.8	1.0	695.8	696
							same contingency as for CES	Contingency	30%						30%	1.0	4,383.7	4,384
586	45	40	40	10	20	30	BASKET DECONTAMINATION										
							assumed same facility as CES therefore factor = 1	Labour	1.0	854.6	1.0	854.6					855
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0			4,563.0	1.0	4,563.0			4,563
							assumed same facility as CES therefore factor = 1	Other	1.0					256.4	1.0	256.4	256
							same contingency as for CES	Contingency	30%						30%	1.0	1,702.2	1,702
586	45	40	40	10	30		RPBB BUILDING DESIGN AND CONSTRUCTION										
							assumed same facility as CES therefore factor = 1	Labour	1.0	4,160.0	1.0	4,160.0					4,160
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0			4,280.0	1.0	4,280.0			4,280
							assumed same facility as CES therefore factor = 1	Other	1.0					832.0	1.0	832.0	832
							same contingency as for CES	Contingency	30%						30%	1.0	2,781.6	2,782
586	45	40	40	10	60		BUILDING SERVICES (RPB)										
							assumed same facility as CES therefore factor = 1	Labour	1.0	4,447.8	1.0	4,447.8					4,448
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0			4,153.8	1.0	4,153.8			4,154
							assumed same facility as CES therefore factor = 1	Other	1.0					1,309.4	1.0	1,309.4	1,309
							same contingency as for CES	Contingency	25%						25%	1.0	2,477.8	2,478
586	45	40	40	10	70		COMMISSIONING (RPB)										
							assumed same facility as CES therefore factor = 1	Labour	1.0	668.2	1.0	668.2					668

						No entry in CES alternative cost category	Materials and Equipment													
						assumed same facility as CES therefore factor = 1	Other	1.0				126.3	1.0	126.3				126		
						same contingency as for CES	Contingency	50%							50%	1.0	397.3	397		
586	45	40	40	10	80	CONST'N INDIRECTS (RPB)														
						assumed same facility as CES therefore factor = 1	Labour	1.0	6,299.6	1.0	6,299.6							6,300		
						No entry in CES alternative cost category	Materials and Equipment													
						assumed same facility as CES therefore factor = 1	Other	1.0				241.5	1.0	241.5				242		
						same contingency as for CES	Contingency	30%							30%	1.0	1,962.3	1,962		
586	45	40	40	400		CONSTRUCTION MANAGEMENT (RPB)														
						assumed same facility as CES therefore factor = 1	Labour	1.0	4,690.6	1.0	4,690.6							4,691		
						No entry in CES alternative cost category	Materials and Equipment													
						No entry in CES alternative cost category	Other													
						same contingency as for CES	Contingency	30%							30%	1.0	1,407.2	1,407		
586	45	40	40	500		COMMISSIONING MANAGEMENT (RPB)														
						assumed same facility as CES therefore factor = 1	Labour	1.0	113.3	1.0	113.3							113		
						No entry in CES alternative cost category	Materials and Equipment													
						assumed same facility as CES therefore factor = 1	Other	1.0				13.5	1.0	13.5				14		
						same contingency as for CES	Contingency	50%							50%	1.0	63.4	63		
586	45	40	40	600		REPACKAGING OPERATIONS (RPB)														
						Labour for repackaging operations for CES is for a fuel inventory of 4717 baskets. RES has 95 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 95/4717	Labour	0.020	3,960.8	0.0	79.8							80		
						the same factor for labour is used for procurement of new baskets	Materials and Equipment	0.020			23,585.0	0.0	475.0					475		
						the same factor for labour is used for waste disposal of old baskets	Other	0.020				378.0	0.0	7.6				8		
						same contingency as for CES	Contingency	30%							30%	1.0	168.7	169		
586	45	40	40	700		OPERATION INDIRECTS (RPB)														
						operation indirect labour costs for CES are for a duration of 10 yrs RES operations are for 1 yr max therefore a factor of 0.1 is used	Labour	0.1	2,678.3	0.1	267.8							268		
						Assume same spares and consumables required as identical equipment is used for both CES & RES. Therefore factor = 1	Materials and Equipment	1.0			172.8	1.0	172.8					173		
						Assume energy consumption for running of facility can be factored relative to duration of facility operation = 1/10yrs = 0.1. Armed response included at rate of $50k/a based on 1 year duration - see note 8.	Other	1.0				374.0	1.0	374.0				374	8	
						same contingency as for CES	Contingency	30%							30%	1.0	244.4	244		
586	45	40	40	800		STORAGE OPERATIONS (RPB)														
						Labour for storage operations for CES is for a fuel inventory of 4717 baskets. RES has 95 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 95/4717	Labour	0.020	990.2	0.0	19.9							20		
						No entry in CES alternative cost category	Materials and Equipment													

No entry in CES alternative cost category	Other							
same contingency as for CES	Contingency	30%			30%	1.0	6.0	6

									Total	**634,897**
									Check: Should = 0	
	Total	299,512	Total	111,935	Total	92,545	Total	130,904.6		
	Check: Should = 0		Check: Should = 0		Check: Should = 0		Check: Should = 0			

BASIS OF ESTIMATE NOTES - Insert references and notes

1 Cost information on silos extracted from OPG R.Heystee email date 11-01-03 : 'PLGS dry canister costs for RES costing' cost includes; materials supply, construction, testing and project management: $60K per canister Fall 2001 dollars. Labour and materials split approx. 33% materials/67%labour

2 ancillary ops factored from CES CVSB. In CES this cost was for a 30 year period (covering 1 facility repeat and 1 repackaging event). for RES this covers 100/200&300year facility repeats & 300y repackaging 3x8 (1 demolish prev (y83). 2 const,n of 222 silos (y84,85) 5 ops for transfer) = 24

3 costs for silos demolition and waste diposal based on unit cost factors obtained for demolition of basket storage vaults in CVSB alternative

4 It is assumed that there is no property tax on facilities located on the Chalk River site. Reference note 5 on table 18 - Cost Estimate Report 1105/MD18084/REP/19

5 258k$/a made up of expenses from table 18 in report (15+118+50+50+25). No property tax or PST included.

6 staffing levels obtained from table 17 in cost estimate report 1105/MD18084/REP/19

7 annual costs for Labour/M&E and Other, obtained from table 18 in cost estimate report 1105/MD18084/REP/19

8 armed response costs during 'fuel handling' based on rate of $100k/a. But, due to $50k/a for armed response included in extended monitoring, this means an additional $50k/a is to be included for the duration of the facility repeat transfers/repackaging events ($50k + $50k = $100k)

9 armed response not captured in 300 yr facility repeat for fuel transfers, as it is covered in basket repackaging at 300yr event

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
586	55							Environmental Assessment and Monitoring	Labour	STEP	OPG	RJH	4	283	280			14130.0
586	55							Environmental Assessment and Monitoring	Materials and Equipment	STEP	OPG	RJH	4	283	280			4200.0
586	55							Environmental Assessment and Monitoring	Other	STEP	OPG	RJH	4	283	280			1550.0
586	55							Environmental Assessment and Monitoring	Contingency	STEP	OPG	RJH	4	283	280			5964.0

NO DATA TO FILL

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check: Total minus budget Should = 0	Check total	Total Cost $k	Budget costs to Years by %
Labour	14130			14130.0	
Materials and Equipment	4200			4200.0	
Other	1550			1550.0	
Contingency	5964.0		*0.0*	5964.0	
Total	25844		*0.0*	25844	

INSTRUCTIONS

Insert lower level WBS numbers as required

Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required

Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15

ACTIVITY DETAIL ESTIMATE

								A	B	C	D	E	F	G	H	I	J	K	L	M	
WBS LEVEL																				TOTAL	
1	2	3	4	5	6	7	8	WBS Description / Detail	Cost Category	Factor	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
											Labour			Materials and other Equipment			Other			Contingency			Cost $k	
586	55							**Environmental Assessment and Monitoring**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
586	55	10						EA & MONITORING PROGRAM MANAGEMENT																
								Costs are incurred over the period Y4 to Y283 or 280 yrs vs 347 yrs in CES. RES has 0.1 staff vs 2 staff in CES. Factor is 280/347 x 0.1/2 = 0.04	Labour	0.04	70306	0.04	2812.24											2,812
									Materials and Equipment	1				1										
								Expenses at $1.5K/a x 280 yrs	Other	1							420	1	420					420
									Contingency	0.3										3232.24	0.3	969.672		970
586	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT																
								Assume C/L & EA process spans 3 years (Y84 to Y86) with with some preparation work in Y83; ie total of 4 years. Due to multiple sites with same technology can share costs	Labour	0.2	7471	0.2	1494.2											1,494
									Materials and Equipment	0.2				0.2										
									Other	0.2							2,150	0.2	430					430
									Contingency	0.3										1924.2	0.3	577.26		577

586	55	40	GROUNDWATER MONITORING													
			Costs span the period Y4 to Y283 or 280 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.6 in CES. Factor is 280/330 x 0.02/0.6 = 0.028.	Labour	0.028	37158	0.028	1040.424								1,040
			M&E at $3K/a x 280 yrs	Materials and Equipment	1				840	1	840					840
			Expenses at $2K/a x 280 yrs	Other	1							560	1	560		560
				Contingency	0.3									2440.424	0.3	732.1272	732
586	55	50	RADIOLOGICAL BIOSPHERE MONITORING													
			Costs span the period Y4 to Y283 or 280 yrs vs 330 ys for CES. RES staff is 0.1 vs 3.3 staff in CES. Factor is 0.025	Labour	0.025	217280	0.025	5432								5,432
			M&E at $9K/a x 280 yrs	Materials and Equipment	1				2520	1	2520					2,520
				Other	1								1			
				Contingency	0.3									7952	0.3	2385.6	2,386
586	55	60	NON-RAD BIOSPHERE MONITORING													
			Costs span the period Y4 to Y283 or 280 yrs vs 330 in CES. RES staff is 0.05 staff vs 0.8 staff in CES. Factor is 280/330 x 0.05/0.8 = 0.052	Labour	0.052	53590	0.052	2786.68								2,787
			M&E at $3K/a x 280 yrs	Materials and Equipment	1				840	1	840					840
				Other	1								1			
				Contingency	0.3									3626.68	0.3	1088.004	1,088
586	55	80	HUMAN HEALTH MONITORING													
			Costs span the period Y4 to Y283 or 280 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.17 in CES. Factor is 280/330 x 0.02/0.17 = 0.098	Labour	0.098	5760	0.098	564.48								564
				Materials and Equipment	1					1						
			Expenses at 0.5K/a x 280 yrs	Other	1							140	1	140		140
				Contingency	0.3									704.48	0.3	211.344	211

Total	14,130	Total	4,200	Total	1,550	Total	5,964.0
Check: Should = 0		Check: Should = 0		Check: Should = 0		Check: Should = 0	

Total	**25,844**
Check: Should = 0	

REACTOR EXTENDED STORE — SILOS — 0

ACTIVITY SUMMARY TO DATA TRANSFER — CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
586	90	0	0	0	0	0	0	0 Program Management	Labour	STEP	CTECH	AM	1	3	3	0	0	NO DATA TO FILL	128.6
586	90	0	0	0	0	0	0	0 Program Management	Materials and Equipment	STEP	CTECH	AM	1	3	3	0	0		0.0
586	90	0	0	0	0	0	0	0 Program Management	Other	STEP	CTECH	AM	1	3	3	0	0		54.2
586	90	0	0	0	0	0	0	0 Program Management	Contingency	STEP	CTECH	AM	1	3	3	0	0		36.5

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check: Total minus budget Should = 0	Check total	Total Cost $k	Budget costs to Years by %
			0%		
Labour	129		*0.0*	128.6	
Materials and Equipment	0		*0.0*	0.0	
Other	54		*0.0*	54.2	
Contingency	36.5		*0.0*	36.5	
Total	219		*0.0*	219	

INSTRUCTIONS

										A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint: copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																						**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**		**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																
586	90							**Program Management**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
								Program management shared between 7 reactor sites at percentages based on table 18 in cost estimate report. 7% for Chalk River			**total for 7 sites**	**Factor**	**RES**	**total for 7 sites**	**Factor**	**RES**	**total for 7 sites**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
								based on 5 staff. Assume 3 x OPG01, 2 x OPG03 for 3 year duration	Labour	0.07	1836.6327	0.07	128.564289										129	
								no entry	Materials and Equipment	0				0	0	0							0	
								the following expenses: Public affairs, overheads, insurance, community compensation & legal fees as table 18	Other	0.07						774	0.07	54.18					54	
								Contingency as CES value	Contingency	20%									20%	1.0	36.5	37	

Total	129	Total	0	Total	54	Total	36.5
Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0

Total	**219**
Check: Should = 0	**0**

BASIS OF ESTIMATE NOTES - Insert references and notes

1
2
3

RES ALTERNATIVE
WBS No 586
SILOS 0
CHALK RIVER

Cost Category	Total K$
Labour	329,243
Materials and Equipment	125,033
Other	110,872
Contingency	151,131
Total Cost	**716,279**

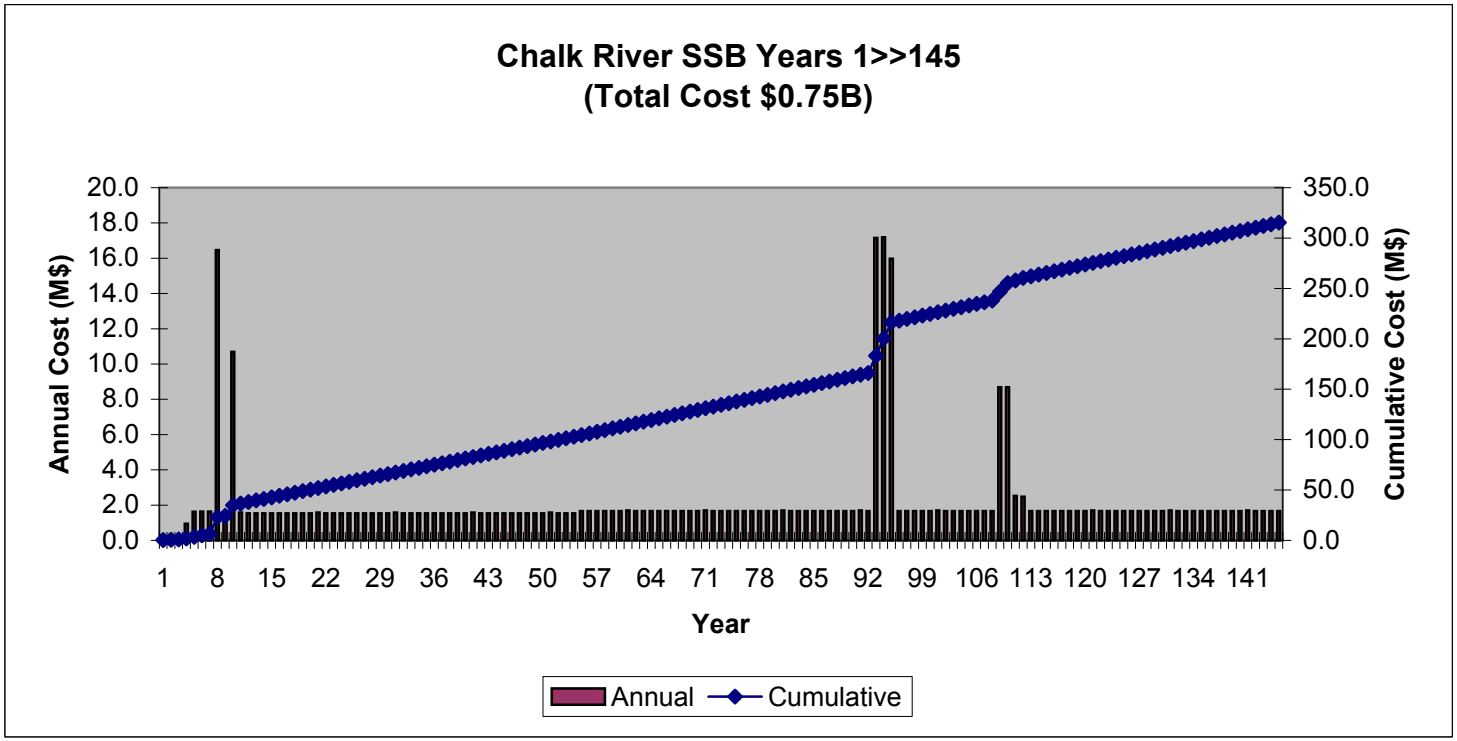
716,279

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	Responsible	Cost Category	WBS Type	Start Year	End Year	Dur'n	Contingency	Total K$
586	15	0	0	0	0	0	0	RJH	Labour	STEP	1	79	7	0	452
586	15	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	79	7	0	0
586	15	0	0	0	0	0	0	RJH	Other	STEP	1	79	7	0	97
586	15	0	0	0	0	0	0	RJH	Contingency	STEP	1	79	7	0	275
586	20	0	0	0	0	0	0	AM	Labour	STEP	276	282	7	0	4,141
586	20	0	0	0	0	0	0	AM	Materials and Equipment	STEP	276	282	7	0	430
586	20	0	0	0	0	0	0	AM	Other	STEP	276	282	7	0	163
586	20	0	0	0	0	0	0	AM	Contingency	STEP	276	282	7	0	1,814
586	25	0	0	0	0	0	0	RJH	Labour	STEP	1	283	40	0	1,303
586	25	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	283	40	0	0
586	25	0	0	0	0	0	0	RJH	Other	STEP	1	283	40	0	243
586	25	0	0	0	0	0	0	RJH	Contingency	STEP	1	283	40	0	618
586	30	0	0	0	0	0	0	RJH	Labour	STEP	4	283	280	0	3,114
586	30	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	4	283	280	0	0
586	30	0	0	0	0	0	0	RJH	Other	STEP	4	283	280	0	15,721
586	30	0	0	0	0	0	0	RJH	Contingency	STEP	4	283	280	0	4,709
586	35	0	0	0	0	0	0	RJH	Labour	STEP	1	82	10	0	684
586	35	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	82	10	0	0
586	35	0	0	0	0	0	0	RJH	Other	STEP	1	82	10	0	462
586	35	0	0	0	0	0	0	RJH	Contingency	STEP	1	82	10	0	573
586	40	0	0	0	0	0	0	AM	Labour	STEP	8	282	275	0	5778.94
586	40	0	0	0	0	0	0	AM	Materials and Equipment	STEP	8	282	275	0	8467.25
586	40	0	0	0	0	0	0	AM	Other	STEP	8	282	275	0	36.63
586	40	0	0	0	0	0	0	AM	Contingency	STEP	8	282	275	0	6237.375
586	45	0	0	0	0	0	0	AM	Labour	STEP	4	283	280	0	299,512
586	45	0	0	0	0	0	0	AM	Materials and Equipment	STEP	4	283	280	0	111,935
586	45	0	0	0	0	0	0	AM	Other	STEP	4	283	280	0	92,545
586	45	0	0	0	0	0	0	AM	Contingency	STEP	4	283	280	0	130,905
586	55	0	0	0	0	0	0	RJH	Labour	STEP	4	283	280	0	14,130
586	55	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	4	283	280	0	4,200
586	55	0	0	0	0	0	0	RJH	Other	STEP	4	283	280	0	1,550
586	55	0	0	0	0	0	0	RJH	Contingency	STEP	4	283	280	0	5,964
586	90	0	0	0	0	0	0	AM	Labour	STEP	1	3	3	0	129
586	90	0	0	0	0	0	0	AM	Materials and Equipment	STEP	1	3	3	0	0
586	90	0	0	0	0	0	0	AM	Other	STEP	1	3	3	0	54
586	90	0	0	0	0	0	0	AM	Contingency	STEP	1	3	3	0	37

RES ALTERNATIVE **FUEL OWNER** **AECL**
WBS No 587
CHALK RIVER
SILOS IN STORAGE BUILDINGS **(SSB)**

Lev 2	WBS Name	Sheet Totals ($k)
15	Siting	824
20	System Development	11,703
25	Safety Assessment	2,147
30	Licensing & Approvals	23,016
35	Public Affairs	1,718
40	Facility Design & Construction	30,081
45	Facility Operation	654,046
55	Environmental Assessment and Monitoring	25,685
90	Program Management	1,014
	Total Cost ($k)	**750,234**

Chalk River SSB Alternative	**750,234**
Siting Phase	**21,353**
Siting	824
EA	2,501
System Development	11,703
SA	682
L&A	2,910
Public Affairs	1,718
Program Mgmt	1,014
Construction Phase	**30,081**
Initial Construction	25,203
Transition to Standalone	4,878
Operations Phase	**698,800**
Repeat & Repackaging	*249,225*
Silos - 100 yrs	1,865
Silos - 200 yrs	1,865
Silos - 300 yrs	1,854
Storage Buildings - 100 yrs	9,561
Storage Buildings - 200 yrs	9,561
Storage Buildings - 300 yrs	9,561
Repackaging B to B - 300 yrs	204,308
PM for Repeats & Repackaging	10,651
Extended Monitoring	*449,576*
Program Mgmt	114,840
Monitoring Survelliance	546
Operation Indirects	258,553
Common Ancillary Services Ops	28,344
Fuel Integrity Monitoring	2,538
SA - Ops & Decommissioning	1,464
L&A - Ops Licence Renewal	20,106
Environmental Monitoring	23,184


Chalk River SSB Years 1>>145
(Total Cost $0.75B)
Annual Cost (M$)
Cumulative Cost (M$)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
1 8 15 22 29 36 43 50 57 64 71 78 85 92 99 106 113 120 127 134 141
Year
Annual
Cumulative

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
587	15							Siting	Labour	STEP	OPG	RJH	1	7	7			NO DATA TO FILL	452.2
587	15							Siting	Materials and Equipment	STEP	OPG	RJH	1	7	7				
587	15							Siting	Other	STEP	OPG	RJH	1	7	7				97.0
587	15							Siting	Contingency	STEP	OPG	RJH	1	7	7				274.6

INSTRUCTIONS

Check: Total minus budget Should = 0 | Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	452		452.2
Materials and Equipment			
Other	97		97.0
Contingency	274.6		274.6
Total	824		824

INSTRUCTIONS

Insert lower level WBS numbers as required

Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required

Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15

A: Use appropriate CES cost | B: Apply Factor | C: Calc RES cost value | D: Use appropriate CES cost | E: Apply Factor | F: Calc RES cost value | G: Use appropriate CES cost | H: Apply Factor | I: Calc RES cost value | J: Use appropriate CES cost | K: Apply Factor | L: Calc RES cost value | M: Total Cost is calculated | Add Basis of estimate Note Ref Number

ACTIVITY DETAIL ESTIMATE

WBS LEVEL								WBS Description / Detail	Cost Category	Factor	Labour			Materials and other Equipment			Other			Contingency			TOTAL	
1	2	3	4	5	6	7	8				CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	Cost $k	
587	15							**Siting**																
587	15	10						SITING MANAGEMENT																
								RES is 7 yrs vs 13 yrs for CES and shared amongst 7 sites due to efficencies of multiple sites assume a factor of 0.05	Labour	0.05	4897.7	0.05	244.885											245
									Materials and Equipment	0.05					0.05										
									Other	0.05							1,300	0.05	65					65
									Contingency	50%											50%	1.0	154.9		155
587	15	70						PREFERRED SITE																	
587	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING																	
								Assume cost is 10% of a CES greenfield site	Labour	0.1	588.3	0.1	58.83											59
									Materials and Equipment	0.1					0.1										
									Other	0.1							120	0.1	12					12
									Contingency	50%											50%	1.0	35.4		35
587	15	70	30					PREFERRED SITE - CHARACTERISATION																	
								Assume cost is 10% of a CES greenfield site	Labour	0.1	1484.8	0.1	148.48											148
									Materials and Equipment	0.1					0.1										
									Other	0.1							200	0.1	20					20
									Contingency	0.5											50%	1.0	84.2		84

Total	824
Check: Should = 0	

Total 452 Check: Should = 0 | Total 97 Check: Should = 0 | Total 274.6 Check: Should = 0

BASIS OF ESTIMATE NOTES - Insert references and notes

1

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REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
587	20	0	0	0	0	0	0	0 System Development	Labour	STEP	CTECH	AM	276	282	7	0	0	NO DATA TO FILL	7727.6
587	20	0	0	0	0	0	0	0 System Development	Materials and Equipment	STEP	CTECH	AM	276	282	7	0	0		430.0
587	20	0	0	0	0	0	0	0 System Development	Other	STEP	CTECH	AM	276	282	7	0	0		304.8
587	20	0	0	0	0	0	0	0 System Development	Contingency	STEP	CTECH	AM	276	282	7	0	0		3240.8

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost
Labour	7728
Materials and Equipment	430
Other	305
Contingency	3240.8
Total	11703

Check: Total minus budget Should = 0

Budget costs to Years by %

Check total	Total Cost $k
0%	
0.0	7727.6
0.0	430.0
0.0	304.8
0.0	3240.8
0.0	11703

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
587	20							**System Development**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
587	20	2						SYSTEM DEVELOPMENT MANAGEMENT																
								Assume same size management team as for CES. Therefore factor = 1/2. Assume additional documeNtation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. SSB not fully new technology but not existing on site - therefore a 50% reduction utilised	Labour	0.26	6690.40	0.26	1756.23										1,756
								No entry in CES alternative cost category	Materials and Equipment	0.00				0.00	0.00	0.00								0
								Assume same size management team as for CES. Therefore factor = 1/2. Assume additional documeNtation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. SSB not fully new technology but not existing on site - therefore a 50% reduction utilised	Other	0.26							300.00	0.26	78.75				79
								Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	550.5	550
587	20	5						SYSTEM OPTIMIZATION																

			Divide between WL and CRL. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Also for storage building technology not in existance but not really 'new technology' an additional 40% is deducted	Labour	0.32	3303.70	0.32	1040.67														1,041
			No entry in CES alternative cost category	Materials and Equipment	0				0.00	0.00	0.00											0
			Divide between WL and CRL. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Also for storage building technology not in existance but not really 'new technology' an additional 40% is deducted	Other	0.32							120.00	0.32	37.80								38
			Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.00	323.54					324
587	20	20	PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)																			
			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Labour	0.16	20750.10	0.16	3268.14														3,268
			Allow reduction due to no cask related feasibilty studies and no fuel container dismantling techniques carried out in this RES alternative, and shared between WL and CRL	Materials and Equipment	0.10				4300.00	0.10	430.00											430
			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Other	0.16							895.00	0.16	140.96								141
			Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.00	1919.55					1,920
587	20	30	STORAGE SYSTEM ENG'NG																			
			Divide between WL and CRL. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Also for relatively sim[le storage building engineering (smaller scale than CES) an additional 70% is deducted	Labour	0.16	8143.20	0.16	1282.55														1,283
			No entry in CES alternative cost category	Materials and Equipment	0				0.00	0.00	0.00											0

			Divide between WL and CRL. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Also for relatively sim[le storage building engineering (smaller scale than CES) an additional 70% is deducted	Other	0.16					200.00	0.16	31.50					32
			Percentage for contingency assumed same as for CES	Contingency	25%								25%	1.00	328.51		329
587	20	40	SECURITY & SAFEGUARD ENG'NG															
			Divide between WL and CRL Assume additional documentation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Smaller site than CES therefore a further factor of 50% is included	Labour	0.26	1447.70	0.26	380.02									380
			No entry in CES alternative cost category	Materials and Equipment	0				0.00	0.00	0.00						0
			Divide between WL & CRL. Assume additional documentation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Smaller site than CES therefore a further factor of 50% is included	Other	0.26					60.00	0.26	15.75					16
			Percentage for contingency assumed same as for CES	Contingency	30%								30%	1.0	118.7		119

Total	**11,703**
Check: Should = 0	**0**

Total	7,728	Total	430	Total	305	Total	3,240.8
Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
587	25							Safety Assessment	Labour	STEP	OPG	RJH	1	283	40			1293.9
587	25							Safety Assessment	Materials and Equipment	STEP	OPG	RJH	1	283	40			
587	25							Safety Assessment	Other	STEP	OPG	RJH	1	283	40			239.5
587	25							Safety Assessment	Contingency	STEP	OPG	RJH	1	283	40			613.3

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	1294		1293.9
Materials and Equipment			
Other	240		239.5
Contingency	613.3		613.3
Total	2147		2147

INSTRUCTIONS

								A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																					**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8															
587	25							**Safety Assessment**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
587	25	10						SAFETY ASSESSMENT MANAGEMENT																
								RES = 10 yrs vs CES = 17 yrs. Share costs over 7 sites.	Labour	0.05	5218.2	0.05	260.91										261	
									Materials and Equipment	0.05					0.05									
									Other	0.05							850	0.05	42.5				43	
									Contingency	40%										40%	1.0	121.4	121	
587	25	30						SA - SITING																
									Labour		2287.5													
									Materials and Equipment															
									Other								3,850							
									Contingency	40%										40%	1.0			
587	25	40						SA - OPERATING LICENSE																
									Labour	0.10	1540.5	0.1	154.05										154	
									Materials and Equipment	0.10					0.1									
									Other	0.10							300	0.1	30				30	
									Contingency	40%										40%	1.0	73.6	74	
587	25	50						SA - FACILITY OPERATIONS																
								RES spans Y11 to Y283 or 273 yrs vs 330 yrs for CES. RES has 0.08 staff and CES has 1 staff. Factor is 273/330 x 0.08/1 = 0.066	Labour	0.066	9604.8	0.066	633.9168										634	

				Materials and Equipment	1				1									
			Expenses at $0.5K/a x 273 yrs	Other	1						137	1	137					137
				Contingency	40%									40%	1.0	308.4		308
587	25	70	SA - DECOMMISSIONING (Processing Facilities)															
			RES has 1 decommissioning events - while CES has 3. Costs can be shared between sites with similar technology; thus factor to 0.1	Labour	0.1	2449.9	0.1	244.99										245
				Materials and Equipment	0.1				0.1									
				Other	0.1						300	0.1	30					30
				Contingency	40%									40%	1.0	110.0		110

Total	**2,147**						
Check: Should = 0							
Total	1,294	Total		Total	240	Total	613.3
Check: Should = 0		Check: Should = 0		Check: Should = 0		Check: Should = 0	

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
587	30							Licensing & Approvals	Labour	STEP	OPG	RJH	1	283	283			3048.8
587	30							Licensing & Approvals	Materials and Equipment	STEP	OPG	RJH	1	283	283			
587	30							Licensing & Approvals	Other	STEP	OPG	RJH	1	283	283			15364.2
587	30							Licensing & Approvals	Contingency	STEP	OPG	RJH	1	283	283			4603.2

NO DATA TO FILL

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check: Total minus budget Should = 0	Check total	Total Cost $k	Budget costs to Years by %
Labour	3049		*0.0*	3048.8	
Materials and Equipment					
Other	15364			15364.2	
Contingency	4603.2		*0.0*	4603.2	
Total	23016		*0.0*	23016	

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
587																								
587	30							**Licensing & Approvals**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
587	30	30						LIAISON WITH CNSC																
								Duration 4 yrs vs 10 yrs in CES and cost shared between 7 sites. Thus factor is 0.057. However due to inefficiencies of multiple sites increase to 0.2	Labour	0.2	555	0.2	111									111
									Materials and Equipment	0.2					0.2									
									Other	0.2							40	0.2	8				8
									Contingency	0.25										25%	1.0	29.8	30
587	30	50						CNSC CONSTRUCTION LICENCE																
									Labour	0.2	2631	0.2	526.2											526
								Some inefficiencies gained due to multiple sites	Materials and Equipment	0.2					0.2									
									Other	0.2							6,264	0.2	1252.8				1,253
									Contingency	0.25										25%	1.0	444.8	445
587	30	60						OTHER GOVN'MT APPROVALS																
587	30	60	10					APPROVAL REQUIREMENTS																
								Duration 4 yrs vs 10 yrs in CES and cost shared between 7 sites. Thus factor is 0.057. However due to inefficiencies of multiple sites increase to 0.2	Labour	0.2	337	0.2	67.4									67

					Materials and Equipment	0.2				0.2									
					Other	0.2						0.2							
					Contingency	0.25										25%	1.0	16.9	17
587	30	60	30	FEDERAL APPROVALS															
					Labour	0.2	133	0.2	26.6										27
					Materials and Equipment	0.2				0.2									
					Other	0.2						0.2							
					Contingency	0.25										25%	1.0	6.7	7
587	30	60	40	PROVINCIAL APPROVALS															
					Labour	0.2	133	0.2	26.6										27
					Materials and Equipment	0.2				0.2									
					Other	0.2						0.2							
					Contingency	0.25										25%	1.0	6.7	7
587	30	60	50	MUNICIPAL APPROVALS															
					Labour	0.2	133	0.2	26.6										27
					Materials and Equipment	0.2				0.2									
					Other	0.2						0.2							
					Contingency	0.25										25%	1.0	6.7	7
587	30	65		CNSC OPERATING LICENCE (Initial Application)															
					Labour	0.2	513	0.2	102.6										103
					Materials and Equipment	0.2				0.2									
					Other	0.2							902	0.2	180.4				180
					Contingency	0.25										25%	1.0	70.8	71
587	30	70		CNSC OPERATING LICENCE (Maintenance & Renewal)															
				CES duration is 330 years. Costs incurred in RES during period Y11 to Y283 or 273 years. RES has 0.08 staff vs CES with 1 staff. Factor is 273/330 x 0.08/1 = 0.066	Labour	0.066	32754	0.066	2161.764										2,162
					Materials and Equipment	1				1									
				Expenses at $51K/a x 273 yrs	Other	1							13,923	1	13923				13,923
					Contingency	0.25										25%	1.0	4,021.2	4,021

				Total	**23,016**
				Check: Should = 0	
Total	3,049	Total		Total	15,364 Total 4,603.2
Check: Should = 0		Check: Should = 0		Check: Should = 0	Check: Should = 0

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
587	35	0	0	0	0	0	0	Public Affairs	Labour	STEP	OPG	RJH	1	10	10	0	0	NO DATA TO FILL	683.8
587	35	0	0	0	0	0	0	Public Affairs	Materials and Equipment	STEP	OPG	RJH	1	10	10	0	0		0.0
587	35	0	0	0	0	0	0	Public Affairs	Other	STEP	OPG	RJH	1	10	10	0	0		461.8
587	35	0	0	0	0	0	0	Public Affairs	Contingency	STEP	OPG	RJH	1	10	10	0	0		572.8

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %
Check total	**Total Cost $k**	
0%		
0.0	683.8	
0.0	0.0	
0.0	461.8	
0.0	572.8	
0.0	1718	

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost
Labour	684
Materials and Equipment	0
Other	462
Contingency	572.8
Total	1718

INSTRUCTIONS

Insert lower level WBS numbers as required

Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required

Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15

										A	B	C	D	E	F	G	H	I	J	K	L	M	
										Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																						**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**		**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																
587	35							**Public Affairs**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
587	35	45						PUBLIC AFFAIRS - PREFERRED SITE																
									Labour	0.05	3046.2	0.05	152.31										152	
									Materials and Equipment	0.05				0	0.05	0							0	
									Other	0.05							600	0.05	30				30	
									Contingency	50%										50%	1.0	91.2	91	
587	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL																
									Labour	0.05	4569.3	0.05	228.465										228	
									Materials and Equipment	0.05				0	0.05	0							0	
									Other	0.05							1,450	0.05	72.5				73	
									Contingency	50%										50%	1.0	150.5	150	
587	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION																
									Labour	0.05	2528.9	0.05	126.445										126	
									Materials and Equipment	0.05				0	0.05	0							0	
									Other	0.05							800	0.05	40				40	
									Contingency	50%										50%	1.0	83.2	83	
587	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT																
									Labour	0.05	3530.8	0.05	176.54										177	

				Materials and Equipment	0.05			0	0.05	0							0
				Other	0.05						170	0.05	8.5				9
				Contingency	50%									50%	1.0	92.5	93
587	35	120	Community Offsets & Benefits														
				Labour	0.15	0	0.15	0									0
				Materials and Equipment	0.15			0	0.15	0							0
				Other	0.15						2,072	0.15	310.8				311
				Contingency	50%									50%	1.0	155.4	155
																Total	**1,718**
																Check: Should = 0	**0**
						Total	684	Total		0	Total	462	Total			572.8	
						Check: Should = 0	0	Check: Should = 0		0	Check: Should = 0	0	Check: Should = 0			0	

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
587	40	0	0	0	0	0	0	Facility Design & Construction	Labour	STEP	CTECH	AM	8	282	275	0	0	NO DATA TO FILL	9910.3
587	40	0	0	0	0	0	0	Facility Design & Construction	Materials and Equipment	STEP	CTECH	AM	8	282	275	0	0		11019.3
587	40	0	0	0	0	0	0	Facility Design & Construction	Other	STEP	CTECH	AM	8	282	275	0	0		707.5
587	40	0	0	0	0	0	0	Facility Design & Construction	Contingency	STEP	CTECH	AM	8	282	275	0	0		8443.7

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check: Total minus budget Should = 0	Budget costs to Years by %	Check total	Total Cost $k
Labour	9910			*0.0*	9910.3
Materials and Equipment	11019			*0.0*	11019.3
Other	707			*0.0*	707.5
Contingency	8443.7			*0.0*	8443.7
Total	30081			*0.0*	30081

INSTRUCTIONS

Insert lower level WBS numbers as required

Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required

Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15

ACTIVITY DETAIL ESTIMATE

WBS LEVEL								WBS Description / Detail	Cost Category	Factor	A	B	C	D	E	F	G	H	I	J	K	L	M	
1	2	3	4	5	6	7	8				Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	TOTAL Cost $k	Add Basis of estimate Note Ref Number
587	40							**Facility Design & Construction**			**Labour** CES	Factor	RES	**Materials and other Equipment** CES	Factor	RES	**Other** CES	Factor	RES	**Contingency** CES	Factor	RES		
587	40	10						SITE IMPROVEMENTS																
								a 10% allowance of the CES costs, applied to the site improvements	Labour	0.10	45,930.4	0.1	4,593.0										4,593	
									Materials and Equipment	0.10				58,350.0	0.1	5,835.0							5,835	
								no property acquisition required	Other	0.00							3,375.0	0.0	0.0				0	
								Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	5,214.0	5,214	
587	40	30						COMMON ANCILLARY FACILITIES																
587	40	30	10					ADMIN AND SUPPORT FACILITIES																
587	40	30	10	1				ADMIN AND VISITOR RECEPTION BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour	0.0	486.3	0.0	0.0								comment 7		0	
									Materials and Equipment	0.0				784.2	0.0	0.0							0	
								No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0				0	
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	0.0	0	
587	40	30	10	2				OPS SUPPT & HEALTH PHYSICS BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour	0.0	1,294.8	0.0	0.0								comment 7		0	
									Materials and Equipment	0.0				1,612.6	0.0	0.0							0	
								No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0				0	

				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	0.0	0
587 40	30	10	3	EQUIP STORAGE AND MAINT'CE BLDG															
				Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour	0.0	1,262.1	0.0	0.0								comment 7		0
					Materials and Equipment	0.0				1,675.0	0.0	0.0							0
				No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0				0
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	0.0	0
587 40	30	10	5	ACTIVE SOLID WASTE HDLG BLDG															
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	459.9	0.3	138.0										138
					Materials and Equipment	0.3				1,135.0	0.3	340.5							341
				No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0				0
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	143.5	144
587 40	30	10	6	SOLID WASTE STORAGE AREA															
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	458.8	0.3	137.6										138
					Materials and Equipment	0.3				437.5	0.3	131.3							131
				No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0				0
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	80.7	81
587 40	30	10	7	ACTIVE LIQ/W TRT'MT BLDG															
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	359.4	0.3	107.8										108
					Materials and Equipment	0.3				1,727.0	0.3	518.1							518
				No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0				0
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	187.8	188
587 40	30	10	8	LOW LVL LIQ/W STRG BLDG															
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	373.7	0.3	112.1										112
					Materials and Equipment	0.3				1,426.0	0.3	427.8							428
				No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0				0
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	162.0	162
587 40	30	10	9	WAREHOUSE BLDG															
				Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour	0.0	470.9	0.0	0.0								comment 7		0
					Materials and Equipment	0.0				550.0	0.0	0.0							0
				No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0				0
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	0.0	0
587 40	30	10	10	GUARDHOUSE AND SECURITY FENCE															
				Building and security exist therefore new building and fence not required. Allowance for refurbishment covered in ***/45/20/50	Labour	0.0	631.2	0.0	0.0								comment 7		0
					Materials and Equipment	0.0				553.7	0.0	0.0							0
					Other	0.0							0.0	0.0	0.0				0
				Increased contingency than CES due to RES facility footprint size not confirmed and therefore length of fence, not yet known	Contingency	20%										20%	1.0	0.0	0

587 40	30	10	11	TRUCK INSP'N / WASH STATION																	
				not req'd as no fuel transported off site	Labour	0.0	872.2	0.0	0.0									comment 7			0
					Materials and Equipment	0.0				1,075.0	0.0	0.0									0
					Other	0.0							389.4	0.0	0.0						0
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	0.0			0
587 40	30	10	12	UTILITY BLDG																	
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	1,023.2	0.3	307.0												307
					Materials and Equipment	0.3				1,257.0	0.3	377.1									377
				No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0						0
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	205.2			205
587 40	30	10	13	TEST FACILITY																	
				Taken as being independent of fuel inventory stored. Same size bldg as CES, facility will be shared by Whiteshell and Chalk River , therefore cost will be 50% of CES costs.	Labour	0.5	766.8	0.5	383.4												383
					Materials and Equipment	0.5				1,675.0	0.5	837.5									838
				No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0						0
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	244.2			244
587 40	30	20		OTHER SITE SYSTEMS																	
587 40	30	20	1	FIRE PROTECTION SYSTEMS																	
				assumed aailable and turned over to RES during transition	Labour	0.00	1,022.2	0.0	0.0									comment 7			0
					Materials and Equipment	0.00				676.2	0.0	0.0									0
				No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0						0
				Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	0.0			0
587 40	30	20	2	SECURITY AND COMMUNICATION SYSTEM																	
				assumed aailable and turned over to RES during transition	Labour	0.00	607.5	0.0	0.0									comment 7			0
					Materials and Equipment	0.00				600.0	0.0	0.0									0
				No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0						0
				Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	0.0			0
587 40	30	20	3	ELECTRICAL AND EMERGENCY POWER																	
				assumed aailable and turned over to RES during transition	Labour	0.00	1,939.6	0.0	0.0									comment 7			0
					Materials and Equipment	0.00				1,932.0	0.0	0.0									0
				No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0						0
				Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	0.0			0
587 40	30	20	4	SANITARY SEWER SYSTEM																	
				assumed aailable and turned over to RES during transition	Labour	0.00	339.2	0.0	0.0									comment 7			0

						Materials and Equipment	0.00				310.5	0.0	0.0									0
					No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0						0
					Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	0.0			0
587	40	30	20	5	POTABLE WATER SYSTEM																	
					assumed aailable and turned over to RES during transition	Labour	0.00	371.6	0.0	0.0										comment 7		0
						Materials and Equipment	0.00				148.0	0.0	0.0									0
					No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0						0
					Percentage for contingency assumed same as for	Contingency	25%										25%	1.0	0.0			0
587	40	30	20	6	RETENTION/SEDIMENTATION POND																	
					assumed aailable and turned over to RES during transition	Labour	0.00	874.4	0.0	0.0										comment 7		0
						Materials and Equipment	0.00				189.6	0.0	0.0									0
					No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0						0
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	0.0			0
587	40	30	20	7	STORM WATER DETENTION POND																	
					assumed aailable and turned over to RES during transition	Labour	0.00	387.8	0.0	0.0										comment 7		0
						Materials and Equipment	0.00				93.5	0.0	0.0									0
					No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0						0
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	0.0			0
587	40	30	20	8	CONST'N MAT'L STOCKPILE AREA																	
					not req'd, concrete brought in as req'd from off-site	Labour	0.00	1,039.2	0.0	0.0										comment 7		0
						Materials and Equipment	0.00				625.0	0.0	0.0									0
					No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0						0
					Percentage for contingency assumed same as for CES	Contingency	15%										15%	1.0	0.0			0
587	40	30	20	9	SITE MATERIALS STORAGE AREA																	
					assumed aailable and turned over to RES during transition	Labour	0.00	1,169.5	0.0	0.0										comment 7		0
						Materials and Equipment	0.00				655.0	0.0	0.0									0
					No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0						0
					Percentage for contingency assumed same as for CES	Contingency	15%										15%	1.0	0.0			0
587	40	30	20	10	ACCESS ROADS AND VEHICLE COMPOUNDS																	
					assumed aailable and turned over to RES during transition	Labour	0.00	1,319.9	0.0	0.0										comment 7		0
						Materials and Equipment	0.00				1,866.9	0.0	0.0									0
					No entry into cost category	Other	0.0							0.0	0.0	0.0						0
					Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	0.0			0
587	40	30	30		CONST'N INDIRECTS ANCILLARY FACILITIES																	
					assumed aailable and turned over to RES during transition	Labour	0.00	4,406.4	0.0	0.0										comment 7		0
						Materials and Equipment	0.00				6,610.9	0.0	0.0									0
					No entry into cost category	Other	0.0							0.0	0.0	0.0						0
					Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	0.0			0
587	40	40			STORAGE CONSTRUCTION																	

587	40	40	10	STORAGE BUILDING DESIGN & CONSTRUCTION															
				The materials & labour costs for CES are based on const'n of 4 storage buildings. For RES these costs are factored to suit 1 building which is approx half the footprint size of a single CES bldg. Combined factor based on building quantity and footprint size (using 6/10 rule).	Labour	0.29	10,080.0	0.29	2,894.7										2,895
					Materials and Equipment	0.29				6,770.0	0.29	1,944.2							1,944
				expenses factor taken same as labour	Other	0.29							2,016.0	0.29	578.9				579
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	1,625.4	1,625
587	40	40	20	STORAGE BUILDING SERVICES DESIGN & INSTALLATION															
				The materials & labour costs for CES are based on const'n of 4 storage buildings. For RES these costs are factored to suit 1 building which is approx half the footprint size of a single CES bldg. Combined factor based on building quantity and footprint size (using 6/10 rule).	Labour	0.29	835.2	0.29	239.8										240
					Materials and Equipment	0.29				764.8	0.29	219.6							220
				expenses factor taken same as labour	Other	0.29							320.0	0.29	91.9				92
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	165.4	165
587	40	40	30	STORAGE BUILDING CONSTRUCTION INDIRECTS															
				The labour costs for CES are based on const'n of 4 storage buildings. For RES these costs are factored to suit 1 building which is approx half the footprint size of a single CES bldg. Combined factor based on building quantity and footprint size (using 6/10 rule).The design part of the labour costs is shared 50/50 between whiteshell & chalk river sites.	Labour	0.29	3,471.2	0.29	996.8										997
				The materials costs for CES are based on const'n of 4 storage buildings. For RES these costs are factored to suit 1 building which is approx half the footprint size of a single CES bldg. Combined factor based on building quantity and footprint size (using 6/10 rule).	Materials and Equipment	0.29				1,351.8	0.29	388.2							388
				No entry into cost category	Other	0.00							0.0	0.00	0.0				0
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	415.5	416
587 40	650			ENERGY CONSUMPTION															
				No entry into cost category	Labour	0.0	0.0	0.0	0.0										0
				No entry into cost category	Materials and Equipment	0.0				0.0	0.0	0.0							0
				consumption for the construction of storage chamber and ancillary buildings	Other	0.10							366.3	0.1	36.6				37
				Contingency included in cost (built into power consumption calculation)	Contingency	0%										0%	1.0	0.0	0
																Total			**30,081**
																Check: Should = 0			**0**
							Total		9,910	Total		11,019	Total		707	Total		8,443.7	
							Check: Should = 0		0	Check: Should = 0		0	Check: Should = 0		0	Check: Should = 0		0	

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
587	45							Facility Operation	Labour	STEP	CTECH	AM	6	283	278			NO DATA TO FILL	307120.1
587	45							Facility Operation	Materials and Equipment	STEP	CTECH	AM	6	283	278				119054.4
587	45							Facility Operation	Other	STEP	CTECH	AM	6	283	278				92379.7
587	45							Facility Operation	Contingency	STEP	CTECH	AM	6	283	278				135492.0

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	307120		307120.1
Materials and Equipment	119054		119054.4
Other	92380		92379.7
Contingency	135492		135492.0
Total	654046		654046

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
587	45							**Facility Operation**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
587	45	20						OPERATIONS - EXTENDED MONITORING																
587	45	20	5					PROGRAM MANAGEMENT																
								Entries in CES DET applicable to RES but duration 273 years RES & 300 years CES therefore 273/300 = 0.91 . Program management spread over 7 sites with Chalk River assumed to have 0.8 staff vs 9 in CES. Thus combined factor	Labour	0.081	312,354.0	0.1	25,266.0												25,266	6
								No entry in CES alternative cost category	Materials and Equipment																
								Annual cost = $258/a x 273yrs	Other	1.00							70,434.0	1.0	70,434.0				70,434	4,5
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	19,140.0	19,140	
587	45	20	40					MONITORING AND SURVEILLANCE -EXTENDED MONITORING																
								CES monitoring and surveillance duration was 300 yrs for 4717 baskets, RES is 273 years for 95 baskets. Chalk River assumed to have 0.5 staff for RES vs 5 in CES. Combined factor based on duration, fuel inventory and staffing levels.	Labour	0.0018	49,716.0	0.0	91.1												91	6
								annual costs = $1k/a x 273 years	Materials and Equipment	1.00				273.0	1.0	273.0							273	7
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	182.1	182	

587	45	20	50		OPERATION INDIRECTS (EXTENDED MONITORING)															
					Entries in CES DET applicable to RES but duration 273 years RES & 300 years CES. Staff for RES = 7 vs 34 in CES. Combined factor = 273/300 x 7/34. M&E costs are $75k/a x 273 years	Labour	0.19	875,048.0	0.2	163,942.8								163,943	6
						Materials and Equipment	1.00				20,475.0	1.0	20,475.0					20,475	7
					Armed response = $50k/a + energy costs at $3k/a. total = $53k x 273 years	Other	1.00							14,469.0	1.0	14,469.0		14,469	7
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	59,666.0	59,666	
587	45	20	60		COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)															
					RES has duration 229 years, CES has 300 years. RES staff is 1 vs 5 in CES. Factor is 229/300 x 1/5	Labour	0.15	148,529.0	0.2	22,675.4								22,675	6
					No entry in CES alternative cost category	Materials and Equipment														
					No entry in CES alternative cost category	Other														
					Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	5,668.9	5,669	
587	45	20	70		FUEL INTEGRITY MONITORING (25 YEARLY)															
					RES has duration 278 years, CES has 300 years. RES staff is 0.1 vs 0.5 in CES. Factor is 278/300 x 0.1/0.5	Labour	0.2	4,631.0	0.2	858.3								858	6
						Materials and Equipment	1.0				695.0	1.0	695.0					695	7
						Other	1.0							139.0	1.0	139.0		139	7
					Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	846.1	846	
587	45	30			OPERATIONS - FACILITY REPEATS															
587	45	30	20		SILOS 100 YEAR REPLACEMENT															
587	45	30	20	10	DEMOLISH EXISTING STORAGE SILOS															
					costs taken from CES basket vault demolition, rated at $104 per tonne of reinforced concrete. Each silo = 115 tonne x 14 silos =1,610Te. Split 50/50 labour/materials	Labour	805.00	0.104	805.0	83.7								84	3
						Materials and Equipment	805.00				0.104	805.0	83.7					84	3
					No costs in this category	Other														
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	50.2	50	
587	45	30	20	20	SILO CONSTRUCTION															
					Assume same costs as for initial construction of the storage silos. 14 silos constructed at this point to house standard and non standard fuelcost per silo = $60K. Allow 67% labour 33% materials.	Labour	9.38	60.0	9.4	562.8								563	1
						Materials and Equipment	4.62				60.0	4.6	277.2					277	1
					No costs in this category	Other														
					Percentage for contingency for silos construction assumed same as for CES basket vaults construction	Contingency	30%										30%	1.0	252.0	252	
587	45	30	20	30	TRANSFER OPERATIONS															
						Labour	0.0051	990.0	0.01	5.1								5.0590	
					Smaller fuel inventory for RES = 14 silos in total - 11 silos with 9 baskets each, 1 spare silo and 2 silos with non standard waste/fuel. Assume transfer ops based on fuel only ie 95 baskets therefore ratio = 95/4717. Labour costs reduced, existing site staff will undertake operations for first 200 years.															
					No costs in this category	Materials and Equipment														
					Armed response included at rate of $50k/a based on 2 years duration - see note 8.	Other	1							100.0	1.0	100.0		100	8	

					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	31.5	31.5177		
587	45	30	20	40	WASTE DISPOSAL																	
					No costs in this category	Labour																
					No costs in this category	Materials and Equipment																
					costs takrn from CES basket vault waste disposal, rated at $200 per tonne of reinforced concrete. Each silo = 115 tonne x 14 silos =1,610Te.	Other	1610							0.2	1,610.0	322.0				322	3	
						Contingency	30%										30%	1.0	96.6	97		
587	45	30	30		SILOS 200 YEAR REPLACEMENT																	
					assumed same as 100 yr replacement	Labour				651.6										652		
					assumed same as 100 yr replacement	Materials and Equipment						360.9								361		
					assumed same as 100 yr replacement	Other										422.0				422		
					assumed same as 100 yr replacement	Contingency													430.3	430		
587	45	30	40		SILOS 300 YEAR REPLACEMENT																	
					assumed same as 100 yr replacement	Labour				740.8										741		
					assumed same as 100 yr replacement	Materials and Equipment						360.9								361		
					assumed same as 100 yr replacement	Other										322.0				322	9	
					assumed same as 100 yr replacement	Contingency													430.3	430		
587	45	30	50		STORAGE BUILDINGS 100 YEAR REPLACEMENT																	
					Costs equal totals of RES costs for Design & Construction, Services & Installation, and Construction Indirects brought forward from the initial construction phase	Labour	1.00	4,131.4	1.0	4,131.4										4,131		
						Materials and Equipment	1.00				2,552.0	1.0	2,552.0							2,552		
						Other	1.00							670.8	1.0	670.8				671		
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	2,206.3	2,206		
587	45	30	60		STORAGE BUILDINGS 200 YEAR REPLACEMENT																	
					Samecost sas for 100 year facility repeat	Labour	1.00	4,131.4	1.0	4,131.4										4,131		
						Materials and Equipment	1.00				2,552.0	1.0	2,552.0							2,552		
						Other	1.00							670.8	1.0	670.8				671		
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	2,206.3	2,206		
587	45	30	70		STORAGE BUILDINGS 300 YEAR REPLACEMENT																	
					Samecost sas for 100 year facility repeat	Labour	1.00	4,131.4	1.0	4,131.4										4,131		
						Materials and Equipment	1.00				2,552.0	1.0	2,552.0							2,552		
						Other	1.00							670.8	1.0	670.8				671		
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	2,206.3	2,206		
587	45	40			OPERATIONS - REPACKAGING																	
587	45	40	5		PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)																	
					Entries in CES DET applicable to RES but duration 13 years RES 100yr=(2license+2const/ops 111-114) + 200yr=(2license+2const/ops 211-214)+ 300yr=(2license+2const'n+1ops 279-283) compared to 114 years CES therefore13/114 of labour costs spread project management over 7 sites and acknowledge inefficiency use 20% factor	Labour	0.02	389,170.0	0.0	8,875.8										8,876		
					No entry in CES alternative cost category	Materials and Equipment																

							see note 4. no property tax assumed this site	Other													4	
							Percentage for contingency assumed same as for CES	Contingency	20%								20%	1.0	1,775.2	1,775	
587	45	40	10	40			COMMON ANCILLARY FACILITIES (REPLACEMENT)			comment 7											
							only require full ancillary buildings (13) at 300yr RPBB event, for 100 & 200yr facility repeats, the replacement of 7 ancillary buildings is required. Therefore combined factor = ((7/13)*2) + 1	Labour	2.1	21,056.2	2.1	43,732.1									43,732	
								Materials and Equipment	2.1				29,785.1	2.1	61,861.4					61,861	
							No entry in CES alternative cost category	Other													
							Percentage for contingency assumed same as for CES	Contingency	22%								22%	1.0	23,230.6	23,231	
587	45	40	10	600	30		ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)														
							duration 7 years RES compared to 30 years CES. Factor =7/30	Labour	0.2	11,882.0	0.2	2,772.5								2,772	2
							No entry in CES alternative cost category	Materials and Equipment													
							No entry in CES alternative cost category	Other													
							Percentage for contingency assumed same as for CES	Contingency	25%								25%	1.0	693.1	693	
587	45	40	40				BASKET TO BASKET 300 YEAR REPACKAGING														
587	45	40	40	05			CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)														
							assumed same facility as CES therefore factor = 1	Labour	1.0	476.1	1.0	476.1								476	
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				354.6	1.0	354.6					355	
							assumed same facility as CES therefore factor = 1	Other	1.0							228.4	1.0	228.4		228	
							same contingency as for CES	Contingency	30%								30%	1.0	317.7	318	
587	45	40	40	10			PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)														
587	45	40	40	10	20		RPBB EQUIP. DESIGN, SUPPLY & INSTALL														
587	45	40	40	10	20	10	RECEIPT & TRANSFER (EQUIP)														
							assumed same facility as CES therefore factor = 1	Labour	1.0	70.8	1.0	70.8								71	
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				1,415.0	1.0	1,415.0					1,415	
							assumed same facility as CES therefore factor = 1	Other	1.0							74.3	1.0	74.3		74	
							same contingency as for CES	Contingency	30%								30%	1.0	468.0	468	
587	45	40	40	10	20	20	BASKET TO BASKET FUEL TRANSFER														
							assumed same facility as CES therefore factor = 1	Labour	1.0	2,319.4	1.0	2,319.4								2,319	
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				11,597.0	1.0	11,597.0					11,597	
							assumed same facility as CES therefore factor = 1	Other	1.0							695.8	1.0	695.8		696	
							same contingency as for CES	Contingency	30%								30%	1.0	4,383.7	4,384	
587	45	40	40	10	20	30	BASKET DECONTAMINATION														
							assumed same facility as CES therefore factor = 1	Labour	1.0	854.6	1.0	854.6								855	
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,563.0	1.0	4,563.0					4,563	
							assumed same facility as CES therefore factor = 1	Other	1.0							256.4	1.0	256.4		256	

						same contingency as for CES	Contingency	30%								30%	1.0	1,702.2	1,702
587	45	40	40	10	30	RPBB BUILDING DESIGN AND CONSTRUCTION													
						assumed same facility as CES therefore factor = 1	Labour	1.0	4,160.0	1.0	4,160.0								4,160
						assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,280.0	1.0	4,280.0					4,280
						assumed same facility as CES therefore factor = 1	Other	1.0							832.0	1.0	832.0		832
						same contingency as for CES	Contingency	30%								30%	1.0	2,781.6	2,782
587	45	40	40	10	60	BUILDING SERVICES (RPB)													
						assumed same facility as CES therefore factor = 1	Labour	1.0	4,447.8	1.0	4,447.8								4,448
						assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,153.8	1.0	4,153.8					4,154
						assumed same facility as CES therefore factor = 1	Other	1.0							1,309.4	1.0	1,309.4		1,309
						same contingency as for CES	Contingency	25%								25%	1.0	2,477.8	2,478
587	45	40	40	10	70	COMMISSIONING (RPB)													
						assumed same facility as CES therefore factor = 1	Labour	1.0	668.2	1.0	668.2								668
						No entry in CES alternative cost category	Materials and Equipment												
						assumed same facility as CES therefore factor = 1	Other	1.0							126.3	1.0	126.3		126
						same contingency as for CES	Contingency	50%								50%	1.0	397.3	397
587	45	40	40	10	80	CONST'N INDIRECTS (RPB)													
						assumed same facility as CES therefore factor = 1	Labour	1.0	6,299.6	1.0	6,299.6								6,300
						No entry in CES alternative cost category	Materials and Equipment												
						assumed same facility as CES therefore factor = 1	Other	1.0							241.5	1.0	241.5		242
						same contingency as for CES	Contingency	30%								30%	1.0	1,962.3	1,962
587	45	40	40	400		CONSTRUCTION MANAGEMENT (RPB)													
						assumed same facility as CES therefore factor = 1	Labour	1.0	4,690.6	1.0	4,690.6								4,691
						No entry in CES alternative cost category	Materials and Equipment												
						No entry in CES alternative cost category	Other												
						same contingency as for CES	Contingency	30%								30%	1.0	1,407.2	1,407
587	45	40	40	500		COMMISSIONING MANAGEMENT (RPB)													
						assumed same facility as CES therefore factor = 1	Labour	1.0	113.3	1.0	113.3								113
						No entry in CES alternative cost category	Materials and Equipment												
						assumed same facility as CES therefore factor = 1	Other	1.0							13.5	1.0	13.5		14
						same contingency as for CES	Contingency	50%								50%	1.0	63.4	63
587	45	40	40	600		REPACKAGING OPERATIONS (RPB)													
						Labour for repackaging operations for CES is for a fuel inventory of 4717 baskets. RES has 95 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 95/4717	Labour	0.020	3,960.8	0.0	79.8								80
						the same factor for labour is used for procurement of new baskets	Materials and Equipment	0.020				23,585.0	0.0	475.0					475

					the same factor for labour is used for waste disposal of old baskets	Other	0.020					378.0	0.0	7.6				8				
					same contingency as for CES	Contingency	30%								30%	1.0	168.7	169				
587	45	40	40	700	OPERATION INDIRECTS (RPB)																	
					operation indirect labour costs for CES are for a duration of 10 yrs RES operations are for 1 yr max therefore a factor of 0.1 is used	Labour	0.1	2,678.3	0.1	267.8								268				
					Assume same spares and consumables required as identical equipment is used for both CES & RES. Therefore factor = 1	Materials and Equipment	1.0				172.8	1.0	172.8					173				
					Assume energy consumption for running of facility can be factored relative to duration of facility operation = 1/10yrs = 0.1. Armed response included at rate of $50k/a based on 1 year duration - see note 8.	Other	1.0					374.0	1.0	374.0				374	8			
					same contingency as for CES	Contingency	30%								30%	1.0	244.4	244				
587	45	40	40	800	STORAGE OPERATIONS (RPB)																	
					Labour for storage operations for CES is for a fuel inventory of 4717 baskets. RES has 95 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 95/4717	Labour	0.020	990.2	0.0	19.9								20				
					No entry in CES alternative cost category	Materials and Equipment																
					No entry in CES alternative cost category	Other																
					same contingency as for CES	Contingency	30%								30%	1.0	6.0	6				

Total	**654,046**
Check: Should = 0	

Total	307,120	Total	119,054	Total	92,380	Total	135,492.0
Check: Should = 0		Check: Should = 0		Check: Should = 0		Check: Should = 0	

BASIS OF ESTIMATE NOTES - Insert references and notes

1 Cost information on silos extracted from OPG R.Heystee email date 11-01-03 : 'PLGS dry canister costs for RES costing' cost includes; materials supply, construction, testing and project management: $60K per canister Fall 2001 dollars. Labour and materials split approx. 33% materials/67%labour

2 ancillary ops factored from CES CVSB. In CES this cost was for a 30 year period (covering 1 facility repeat and 1 repackaging event). for RES this covers 100/200&300year facility repeats & 300y repackaging 3x8 (1 demolish prev (y83). 2 const,n of 222 silos (y84,85) 5 ops for transfer) = 24

3 costs for silos demolition and waste diposal based on unit cost factors obtained for demolition of basket storage vaults in CVSB alternative

4 It is assumed that there is no property tax on facilities located on the Chalk River site. Reference note 5 on table 18 - Cost Estimate Report 1105/MD18084/REP/19

5 258k$/a made up of expenses from table 18 in report (15+118+50+50+25). No property tax or PST included.

6 staffing levels obtained from table 17 in cost estimate report 1105/MD18084/REP/19

7 annual costs for Labour/M&E and Other, obtained from table 18 in cost estimate report 1105/MD18084/REP/19

8 armed response costs during 'fuel handling' based on rate of $100k/a. But, due to $50k/a for armed response included in extended monitoring, this means an additional $50k/a is to be included for the duration of the facility repeat transfers/repackaging events ($50k + $50k = $100k)

9 armed response not captured in 300 yr facility repeat for fuel transfers, as it is covered in basket repackaging at 300yr event

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
587	55	0	0	0	0	0	0	Environmental Assessment and Monitoring	Labour	STEP	OPG	RJH	4	283	280	0	0	NO DATA TO FILL	14130.0
587	55	0	0	0	0	0	0	Environmental Assessment and Monitoring	Materials and Equipment	STEP	OPG	RJH	4	283	280	0	0		4095.0
587	55	0	0	0	0	0	0	Environmental Assessment and Monitoring	Other	STEP	OPG	RJH	4	283	280	0	0		1533.0
587	55	0	0	0	0	0	0	Environmental Assessment and Monitoring	Contingency	STEP	OPG	RJH	4	283	280	0	0		5927.4

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
		0%	
Labour	14130	*0.0*	14130.0
Materials and Equipment	4095	*0.0*	4095.0
Other	1533	*0.0*	1533.0
Contingency	5927.4	*0.0*	5927.4
Total	25685	*0.0*	25685

INSTRUCTIONS

										A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																						**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**											Cost $k	
1	2	3	4	5	6	7	8																
587	55							**Environmental Assessment and Monitoring**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	
587	55	10						EA & MONITORING PROGRAM MANAGEMENT															
								Costs are incurred over the period Y4 to Y283 or 280 yrs vs 347 yrs in CES. RES has 0.1 staff vs 2 staff in CES. Factor is 280/347 x 0.1/2 = 0.04	Labour	0.04	70306	0.04	2812.24											2,812
									Materials and Equipment	1				0	1	0							0
								Expenses at $1.5K/a x 280 yrs	Other	1							420	1	420				420
									Contingency	0.3										3232.24	0.3	969.672	970
587	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT															
								Assume C/L & EA process spans 3 years (Y5 to Y7) with with some preparation work in Y4; ie total of 4 years. Due to multiple sites with same technology can share costs	Labour	0.2	7471	0.2	1494.2											1,494
									Materials and Equipment	0.2				0	0.2	0							0
									Other	0.2							2,150	0.2	430				430
									Contingency	0.3										1924.2	0.3	577.26	577
587	55	40						GROUNDWATER MONITORING															

			Costs span the period Y11 to Y283 or 273 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.6 in CES. Factor is 273/330 x 0.02/0.6 = 0.028.	Labour	0.028	37158	0.028	1040.424										1,040
			M&E at $3K/a x 273 yrs	Materials and Equipment	1				819	1	819							819
			Expenses at $2K/a x 273 yrs	Other	1							546	1	546				546
				Contingency	0.3										2405.424	0.3	721.6272	722
587	55	50	RADIOLOGICAL BIOSPHERE MONITORING															
			Costs span the period Y11 to Y283 or 273 yrs vs 330 ys for CES. RES staff is 0.1 vs 3.3 staff in CES. Factor is 0.025	Labour	0.025	217280	0.025	5432										5,432
			M&E at $9K/a x 273 yrs	Materials and Equipment	1				2457	1	2457							2,457
				Other	1							0	1	0				0
				Contingency	0.3										7889	0.3	2366.7	2,367
587	55	60	NON-RAD BIOSPHERE MONITORING															
			Costs span the period Y11 to Y283 or 273 yrs vs 330 in CES. RES staff is 0.05 staff vs 0.8 staff in CES. Factor is 273/330 x 0.05/0.8 = 0.052	Labour	0.052	53590	0.052	2786.68										2,787
			M&E at $3K/a x 273 yrs	Materials and Equipment	1				819	1	819							819
				Other	1							0	1	0				0
				Contingency	0.3										3605.68	0.3	1081.704	1,082
587	55	80	HUMAN HEALTH MONITORING															
			Costs span the period Y11 to Y283 or 273 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.17 in CES. Factor is 273/330 x 0.02/0.17 = 0.098	Labour	0.098	5760	0.098	564.48										564
				Materials and Equipment	1				0	1	0							0
			Expenses at 0.5K/a x 273 yrs	Other	1							137	1	137				137
				Contingency	0.3										701.48	0.3	210.444	210
															Total			**25,685**
															Check: Should = 0			**0**
						Total		14,130	Total		4,095	Total		1,533	Total		5,927.4	
						Check: Should = 0		0	Check: Should = 0		0	Check: Should = 0		0	Check: Should = 0		0	

BASIS OF ESTIMATE NOTES - Insert references and notes

1

2

3

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
587	90	0	0	0	0	0	0	Program Management	Labour	STEP	CTECH	AM	1	10	10	0	0	NO DATA TO FILL	664.0
587	90	0	0	0	0	0	0	Program Management	Materials and Equipment	STEP	CTECH	AM	1	10	10	0	0		0.0
587	90	0	0	0	0	0	0	Program Management	Other	STEP	CTECH	AM	1	10	10	0	0		180.6
587	90	0	0	0	0	0	0	Program Management	Contingency	STEP	CTECH	AM	1	10	10	0	0		168.9

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
		0%	
Labour	664	0.0	664.0
Materials and Equipment	0	0.0	0.0
Other	181	0.0	180.6
Contingency	168.9	0.0	168.9
Total	1014	0.0	1014

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A Use appropriate CES cost	B Apply Factor	C Calc RES cost value	D Use appropriate CES cost	E Apply Factor	F Calc RES cost value	G Use appropriate CES cost	H Apply Factor	I Calc RES cost value	J Use appropriate CES cost	K Apply Factor	L Calc RES cost value	M Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																								**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																		
587	90							**Program Management**																	
								Program management shared between 7 reactor sites at percentages based on table 18 in cost estimate report. 7% for Chalk River			**total for 7 sites**	**Factor**	**RES**	**total for 7 sites**	**Factor**	**RES**	**total for 7 sites**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
								based on 8 staff. Assume 4 x OPG01, 4 x OPG03 for 10year duration	Labour	0.07	9486.204	0.07	664.03428										664	
								no entry	Materials and Equipment	0				0	0	0							0	
								the following expenses: Public affairs, overheads, insurance, community compensation & legal fees as table 18	Other	0.07							2580	0.07	180.6				181	
								Contingency as CES value	Contingency	20%										20%	1.0	168.9	169	

Total	664	Total	0	Total	181	Total	168.9
Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0

Total	**1,014**
Check: Should = 0	**0**

BASIS OF ESTIMATE NOTES - Insert references and notes

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RES ALTERNATIVE
WBS No 587
SILOS IN STORAGE BUILDINGS (SSB)
CHALK RIVER

Cost Category	Total K$
Labour	345,031
Materials and Equipment	134,599
Other	111,268
Contingency	159,337
Total Cost	**750,234**

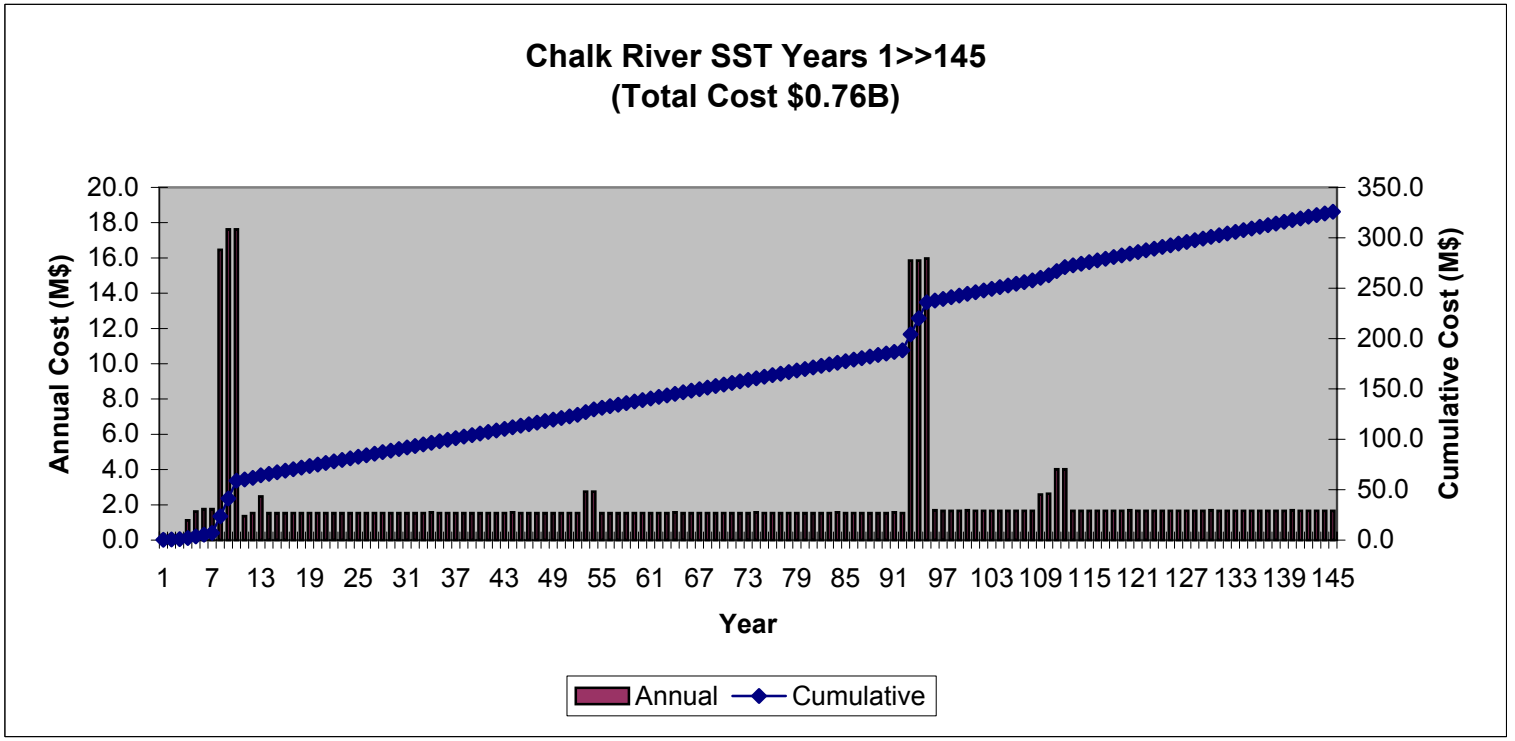
750,234

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	Responsible	Cost Category	WBS Type	Start Year	End Year	Dur'n	Contingency	Total K$
587	15	0	0	0	0	0	0	RJH	Labour	STEP	1	7	7	0	452
587	15	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	7	7	0	0
587	15	0	0	0	0	0	0	RJH	Other	STEP	1	7	7	0	97
587	15	0	0	0	0	0	0	RJH	Contingency	STEP	1	7	7	0	275
587	20	0	0	0	0	0	0	AM	Labour	STEP	276	282	7	0	7,728
587	20	0	0	0	0	0	0	AM	Materials and Equipment	STEP	276	282	7	0	430
587	20	0	0	0	0	0	0	AM	Other	STEP	276	282	7	0	305
587	20	0	0	0	0	0	0	AM	Contingency	STEP	276	282	7	0	3,241
587	25	0	0	0	0	0	0	RJH	Labour	STEP	1	283	40	0	1,294
587	25	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	283	40	0	0
587	25	0	0	0	0	0	0	RJH	Other	STEP	1	283	40	0	240
587	25	0	0	0	0	0	0	RJH	Contingency	STEP	1	283	40	0	613
587	30	0	0	0	0	0	0	RJH	Labour	STEP	1	283	283	0	3,049
587	30	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	283	283	0	0
587	30	0	0	0	0	0	0	RJH	Other	STEP	1	283	283	0	15,364
587	30	0	0	0	0	0	0	RJH	Contingency	STEP	1	283	283	0	4,603
587	35	0	0	0	0	0	0	RJH	Labour	STEP	1	10	10	0	684
587	35	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	10	10	0	0
587	35	0	0	0	0	0	0	RJH	Other	STEP	1	10	10	0	462
587	35	0	0	0	0	0	0	RJH	Contingency	STEP	1	10	10	0	573
587	40	0	0	0	0	0	0	AM	Labour	STEP	8	282	275	0	9910.3485
587	40	0	0	0	0	0	0	AM	Materials and Equipment	STEP	8	282	275	0	11019.2557
587	40	0	0	0	0	0	0	AM	Other	STEP	8	282	275	0	707.469839
587	40	0	0	0	0	0	0	AM	Contingency	STEP	8	282	275	0	8443.65121
587	45	0	0	0	0	0	0	AM	Labour	STEP	6	283	278	0	307,120
587	45	0	0	0	0	0	0	AM	Materials and Equipment	STEP	6	283	278	0	119,054
587	45	0	0	0	0	0	0	AM	Other	STEP	6	283	278	0	92,380
587	45	0	0	0	0	0	0	AM	Contingency	STEP	6	283	278	0	135,492
587	55	0	0	0	0	0	0	RJH	Labour	STEP	4	283	280	0	14,130
587	55	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	4	283	280	0	4,095
587	55	0	0	0	0	0	0	RJH	Other	STEP	4	283	280	0	1,533
587	55	0	0	0	0	0	0	RJH	Contingency	STEP	4	283	280	0	5,927
587	90	0	0	0	0	0	0	AM	Labour	STEP	1	10	10	0	664
587	90	0	0	0	0	0	0	AM	Materials and Equipment	STEP	1	10	10	0	0
587	90	0	0	0	0	0	0	AM	Other	STEP	1	10	10	0	181
587	90	0	0	0	0	0	0	AM	Contingency	STEP	1	10	10	0	169

RES ALTERNATIVE **FUEL OWNER** **AECL**
WBS No 588
CHALK RIVER
SILOS IN SHALLOW TRENCH **(SST)**

Lev 2	WBS Name	Sheet Totals ($k)
15	Siting	1,003
20	System Development	11,937
25	Safety Assessment	2,147
30	Licensing & Approvals	23,016
35	Public Affairs	1,718
40	Facility Design & Construction	51,389
45	Facility Operation	641,115
55	Environmental Assessment and Monitoring	25,685
90	Program Management	1,014
	Total Cost ($k)	**759,024**

Chalk River SST Alternative	**759,024**
Siting Phase	**21,766**
Siting	1,003
EA	2,501
System Development	11,937
SA	682
L&A	2,910
Public Affairs	1,718
Program Mgmt	1,014
Construction Phase	**51,389**
Initial Fuel Transfers	46,510
Transition to Standalone	4,878
Operations Phase	**685,869**
Repeat & Repackaging	*242,610*
Initial fuel Transfers	4,511
Silos - 100 yrs	1,865
Silos - 200 yrs	1,865
Silos - 300 yrs	1,780
Storage Chamber Replacement - 200 yrs	16,217
Repackaging B to B - 300 yrs	204,308
PM for Repeats & Repackaging	12,063
Extended Monitoring	*443,259*
Program Mgmt	114,419
Monitoring Surveliance	548
Operation Indirects	257,606
Common Ancillary Services Ops	23,393
Fuel Integrity Monitoring	2,538
SA - Ops & Decommissioning	1,464
L&A - Ops Licence Renewal	20,106
Environmental Monitoring	23,184


Chalk River SST Years 1>>145
(Total Cost $0.76B)
Annual Cost (M$)
Cumulative Cost (M$)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
1 7 13 19 25 31 37 43 49 55 61 67 73 79 85 91 97 103 109 115 121 127 133 139 145
Year
Annual
Cumulative

REACTOR EXTENDED STORE — SILOS IN SHALLOW TRENCH (SST)

ACTIVITY SUMMARY TO DATA TRANSFER — CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
588	15	0	0	0	0	0	0	Siting	Labour	STEP	OPG	RJH	1	7	7	0	0	NO DATA TO FILL	555.9
588	15	0	0	0	0	0	0	Siting	Materials and Equipment	STEP	OPG	RJH	1	7	7	0	0		0.0
588	15	0	0	0	0	0	0	Siting	Other	STEP	OPG	RJH	1	7	7	0	0		113.0
588	15	0	0	0	0	0	0	Siting	Contingency	STEP	OPG	RJH	1	7	7	0	0		334.4

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
		0%	
Labour	556	0.0	555.9
Materials and Equipment	0	0.0	0.0
Other	113	0.0	113.0
Contingency	334.4	0.0	334.4
Total	1003	0.0	1003

INSTRUCTIONS

Insert lower level WBS numbers as required | Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required | Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15 | A: Use appropriate CES cost | B: Apply Factor | C: Calc RES cost value | D: Use appropriate CES cost | E: Apply Factor | F: Calc RES cost value | G: Use appropriate CES cost | H: Apply Factor | I: Calc RES cost value | J: Use appropriate CES cost | K: Apply Factor | L: Calc RES cost value | M: Total Cost is calculated | Add Basis of estimate Note Ref Number

ACTIVITY DETAIL ESTIMATE

WBS 1	2	3	4	WBS Description / Detail	Cost Category	Factor	Labour CES (A)	Labour Factor (B)	Labour RES (C)	Materials and other Equipment CES (D)	Factor (E)	RES (F)	Other CES (G)	Factor (H)	RES (I)	Contingency CES (J)	Factor (K)	RES (L)	TOTAL Cost $k (M)
588	15			Siting			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	
588	15	10		SITING MANAGEMENT															
				RES is 7 yrs vs 13 yrs for CES and shared amongst 7 sites.	Labour	0.05	4897.7	0.05	244.885										245
					Materials and Equipment	0.05				0	0.05	0							0
					Other	0.05							1,300	0.05	65				65
					Contingency	50%										50%	1.0	154.9	155
588	15	70		PREFERRED SITE															
588	15	70	10	PREFERRED SITE - SUPPORT AND REPORTING															
				Assume cost is 15% of a CES greenfield site	Labour	0.15	588.3	0.15	88.245										88
					Materials and Equipment	0.15				0	0.15	0							0
					Other	0.15							120	0.15	18				18
					Contingency	50%										50%	1.0	53.1	53
588	15	70	30	PREFERRED SITE - CHARACTERISATION															
				Assume cost is 15% of a CES greenfield site	Labour	0.15	1484.8	0.15	222.72										223
					Materials and Equipment	0.15				0	0.15	0							0
					Other	0.15							200	0.15	30				30
					Contingency	0.5										50%	1.0	126.4	126

Total	1,003
Check: Should = 0	0

	Labour	Materials and other Equipment	Other	Contingency
Total	556	0	113	334.4
Check: Should = 0	0	0	0	0

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN SHALLOW TRENCH (SST)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
588	20	0	0	0	0	0	0	System Development	Labour	STEP	CTECH	AM	276	282	7	0	0	NO DATA TO FILL	7932.6
588	20	0	0	0	0	0	0	System Development	Materials and Equipment	STEP	CTECH	AM	276	282	7	0	0		430.0
588	20	0	0	0	0	0	0	System Development	Other	STEP	CTECH	AM	276	282	7	0	0		279.6
588	20	0	0	0	0	0	0	System Development	Contingency	STEP	CTECH	AM	276	282	7	0	0		3294.8

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
		0%	
Labour	7901	*0.0*	7932.6
Materials and Equipment	430	*0.0*	430.0
Other	311	*0.0*	279.6
Contingency	3294.8	*0.0*	3294.8
Total	11937	*0.0*	11937

INSTRUCTIONS

Insert lower level WBS numbers as required

Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required

Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15

ACTIVITY DETAIL ESTIMATE

WBS LEVEL								WBS Description / Detail	Cost Category	Factor	A	B	C	D	E	F	G	H	I	J	K	L	M	
1	2	3	4	5	6	7	8				Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	TOTAL Cost $k	Add Basis of estimate Note Ref Number
588	20							**System Development**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
588	20	2						SYSTEM DEVELOPMENT MANAGEMENT																
								Assume smaller size management team as for CES 50%, but shared between NBP and HQ, with a 5% allowance for operating on both sites.	Labour	0.26	6690.40	0.26	1756.23									1,756	
								No entry in CES alternative cost category	Materials and Equipment	0.00				0.00	0.00	0.00							0	
								Assume smaller size management team as for CES 50%, but shared between NBP and HQ, with a 5% allowance for operating on both sites.	Other	0.26							300.00	0.26	78.75				79	
								Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	550.5	550	
588	20	5						SYSTEM OPTIMIZATION																
								Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 30%	Labour	0.37	3303.70	0.37	1214.11									1,214	
								No entry in CES alternative cost category	Materials and Equipment	0				0.00	0.00	0.00							0	

			Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 30%	Other	0.37						120.00	0.37	44.10				44
			Percentage for contingency assumed same as for CES	Contingency	30%									30%	1.00	377.46	377
588	20	20	PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)															
			Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Labour	0.16	20750.10	0.16	3268.14									3,268
			Allow reduction due to no cask related feasibilty studies and no fuel container dismantling techniques carried out in this RES alternative, and shared between NBP and HQ	Materials and Equipment	0.10				4300.00	0.10	430.00						430
			Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Other	0.16						895.00	0.16	140.96				141
			Percentage for contingency assumed same as for CES	Contingency	50%									50%	1.00	1919.55	1,920
588	20	30	STORAGE SYSTEM ENG'NG															
			Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Labour	0.16	8143.20	0.16	1282.55									1,283
			No entry in CES alternative cost category	Materials and Equipment	0				0.00	0.00	0.00						0
			Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Assume	Labour	0.16						200.00	0.16	31.50				32
			Percentage for contingency assumed same as for CES	Contingency	25%									25%	1.00	328.51	329

588	20	40	SECURITY & SAFEGUARD ENG'NG																			
			Divide between NBP and HQ. Assume additional documentation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Smaller site than CES therefore a further factor of 50% is included	Labour	0.26	1447.70	0.26	380.02													380
			No entry in CES alternative cost category	Materials and Equipment	0				0.00	0.00	0.00												0
			Divide between NBP and HQ. Assume additional documentation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Smaller site than CES therefore a further factor of 50% is included	Other	0.26							60.00	0.26	15.75								16
			Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	118.7					119
																					Total	**11,937**
																					Check: Should = 0	**0**
						Total	7,901	Total	430	Total	311	Total	3,294.8									
						Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0									

REACTOR EXTENDED STORE — SILOS IN SHALLOW TRENCH (SST)

ACTIVITY SUMMARY TO DATA TRANSFER — CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
588	25							Safety Assessment	Labour	STEP	OPG	RJH	1	283	283			1293.9
588	25							Safety Assessment	Materials and Equipment	STEP	OPG	RJH	1	283	283			
588	25							Safety Assessment	Other	STEP	OPG	RJH	1	283	283			239.5
588	25							Safety Assessment	Contingency	STEP	OPG	RJH	1	283	283			613.3

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %
Check total	**Total Cost $k**	

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	1294		1293.9
Materials and Equipment			
Other	240		239.5
Contingency	613.3		613.3
Total	2147		2147

INSTRUCTIONS

										A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																						**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																
588	25							**Safety Assessment**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	
588	25	10						SAFETY ASSESSMENT MANAGEMENT															
								RES = 8 yrs vs CES = 17 yrs. Share costs over 7 sites. However due to inefficencies of multiple sites increase to 0.2	Labour	0.05	5218.2	0.05	260.91											261
									Materials and Equipment	0.05				0.05										
									Other	0.05						850	0.05	42.5					43
									Contingency	40%									40%	1.0	121.4		121
588	25	30						SA - SITING															
									Labour		2287.5												
									Materials and Equipment														
									Other							3,850							
									Contingency	40%									40%	1.0			
588	25	40						SA - OPERATING LICENSE															
									Labour	0.1	1540.5	0.1	154.05										154
									Materials and Equipment	0.1				0.1									
									Other	0.1						300	0.1	30					30
									Contingency	40%									40%	1.0	73.6		74
588	25	50						SA - FACILITY OPERATIONS															

			RES spans Y11 to Y283 or 273 yrs vs 330 yrs for CES. RES has 0.08 staff and CES has 1 staff. Factor is 273/330 x 0.08/1 = 0.067	Labour	0.066	9604.8	0.066	633.9168								634
				Materials and Equipment	1				1							
			Expenses at $0.5K/a x 273 yrs	Other	1					137	1	137				137
				Contingency	40%								40%	1.0	308.4	308
588	25	70	SA - DECOMMISSIONING (Processing Facilities)													
			RES has 1 decommissioning events - while CES has 3. Costs can be shared between sites with similar technology; thus factor to 0.15	Labour	0.1	2449.9	0.1	244.99								245
				Materials and Equipment	0.1				0.1							
				Other	0.1					300	0.1	30				30
				Contingency	40%								40%	1.0	110.0	110
													Total			**2,147**
													Check: Should = 0			
						Total		1,294	Total	Total		240	Total		613.3	
						Check: Should = 0			Check: Should = 0	Check: Should = 0			Check: Should = 0			

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN SHALLOW TRENCH (SST)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
588	30	0	0	0	0	0	0	Licensing & Approvals	Labour	STEP	OPG	RJH	1	283	283	0	0	NO DATA TO FILL	3048.8
588	30	0	0	0	0	0	0	Licensing & Approvals	Materials and Equipment	STEP	OPG	RJH	1	283	283	0	0		0.0
588	30	0	0	0	0	0	0	Licensing & Approvals	Other	STEP	OPG	RJH	1	283	283	0	0		15364.2
588	30	0	0	0	0	0	0	Licensing & Approvals	Contingency	STEP	OPG	RJH	1	283	283	0	0		4603.2

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost
Labour	3049
Materials and Equipment	0
Other	15364
Contingency	4603.2
Total	23016

Check: Total minus budget Should = 0

Budget costs to Years by %

Check total	Total Cost $k
0%	
0.0	3048.8
0.0	0.0
0.0	15364.2
0.0	4603.2
0.0	23016

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
588																								
588	30							**Licensing & Approvals**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
588	30	30						LIAISON WITH CNSC																
								Duration 4 yrs vs 10 yrs in CES and cost shared between 7 sites. Thus factor is 0.057. However due to inefficiencies of multiple sites increase to 0.2	Labour	0.2	555	0.2	111									111
									Materials and Equipment	0.2				0	0.2	0								0
									Other	0.2							40	0.2	8				8
									Contingency	0.25										25%	1.0	29.8		30
588	30	50						CNSC CONSTRUCTION LICENCE																
									Labour	0.2	2631	0.2	526.2											526
								Some inefficiencies gained due to multiple sites	Materials and Equipment	0.2				0	0.2	0								0
									Other	0.2							6,264	0.2	1252.8					1,253
									Contingency	0.25										25%	1.0	444.8		445
588	30	60						OTHER GOVN'MT APPROVALS																
588	30	60	10					APPROVAL REQUIREMENTS																
								Duration 4 yrs vs 10 yrs in CES and cost shared between 7 sites. Thus factor is 0.057. However due to inefficiencies of multiple sites increase to 0.2	Labour	0.2	337	0.2	67.4									67

					Materials and Equipment	0.2				0	0.2	0									0
					Other	0.2							0	0.2	0						0
					Contingency	0.25										25%	1.0	16.9			17
588	30	60	30	FEDERAL APPROVALS																	
					Labour	0.2	133	0.2	26.6												27
					Materials and Equipment	0.2				0	0.2	0									0
					Other	0.2							0	0.2	0						0
					Contingency	0.25										25%	1.0	6.7			7
588	30	60	40	PROVINCIAL APPROVALS																	
					Labour	0.2	133	0.2	26.6												27
					Materials and Equipment	0.2				0	0.2	0									0
					Other	0.2							0	0.2	0						0
					Contingency	0.25										25%	1.0	6.7			7
588	30	60	50	MUNICIPAL APPROVALS																	
					Labour	0.2	133	0.2	26.6												27
					Materials and Equipment	0.2				0	0.2	0									0
					Other	0.2							0	0.2	0						0
					Contingency	0.25										25%	1.0	6.7			7
588	30	65		CNSC OPERATING LICENCE (Initial Application)																	
					Labour	0.2	513	0.2	102.6												103
					Materials and Equipment	0.2				0	0.2	0									0
					Other	0.2							902	0.2	180.4						180
					Contingency	0.25										25%	1.0	70.8			71
588	30	70		CNSC OPERATING LICENCE (Maintenance & Renewal)																	
				CES duration is 330 years. Costs incurred in RES during period Y11 to Y283 or 273 years. RES has 0.08 staff vs CES with 1 staff. Factor is 273/330 x 0.08/1 = 0.066	Labour	0.066	32754	0.066	2161.764												2,162
					Materials and Equipment	1				0	1	0									0
				Expenses at $51K/a x 273 yrs	Other	1							13,923	1	13923						13,923
					Contingency	0.25										25%	1.0	4,021.2			4,021

Total	**23,016**
Check: Should = 0	**0**

Total	3,049	Total	0	Total	15,364	Total	4,603.2
Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN SHALLOW TRENCH (SST)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
588	35	0	0	0	0	0	0	Public Affairs	Labour	STEP	OPG	RJH	1	10	10	0	0	NO DATA TO FILL	683.8
588	35	0	0	0	0	0	0	Public Affairs	Materials and Equipment	STEP	OPG	RJH	1	10	10	0	0		0.0
588	35	0	0	0	0	0	0	Public Affairs	Other	STEP	OPG	RJH	1	10	10	0	0		461.8
588	35	0	0	0	0	0	0	Public Affairs	Contingency	STEP	OPG	RJH	1	10	10	0	0		572.8

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost
Labour	684
Materials and Equipment	0
Other	462
Contingency	572.8
Total	1718

Check: Total minus budget Should = 0

Budget costs to Years by %

Check total	Total Cost $k
0%	
0.0	683.8
0.0	0.0
0.0	461.8
0.0	572.8
0.0	1718

INSTRUCTIONS

Insert lower level WBS numbers as required

Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required

Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15

										A	B	C	D	E	F	G	H	I	J	K	L	M	
										Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																						**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**		**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																
588	35							**Public Affairs**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
588	35	45						PUBLIC AFFAIRS - PREFERRED SITE																
									Labour	0.05	3046.2	0.05	152.31										152	
									Materials and Equipment	0.05				0	0.05	0							0	
									Other	0.05						600	0.05	30				30	
									Contingency	50%									50%	1.0	91.2	91	
588	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL																
									Labour	0.05	4569.3	0.05	228.465										228	
									Materials and Equipment	0.05				0	0.05	0							0	
									Other	0.05						1,450	0.05	72.5				73	
									Contingency	50%									50%	1.0	150.5	150	
588	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION																
									Labour	0.05	2528.9	0.05	126.445										126	
									Materials and Equipment	0.05				0	0.05	0							0	
									Other	0.05						800	0.05	40				40	
									Contingency	50%									50%	1.0	83.2	83	
588	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT																
									Labour	0.05	3530.8	0.05	176.54										177	

				Materials and Equipment	0.05			0	0.05	0								0
				Other	0.05						170	0.05	8.5					9
				Contingency	50%									50%	1.0	92.5		93
588	35	120	Community Offsets & Benefits															
				Labour	0.15	0	0.15	0										0
				Materials and Equipment	0.15			0	0.15	0								0
				Other	0.15						2,072	0.15	310.8					311
				Contingency	50%									50%	1.0	155.4		155

Total	**1,718**
Check: Should = 0	**0**

Total	684	Total	0	Total	462	Total		572.8	
Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0		0	

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN SHALLOW TRENCH (SST)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
588	40							Facility Design & Construction	Labour	STEP	CTECH	AM	8	282	275			NO DATA TO FILL	17953.3
588	40							Facility Design & Construction	Materials and Equipment	STEP	CTECH	AM	8	282	275				18299.3
588	40							Facility Design & Construction	Other	STEP	CTECH	AM	8	282	275				1968.9
588	40							Facility Design & Construction	Contingency	STEP	CTECH	AM	8	282	275				13167.0

INSTRUCTIONS

Check: Total minus budget Should = 0 | Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	17953		17953.3
Materials and Equipment	18299		18299.3
Other	1969		1968.9
Contingency	13167.0		13167.0
Total	51389		51389

INSTRUCTIONS

									A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																					**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8															
588	40							**Facility Design & Construction**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
588	40	10						SITE IMPROVEMENTS																
								a 10% allowance of the CES costs, applied to the site improvements	Labour	0.10	45,930.4	0.1	4,593.0										4,593
									Materials and Equipment	0.10				58,350.0	0.1	5,835.0								5,835
								no property acquisition required	Other								3,375.0							
								Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	5,214.0		5,214
588	40	30						COMMON ANCILLARY FACILITIES																
588	40	30	10					ADMIN AND SUPPORT FACILITIES																
588	40	30	10	1				ADMIN AND VISITOR RECEPTION BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in	Labour		486.3										comment 7			
									Materials and Equipment					784.2										
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0			
588	40	30	10	2				OPS SUPPT & HEALTH PHYSICS BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour		1,294.8										comment 7			
									Materials and Equipment					1,612.6										
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0			
588	40	30	10	3				EQUIP STORAGE AND MAINT'CE BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour		1,262.1										comment 7			
									Materials and Equipment					1,675.0										

				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0		
588	40	30	10	5	ACTIVE SOLID WASTE HDLG BLDG														
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	459.9	0.3	138.0										138
					Materials and Equipment	0.3				1,135.0	0.3	340.5							341
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	143.5	144
588	40	30	10	6	SOLID WASTE STORAGE AREA														
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	458.8	0.3	137.6										138
					Materials and Equipment	0.3				437.5	0.3	131.3							131
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	80.7	81
588	40	30	10	7	ACTIVE LIQ/W TRT'MT BLDG														
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	359.4	0.3	107.8										108
					Materials and Equipment	0.3				1,727.0	0.3	518.1							518
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	187.8	188
588	40	30	10	8	LOW LVL LIQ/W STRG BLDG														
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	373.7	0.3	112.1										112
					Materials and Equipment	0.3				1,426.0	0.3	427.8							428
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	162.0	162
588	40	30	10	9	WAREHOUSE BLDG														
				Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour		470.9									comment 7			
					Materials and Equipment					550.0									
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0		
588	40	30	10	10	GUARDHOUSE AND SECURITY FENCE														
				Building and security exist therefore new building and fence not required. Allowance for refurbishment covered in ***/45/20/50	Labour		631.2									comment 7			
					Materials and Equipment					553.7									
					Other														
				Increased contingency than CES due to RES facility footprint size not confirmed and therefore length of fence, not yet known	Contingency	20%										20%	1.0		
588	40	30	10	11	TRUCK INSP'N / WASH STATION														
				not req'd as no fuel transported off site	Labour		872.2									comment 7			
					Materials and Equipment					1,075.0									
					Other							389.4							
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0		
588	40	30	10	12	UTILITY BLDG														
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	1,023.2	0.3	307.0										307
					Materials and Equipment	0.3				1,257.0	0.3	377.1							377
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	205.2	205

588 40	30	10	13	TEST FACILITY																			
				Taken as being independent of fuel inventory stored. Same size bldg as CES, facility will be shared by Whiteshell and Chalk River , therefore cost will be 50% of CES costs.	Labour	0.5	766.8	0.5	383.4													383
					Materials and Equipment	0.5				1,675.0	0.5	837.5												838
				No entry in CES alternative cost category	Other																			
				Percentage for contingency assumed same as for CES	Contingency	20%												20%	1.0	244.2				244
588 40	30	20		OTHER SITE SYSTEMS																			
588 40	30	20	1	FIRE PROTECTION SYSTEMS																			
				assumed aailable and turned over to RES during transition	Labour		1,022.2														comment 7			
					Materials and Equipment					676.2														
				No entry in CES alternative cost category	Other																			
				Percentage for contingency assumed same as for CES	Contingency	25%												25%	1.0					
588 40	30	20	2	SECURITY AND COMMUNICATION SYSTEM																			
				assumed aailable and turned over to RES during transition	Labour		607.5														comment 7			
					Materials and Equipment					600.0														
				No entry in CES alternative cost category	Other																			
				Percentage for contingency assumed same as for CES	Contingency	25%												25%	1.0					
588 40	30	20	3	ELECTRICAL AND EMERGENCY POWER																			
				assumed aailable and turned over to RES during transition	Labour		1,939.6														comment 7			
					Materials and Equipment					1,932.0														
				No entry in CES alternative cost category	Other																			
				Percentage for contingency assumed same as for CES	Contingency	25%												25%	1.0					
588 40	30	20	4	SANITARY SEWER SYSTEM																			
				assumed aailable and turned over to RES during transition	Labour		339.2														comment 7			
					Materials and Equipment					310.5														
				No entry in CES alternative cost category	Other																			
				Percentage for contingency assumed same as for CES	Contingency	25%												25%	1.0					
588 40	30	20	5	POTABLE WATER SYSTEM																			
				assumed aailable and turned over to RES during transition	Labour		371.6														comment 7			
					Materials and Equipment					148.0														
				No entry in CES alternative cost category	Other																			
				Percentage for contingency assumed same as	Contingency	25%												25%	1.0					
588 40	30	20	6	RETENTION/SEDIMENTATION POND																			
				assumed aailable and turned over to RES during transition	Labour		874.4														comment 7			
					Materials and Equipment					189.6														
				No entry in CES alternative cost category	Other																			
				Percentage for contingency assumed same as for CES	Contingency	30%												30%	1.0					
588 40	30	20	7	STORM WATER DETENTION POND																			
				assumed aailable and turned over to RES during transition	Labour		387.8														comment 7			
					Materials and Equipment					93.5														
				No entry in CES alternative cost category	Other																			
				Percentage for contingency assumed same as for CES	Contingency	30%												30%	1.0					
588 40	30	20	8	CONST'N MAT'L STOCKPILE AREA																			
				not req'd, concrete brought in as req'd from off-site	Labour		1,039.2														comment 7			
					Materials and Equipment					625.0														
				No entry in CES alternative cost category	Other																			

				Percentage for contingency assumed same as for CES	Contingency	15%									15%	1.0					
588	40	30	20	9	SITE MATERIALS STORAGE AREA																
				assumed aailable and turned over to RES during transition	Labour		1,169.5										comment 7				
					Materials and Equipment					655.0											
				No entry in CES alternative cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	15%									15%	1.0					
588	40	30	20	10	ACCESS ROADS AND VEHICLE COMPOUNDS																
				assumed aailable and turned over to RES during transition	Labour		1,319.9										comment 7				
					Materials and Equipment					1,866.9											
				No entry into cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	25%									25%	1.0					
588	40	30	30		CONST'N INDIRECTS ANCILLARY FACILITIES																
				assumed aailable and turned over to RES during transition	Labour		4,406.4										comment 7				
					Materials and Equipment					6,610.9											
				No entry into cost category	Other																
				Percentage for contingency assumed same as for CES	Contingency	25%									25%	1.0					
588	40	40			STORAGE DESIGN & CONST'N (CHAMBERS)																
				Construction of the shallow trench storage chamber. Based on CVST CES stage 1 storage const'n of 4 chambers and access tunnel. The CES design content for stages 2,3&4 has been omitted. 1 chamber length approx 30m for RES as opposed to 4 CES chambers at length 160m. Therefore factor due to length & quantity & use 6/10 rule.	Labour	0.16	72,832.7	0.2	11,611.6													11,612
					Materials and Equipment	0.16				59,932.2	0.2	9,554.9									9,555
				expenses factor taken same as labour	Other	0.27							7,290.0	0.3	1,932.3						1,932
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	6,929.6			6,930
588	40	50			STORAGE CONSTRUCTION (SILOS)																
				Construction of 14 storage silos. 1 silo contains standard fuel, 1 silo as spare and remaining silos contain non standard fuel. Cost per silo = $60K. Allow 67% labour 33% materials.	Labour	9.38	60.0	9.38	562.8													563
					Materials and Equipment	4.62				60.0	4.62	277.2									277
				no costs in this category	Other																
				no contingency on cost	Contingency											1.0					
588	40	650			ENERGY CONSUMPTION																
				No entry into cost category	Labour																
				No entry into cost category	Materials and Equipment																
				consumption for the construction of storage chamber and ancillary buildings	Other	0.10							366.3	0.1	36.6						37
				Contingency included in cost (built into power consumption calculation)	Contingency											1.0					
																				Total	**51,389**
																				Check: Should = 0	
							Total		17,953	Total		18,299	Total		1,969	Total		13,167.0			
							Check: Should = 0			Check: Should = 0			Check: Should = 0			Check: Should = 0					

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REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN SHALLOW TRENCH (SST)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
588	45							Facility Operation	Labour	STEP	CTECH	AM	6	283	278			NO DATA TO FILL	306119.6
588	45							Facility Operation	Materials and Equipment	STEP	CTECH	AM	6	283	278				111490.5
588	45							Facility Operation	Other	STEP	CTECH	AM	6	283	278				91612.5
588	45							Facility Operation	Contingency	STEP	CTECH	AM	6	283	278				131891.9

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	306120		306119.6
Materials and Equipment	111491		111490.5
Other	91613		91612.5
Contingency	131892		131891.9
Total	641115		641115

INSTRUCTIONS

Insert lower level WBS numbers as required

Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required

Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15

ACTIVITY DETAIL ESTIMATE

											A	B	C	D	E	F	G	H	I	J	K	L	M	
WBS LEVEL								WBS Description / Detail	Cost Category	Factor	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	TOTAL	
1	2	3	4	5	6	7	8				Labour			Materials and other Equipment			Other			Contingency			Cost $k	
588	45							**Facility Operation**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
588	45	10						OPERATIONS FUEL TRANSFER																
588	45	10	5					PROGRAM MANAGEMENT - INITIAL FUEL TRANSFER																
								Program management runs fromY9to 11. (y9-10 const'n 11 fuel transfer ops) therefore factoring labour costs for CES which is 30 years is factored 3/30 and spread project management over 7 sites and acknowledge inefficiency use 20% factor	Labour	0.02	110,251.0	0.0	2,205.0									2,205	
								No entry in CES alternative cost category	Materials and Equipment																
								Annual cost = $258/a x 3 yrs	Other	1.00							774	1.0	774.0				774	2
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	595.8	596	
588	45	10	25					MONITORING AND SURVEILLANCE (FUEL TRANSFER)																
								No labour required, existing site staff will undertake operations for first 200 years.	Labour		6,500.0													
								allow slight reduction in costs for monitoring equipment	Materials and Equipment	0.75				53.0	0.8	39.8							40	
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	19.9	20	
588	45	10	30					OPERATION INDIRECTS (FUEL TRANSFER)																
								No labour required, existing site staff will undertake operations for first 200 years.	Labour															
								CES spares costs are for processing bldg. Relatively low spares for a starage chamber allow 10%	Materials and Equipment	0.1				1,284.0	0.1	128.4							128	
								additional fuel receipt security/armed response omitted. Other category is for energy consumption only.	Other	0.033							16,380.0	0.0	546.0				546	
								Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	202.3	202	

588	45	10	40	STORAGE OPERATIONS															
				No labour required, existing site staff will undertake operations for first 200 years.	Labour		29,706.0												
				none applicable to basket fuel alternatives	Materials and Equipment				300.0										
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%								30%	1.0				
588	45	20		OPERATIONS - EXTENDED MONITORING															
588	45	20	5	PROGRAM MANAGEMENT															
				Entries in CES DET applicable to RES but duration 272 years RES & 300 years CES therefore272/300. Program management spread over 7 sites with Chalk River assumed to have 0.8 staff vs 9 in CES. Thus combined factor	Labour	0.081	312,354.0	0.1	25,173.4								25,173	6
				No entry in CES alternative cost category	Materials and Equipment														
				Annual cost = $258/a x 272 yrs	Other	1.00					70,176.0	1.0	70,176.0				70,176	1,2	
				Percentage for contingency assumed same as for CES	Contingency	20%								20%	1.0	19,069.9	19,070		
588	45	20	40	MONITORING AND SURVEILLANCE -EXTENDED MONITORING															
				CES monitoring and surveillance duration was 300 yrs for 4717 baskets, RES is 272 years for 95 baskets. Chalk River assumed to have 0.5 staff for RES vs 5 in CES. Combined factor based on duration, fuel inventory and staffing levels.	Labour	0.0019	49,716.0	0.0	93.5								93	6	
				annual costs = $1k/a x 272 years	Materials and Equipment	1.00				272.0	1.0	272.0					272	7	
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	50%								50%	1.0	182.7	183		
588	45	20	50	OPERATION INDIRECTS (EXTENDED MONITORING)															
					Labour	0.19	875,048.0	0.2	163,342.3								163,342	6	
				Entries in CES DET applicable to RES but duration 272years RES & 300 years CES. Staff for RES = 7 vs 34 in CES. Combined factor = 272/300 x 7/34. M&E costs are $75k/a x 272 years	Materials and Equipment	1.00				20,400.0	1.0	20,400.0					20,400	7	
				Armed response = $50k/a + energy costs at $3k/a. total = $53k x 272 years	Other	1.00					14,416.0	1.0	14,416.0				14,416	7	
				Percentage for contingency assumed same as for CES	Contingency	30%								30%	1.0	59,447.5	59,447		
588	45	20	60	COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)															
				RES has duration 189 years, CES has 300 years. RES staff is 1 vs 5 in CES. Factor is 189/300 x 1/5	Labour	0.13	148,529.0	0.1	18,714.7								18,715	6	
				No entry in CES alternative cost category	Materials and Equipment														
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	25%								25%	1.0	4,678.7	4,679		
588	45	20	70	FUEL INTEGRITY MONITORING (25 YEARLY)															
				RES has duration 278 years, CES has 300 years. RES staff is 0.1 vs 0.5 in CES. Factor is 278/300 x 0.1/0.5	Labour	0.2	4,631.0	0.2	858.3								858	6	
					Materials and Equipment	1.0				695.0	1.0	695.0					695	7	
					Other	1.0					139.0	1.0	139.0				139	7	

					Percentage for contingency assumed same as for CES	Contingency	50%								50%	1.0	846.1	846	
588	45	30			OPERATIONS - FACILITY REPEATS														
588	45	30	20		SILOS 100 YEAR REPLACEMENT														
588	45	30	20	10	DEMOLISH EXISTING STORAGE SILOS														
					costs taken from CES basket vault demolition, rated at $104 per tonne of reinforced concrete. Each silo = 115 tonne x 14 silos =1,610Te. Split 50/50 labour/materials	Labour	805.00	0.104	805.0	83.7								84	5
						Materials and Equipment	805.00				0.104	805.0	83.7					84	5
					No costs in this category	Other													
					Percentage for contingency assumed same as for CES	Contingency	30%								30%	1.0	50.2	50	
588	45	30	20	20	SILO CONSTRUCTION														
					Assume same costs as for initial construction of the storage silos. 14 silos constructed at this point to house standard and non standard fuelcost per silo = $60K. Allow 67% labour 33% materials.	Labour	9.38	60.0	9.4	562.8								563	3
						Materials and Equipment	4.62				60.0	4.6	277.2					277	3
					No costs in this category	Other													
					Percentage for contingency for silos construction assumed same as for CES basket vaults construction	Contingency	30%								30%	1.0	252.0	252	
588	45	30	20	30	TRANSFER OPERATIONS														
					Smaller fuel inventory for RES = 14 silos in total - 11 silos with 9 baskets each, 1 spare silo and 2 silos with non standard waste/fuel. Assume transfer ops based on fuel only ie 95 baskets therefore ratio = 95/4717. Labour costs reduced, existing site staff will undertake operations for first 200 years.	Labour	0.005	990.0	0.01	5.1								5	
					No costs in this category	Materials and Equipment													
					Armed response included at rate of $50k/a based on 2 years duration - see note 8.	Other	1				100.0	1.0	100.0					100	8
					Percentage for contingency assumed same as for CES	Contingency	30%								30%	1.0	31.5	32	
588	45	30	20	40	WASTE DISPOSAL														
					No costs in this category	Labour													
					No costs in this category	Materials and Equipment													
					costs takrn from CES basket vault waste disposal, rated at $200 per tonne of reinforced concrete. Each silo = 115 tonne x 14 silos =1,610Te.	Other	1610				0.2	1,610.0	322.0					322	5
						Contingency	30%								30%	1.0	96.6	97	
588	45	30	30		SILOS 200 YEAR REPLACEMENT														
					assumed same as 100 yr replacement	Labour				651.6								652	
					assumed same as 100 yr replacement	Materials and Equipment						360.9						361	
					assumed same as 100 yr replacement	Other							422.0					422	
					assumed same as 100 yr replacement	Contingency											430.3	430	
588	45	30	40		SILOS 300 YEAR REPLACEMENT														
					assumed same as 100 yr replacement	Labour				666.5								667	
					assumed same as 100 yr replacement	Materials and Equipment						360.9						361	
					assumed same as 100 yr replacement	Other							322.0					322	9
					Percentage for contingency assumed same as for CES	Contingency											430.3	430	
588	45	30	50		STORAGE CHAMBER 200 YEAR REPLACEMENT														
					Replacement of the shallow trench storage chamber. Based on CVST CES chambers replacement. 1 chamber length approx 70m for RES as opposed to 16 CES chambers at length 160m. Therefore factor due to length & quantity &	Labour	0.12	110,400.0	0.1	12,737.5								12,737	
						Materials and Equipment	0.12					0.1							

						use 6/10 rule.	Other	0.12				2,048.4	0.1	236.3				236		
						Percentage for contingency assumed same as for CES	Contingency	25%							25%	1.0	3,243.5	3,243		
588	45	40				OPERATIONS - REPACKAGING														
588	45	40	5			PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)														
						Entries in CES DET applicable to RES but duration 13 years RES 100yr=(2license+2const/ops 109-112) + 200yr=(2license+2const/ops 209-212)+ 300yr=(2license+2const'n+1ops 277-281) compared to 114 years CES therefore13/114 of labour costs spread project management over 7 sites and acknowledge inefficiency use 20% factor	Labour	0.02	440,778.0	0.0	10,052.8						10,053	
						No entry in CES alternative cost category	Materials and Equipment													
						see note 1. no property tax assumed this site	Other													1
						Percentage for contingency assumed same as for CES	Contingency	20%							20%	1.0	2,010.6	2,011		
588	45	40	10	40		COMMON ANCILLARY FACILITIES (REPLACEMENT)			comment 7											
						only require full ancillary buildings (13) at 300yr RPBB event, for 100 & 200yr facility repeats, the replacement of 7 ancillary buildings is required. Therefore combined factor = ((7/13)*2) + 1	Labour	2.1	21,056.2	2.1	43,732.1						43,732	
							Materials and Equipment	2.1			29,785.1	2.1	61,861.4					61,861		
						No entry in CES alternative cost category	Other													
						Percentage for contingency assumed same as for CES	Contingency	22%							22%	1.0	23,230.6	23,231		
588	45	40	10	600	30	ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)														
						duration 7 years RES compared to 30 years CES. Factor =24/30	Labour	0.2	11,882.0	0.2	2,772.5						2,772	4		
						No entry in CES alternative cost category	Materials and Equipment													
						No entry in CES alternative cost category	Other													
						Percentage for contingency assumed same as for CES	Contingency	25%							25%	1.0	693.1	693		
588	45	40	40			BASKET TO BASKET 300 YEAR REPACKAGING														
588	45	40	40	05		CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)														
						assumed same facility as CES therefore factor = 1	Labour	1.0	476.1	1.0	476.1						476			
						assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0			354.6	1.0	354.6				355			
						assumed same facility as CES therefore factor = 1	Other	1.0				228.4	1.0	228.4				228		
						same contingency as for CES	Contingency	30%							30%	1.0	317.7	318		
588	45	40	40	10		PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)														
588	45	40	40	10	20	RPBB EQUIP. DESIGN, SUPPLY & INSTALL														
588	45	40	40	10	20	10	RECEIPT & TRANSFER (EQUIP)													
						assumed same facility as CES therefore factor = 1	Labour	1.0	70.8	1.0	70.8						71			
						assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0			1,415.0	1.0	1,415.0				1,415			
						assumed same facility as CES therefore factor = 1	Other	1.0				74.3	1.0	74.3				74		
						same contingency as for CES	Contingency	30%							30%	1.0	468.0	468		
588	45	40	40	10	20	20	BASKET TO BASKET FUEL TRANSFER													

							assumed same facility as CES therefore factor = 1	Labour	1.0	2,319.4	1.0	2,319.4									2,319
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				11,597.0	1.0	11,597.0						11,597
							assumed same facility as CES therefore factor = 1	Other	1.0							695.8	1.0	695.8			696
							same contingency as for CES	Contingency	30%										30%	1.0	4,383.7	4,384
588	45	40	40	10	20	30	BASKET DECONTAMINATION														
							assumed same facility as CES therefore factor = 1	Labour	1.0	854.6	1.0	854.6									855
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,563.0	1.0	4,563.0						4,563
							assumed same facility as CES therefore factor = 1	Other	1.0							256.4	1.0	256.4			256
							same contingency as for CES	Contingency	30%										30%	1.0	1,702.2	1,702
588	45	40	40	10	30		RPBB BUILDING DESIGN AND CONSTRUCTION														
							assumed same facility as CES therefore factor = 1	Labour	1.0	4,160.0	1.0	4,160.0									4,160
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,280.0	1.0	4,280.0						4,280
							assumed same facility as CES therefore factor = 1	Other	1.0							832.0	1.0	832.0			832
							same contingency as for CES	Contingency	30%										30%	1.0	2,781.6	2,782
588	45	40	40	10	60		BUILDING SERVICES (RPB)														
							assumed same facility as CES therefore factor = 1	Labour	1.0	4,447.8	1.0	4,447.8									4,448
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,153.8	1.0	4,153.8						4,154
							assumed same facility as CES therefore factor = 1	Other	1.0							1,309.4	1.0	1,309.4			1,309
							same contingency as for CES	Contingency	25%										25%	1.0	2,477.8	2,478
588	45	40	40	10	70		COMMISSIONING (RPB)														
							assumed same facility as CES therefore factor = 1	Labour	1.0	668.2	1.0	668.2									668
							No entry in CES alternative cost category	Materials and Equipment													
							assumed same facility as CES therefore factor = 1	Other	1.0							126.3	1.0	126.3			126
							same contingency as for CES	Contingency	50%										50%	1.0	397.3	397
588	45	40	40	10	80		CONST'N INDIRECTS (RPB)														
							assumed same facility as CES therefore factor = 1	Labour	1.0	6,299.6	1.0	6,299.6									6,300
							No entry in CES alternative cost category	Materials and Equipment													
							assumed same facility as CES therefore factor = 1	Other	1.0							241.5	1.0	241.5			242
							same contingency as for CES	Contingency	30%										30%	1.0	1,962.3	1,962
588	45	40	40	400			CONSTRUCTION MANAGEMENT (RPB)														
							assumed same facility as CES therefore factor = 1	Labour	1.0	4,690.6	1.0	4,690.6									4,691
							No entry in CES alternative cost category	Materials and Equipment													
							No entry in CES alternative cost category	Other													
							same contingency as for CES	Contingency	30%										30%	1.0	1,407.2	1,407
588	45	40	40	500			COMMISSIONING MANAGEMENT (RPB)														
							assumed same facility as CES therefore factor = 1	Labour	1.0	113.3	1.0	113.3									113
							No entry in CES alternative cost category	Materials and Equipment													
							assumed same facility as CES therefore factor = 1	Other	1.0							13.5	1.0	13.5			14

					same contingency as for CES	Contingency	50%								50%	1.0	63.4	63	
588	45	40	40	600	REPACKAGING OPERATIONS (RPB)														
					Labour for repackaging operations for CES is for a fuel inventory of 4717 baskets. RES has 95 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 95/4717	Labour	0.020	3,960.8	0.0	79.8								80	
					the same factor for labour is used for procurement of new baskets	Materials and Equipment	0.020				23,585.0	0.0	475.0					475	
					the same factor for labour is used for waste disposal of old baskets	Other	0.020							378.0	0.0	7.6		8	
					same contingency as for CES	Contingency	30%								30%	1.0	168.7	169	
588	45	40	40	700	OPERATION INDIRECTS (RPB)														
					operation indirect labour costs for CES are for a duration of 10 yrs RES operations are for 1 yr max therefore a factor of 0.1 is used	Labour	0.1	2,678.3	0.1	267.8								268	
					Assume same spares and consumables required as identical equipment is used for both CES & RES. Therefore factor = 1	Materials and Equipment	1.0				172.8	1.0	172.8					173	
					Assume energy consumption for running of facility can be factored relative to duration of facility operation = 1/10yrs = 0.1. Armed response included at rate of $50k/a based on 1 year duration - see note 8.	Other	1.0							374.0	1.0	374.0		374	8
					same contingency as for CES	Contingency	30%								30%	1.0	244.4	244	
588	45	40	40	800	STORAGE OPERATIONS (RPB)														
					Labour for storage operations for CES is for a fuel inventory of 4717 baskets. RES has 95 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 95/4717	Labour	0.020	990.2	0.0	19.9								20	
					No entry in CES alternative cost category	Materials and Equipment													
					No entry in CES alternative cost category	Other													
					same contingency as for CES	Contingency	30%								30%	1.0	6.0	6	

						Total		**641,115**
						Check: Should = 0		
Total	306,120	Total	111,491	Total	91,613	Total	131,891.9	
Check: Should = 0		Check: Should = 0		Check: Should = 0		Check: Should = 0		

BASIS OF ESTIMATE NOTES - Insert references and notes

1 It is assumed that there is no property tax on facilities located on the Chalk River site. Reference note 5 on table 18 - Cost Estimate Report 1105/MD18084/REP/19

2 258k$/a made up of expenses from table 18 in report (15+118+50+50+25). No property tax or PST included.

3 Cost information on silos extracted from OPG R.Heystee email date 11-01-03 : 'PLGS dry canister costs for RES costing' cost includes; materials supply, construction, testing and project management: $60K per canister Fall 2001 dollars. Labour and materials split approx. 33% materials/67%labour

4 ancillary ops factored from CES CVSB. In CES this cost was for a 30 year period (covering 1 facility repeat and 1 repackaging event). for RES this covers 100/200&300year facility repeats & 300y repackaging 3x8 (1 demolish prev (y83). 2 const,n of 222 silos (y84,85) 5 ops for transfer) = 24

5 costs for silos demolition and waste diposal based on unit cost factors obtained for demolition of basket storage vaults in CVSB alternative

6 staffing levels obtained from table 17 in cost estimate report 1105/MD18084/REP/19

7 annual costs for Labour/M&E and Other, obtained from table 18 in cost estimate report 1105/MD18084/REP/19

8 armed response costs during 'fuel handling' based on rate of $100k/a. But, due to $50k/a for armed response included in extended monitoring, this means an additional $50k/a is to be included for the duration of the facility repeat transfers/repackaging events ($50k + $50k = $100k)

9 armed response not captured in 300 yr facility repeat for fuel transfers, as it is covered in basket repackaging at 300yr event

REACTOR EXTENDED STORE — SILOS IN SHALLOW TRENCH (SST)

ACTIVITY SUMMARY TO DATA TRANSFER — CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
588	55							Environmental Assessment and Monitoring	Labour	STEP	OPG	RJH	4	283	280			14130.0
588	55							Environmental Assessment and Monitoring	Materials and Equipment	STEP	OPG	RJH	4	283	280			4095.0
588	55							Environmental Assessment and Monitoring	Other	STEP	OPG	RJH	4	283	280			1533.0
588	55							Environmental Assessment and Monitoring	Contingency	STEP	OPG	RJH	4	283	280			5927.4

NO DATA TO FILL

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check: Total minus budget Should = 0	Check total	Total Cost $k	Budget costs to Years by %
Labour	14130		*0.0*	14130.0	
Materials and Equipment	4095			4095.0	
Other	1533			1533.0	
Contingency	5927.4		*0.0*	5927.4	
Total	25685		*0.0*	25685	

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
588	55							**Environmental Assessment and Monitoring**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
588	55	10						EA & MONITORING PROGRAM MANAGEMENT																
								Costs are incurred over the period Y4 to Y283 or 280 yrs vs 347 yrs in CES. RES has 0.1 staff vs 2 staff in CES. Factor is 280/347 x 0.1/2 = 0.04	Labour	0.04	70306	0.04	2812.24										2,812
									Materials and Equipment	1				1										
								Expenses at $1.5K/a x 280 yrs	Other	1							420	1	420					420
									Contingency	0.3										3232.24	0.3	969.672		970
588	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT																
								Assume C/L & EA process spans 3 years (Y5 to Y7) with with some preparation work in Y4; ie total of 4 years. Due to multiple sites with same technology can share costs	Labour	0.2	7471	0.2	1494.2										1,494
									Materials and Equipment	0.2				0.2										
									Other	0.2							2,150	0.2	430					430
									Contingency	0.3										1924.2	0.3	577.26		577

588	55	40	GROUNDWATER MONITORING															
			Costs span the period Y11 to Y283 or 273 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.6 in CES. Factor is 273/330 x 0.02/0.6 = 0.028.	Labour	0.028	37158	0.028	1040.424										1,040
			M&E at $3K/a x 273 yrs	Materials and Equipment	1				819	1	819							819
			Expenses at $2K/a x 273 yrs	Other	1							546	1	546				546
				Contingency	0.3										2405.424	0.3	721.6272	722
588	55	50	RADIOLOGICAL BIOSPHERE MONITORING															
			Costs span the period Y11 to Y283 or 273 yrs vs 330 ys for CES. RES staff is 0.1 vs 3.3 staff in CES. Factor is 0.025	Labour	0.025	217280	0.025	5432										5,432
			M&E at $9K/a x 273 yrs	Materials and Equipment	1				2457	1	2457							2,457
				Other	1								1					
				Contingency	0.3										7889	0.3	2366.7	2,367
588	55	60	NON-RAD BIOSPHERE MONITORING															
			Costs span the period Y11 to Y283 or 273 yrs vs 330 in CES. RES staff is 0.05 staff vs 0.8 staff in CES. Factor is 273/330 x 0.05/0.8 = 0.052	Labour	0.052	53590	0.052	2786.68										2,787
			M&E at $3K/a x 273 yrs	Materials and Equipment	1				819	1	819							819
				Other	1								1					
				Contingency	0.3										3605.68	0.3	1081.704	1,082
588	55	80	HUMAN HEALTH MONITORING															
			Costs span the period Y11 to Y283 or 273 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.17 in CES. Factor is 273/330 x 0.02/0.17 = 0.098	Labour	0.098	5760	0.098	564.48										564
				Materials and Equipment	1					1								
			Expenses at 0.5K/a x 273 yrs	Other	1							137	1	137				137
				Contingency	0.3										701.48	0.3	210.444	210
																	Total	**25,685**
																	Check: Should = 0	
						Total		14,130	Total		4,095	Total		1,533	Total		5,927.4	
						Check: Should = 0			Check: Should = 0			Check: Should = 0			Check: Should = 0			

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN SHALLOW TRENCH (SST)
CHALK RIVER

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
588	90	0	0	0	0	0	0	Program Management	Labour	STEP	CTECH	AM	1	10	10	0	0	NO DATA TO FILL	664.0
588	90	0	0	0	0	0	0	Program Management	Materials and Equipment	STEP	CTECH	AM	1	10	10	0	0		0.0
588	90	0	0	0	0	0	0	Program Management	Other	STEP	CTECH	AM	1	10	10	0	0		180.6
588	90	0	0	0	0	0	0	Program Management	Contingency	STEP	CTECH	AM	1	10	10	0	0		168.9

INSTRUCTIONS

Check: Total minus budget Should = 0 | Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
		0%	
Labour	664	0.0	664.0
Materials and Equipment	0	0.0	0.0
Other	181	0.0	180.6
Contingency	168.9	0.0	168.9
Total	1014	0.0	1014

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
588	90							**Program Management**																
								Program management shared between 7 reactor sites at percentages based on table 18 in cost estimate report. 7% for Chalk River			**total for 7 sites**	**Factor**	**RES**	**total for 7 sites**	**Factor**	**RES**	**total for 7 sites**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
								based on 8 staff. Assume 4 x OPG01, 4 x OPG03 for 10year duration	Labour	0.07	9486.204	0.07	664.03428										664	
								no entry	Materials and Equipment	0				0	0	0							0	
								the following expenses: Public affairs, overheads, insurance, community compensation & legal fees as table 18	Other	0.07							2580	0.07	180.6				181	
								Contingency as CES value	Contingency	20%										20%	1.0	168.9	169	

Total	664	Total	0	Total	181	Total	168.9	**Total**	**1,014**
Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	**Check: Should = 0**	**0**

BASIS OF ESTIMATE NOTES - Insert references and notes

1

2

RES ALTERNATIVE
WBS No 588
SILOS IN SHALLOW TRENCH (SST)
CHALK RIVER

Cost Category	Total K$
Labour	352,382
Materials and Equipment	134,315
Other	111,753
Contingency	160,574
Total Cost	**759,024**

759,024

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	Responsible	Cost Category	WBS Type	Start Year	End Year	Dur'n	Contingency	Total K$
588	15	0	0	0	0	0	0	RJH	Labour	STEP	1	7	7	0	556
588	15	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	7	7	0	0
588	15	0	0	0	0	0	0	RJH	Other	STEP	1	7	7	0	113
588	15	0	0	0	0	0	0	RJH	Contingency	STEP	1	7	7	0	334
588	20	0	0	0	0	0	0	AM	Labour	STEP	276	282	7	0	7,933
588	20	0	0	0	0	0	0	AM	Materials and Equipment	STEP	276	282	7	0	430
588	20	0	0	0	0	0	0	AM	Other	STEP	276	282	7	0	280
588	20	0	0	0	0	0	0	AM	Contingency	STEP	276	282	7	0	3,295
588	25	0	0	0	0	0	0	RJH	Labour	STEP	1	283	283	0	1,294
588	25	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	283	283	0	0
588	25	0	0	0	0	0	0	RJH	Other	STEP	1	283	283	0	240
588	25	0	0	0	0	0	0	RJH	Contingency	STEP	1	283	283	0	613
588	30	0	0	0	0	0	0	RJH	Labour	STEP	1	283	283	0	3,049
588	30	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	283	283	0	0
588	30	0	0	0	0	0	0	RJH	Other	STEP	1	283	283	0	15,364
588	30	0	0	0	0	0	0	RJH	Contingency	STEP	1	283	283	0	4,603
588	35	0	0	0	0	0	0	RJH	Labour	STEP	1	10	10	0	684
588	35	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	10	10	0	0
588	35	0	0	0	0	0	0	RJH	Other	STEP	1	10	10	0	462
588	35	0	0	0	0	0	0	RJH	Contingency	STEP	1	10	10	0	573
588	40	0	0	0	0	0	0	AM	Labour	STEP	8	282	275	0	17953.3163
588	40	0	0	0	0	0	0	AM	Materials and Equipment	STEP	8	282	275	0	18299.3245
588	40	0	0	0	0	0	0	AM	Other	STEP	8	282	275	0	1968.94697
588	40	0	0	0	0	0	0	AM	Contingency	STEP	8	282	275	0	13167.0053
588	45	0	0	0	0	0	0	AM	Labour	STEP	6	283	278	0	306,120
588	45	0	0	0	0	0	0	AM	Materials and Equipment	STEP	6	283	278	0	111,491
588	45	0	0	0	0	0	0	AM	Other	STEP	6	283	278	0	91,613
588	45	0	0	0	0	0	0	AM	Contingency	STEP	6	283	278	0	131,892
588	55	0	0	0	0	0	0	RJH	Labour	STEP	4	283	280	0	14,130
588	55	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	4	283	280	0	4,095
588	55	0	0	0	0	0	0	RJH	Other	STEP	4	283	280	0	1,533
588	55	0	0	0	0	0	0	RJH	Contingency	STEP	4	283	280	0	5,927
588	90	0	0	0	0	0	0	AM	Labour	STEP	1	10	10	0	664
588	90	0	0	0	0	0	0	AM	Materials and Equipment	STEP	1	10	10	0	0
588	90	0	0	0	0	0	0	AM	Other	STEP	1	10	10	0	181
588	90	0	0	0	0	0	0	AM	Contingency	STEP	1	10	10	0	169

B2 Cost Estimate Schedules for Chalk River Site

WBS No 586 – Silos
WBS No 587 – SSB
WBS No 588 – SST

Cost estimate schedules to lowest WBS level are presented in this section and are also available on the CD.

	LINE No sp sht	Level	586	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt
	1	1	586								**SILOS - AECL CHALK RIVER**										
	2	2	586	15							**SITING**	Db Sm									
	3	3	586	15	10						TECHNICAL SITING MANAGEMENT	Db Act	FIXED	OPG	RJH	1	79	7			
	4	3	586	15	70						PREFERRED SITE	Db Sm									
	5	4	586	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING	Db Act	FIXED	OPG	RJH	76	76	1			
	6	4	586	15	70	30					PREFERRED SITE - CHARACTERIZATION	Db Act	FIXED	OPG	RJH	76	76	1			
	7																				
	8	2	586	20							**SYSTEM DEVELOPMENT**	Db Sm									
	9	3	586	20	02						SYSTEM DEVELOPMENT MANAGEMENT	Db Act	FIXED	CTECH	AM	276	282	7			
	10	3	586	20	05						SYSTEM OPTIMIZATION	Db Act	FIXED	CTECH	AM	276	279	4			
	11	3	586	20	20						PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)	Db Act	FIXED	CTECH	AM	276	282	7			
	12	3	586	20	30						STORAGE SYSTEM ENG'NG	Db Act	FIXED	CTECH	AM	276	282	7			
	13	3	586	20	40						SECURITY & SAFEGUARD ENG'NG	Db Act	FIXED	CTECH	AM	278	278	1			
	14																				
	15	2	586	25							**SAFETY ASSESSMENT**	Db Sm									
	16	3	586	25	10						SAFETY ASSESSMENT MANAGEMENT	Db Act	FIXED	OPG	RJH	1	82	11			
	17	3	586	25	30						SA - SITING	Db Act	FIXED	OPG	RJH	75	76	2			
	18	3	586	25	40						SA - OPERATING LICENSE	Db Act	FIXED	OPG	RJH	81	82	2			
	19	3	586	25	50						SA - FACILITY OPERATIONS	Db Act	FIXED	OPG	RJH	14	270	28			
	20	3	586	25	70						SA - DECOMMISSIONING (Processing Facilities)	Db Act	FIXED	OPG	RJH	282	283	2			
	21																				
	22	2	586	30							**LICENSING & APPROVALS**	Db Sm									
	23	3	586	30	30						LIAISON WITH CNSC	Db Act	FIXED	CTECH	RJH	73	76	4			
	24	3	586	30	50						CNSC CONSTRUCTION LICENCE	Db Act	FIXED	CTECH	RJH	77	79	3			
	25	3	586	30	60						OTHER GOVN'MT APPROVALS	Db Act	FIXED	CTECH	RJH						
	26	4	586	30	60	10					APPROVAL REQUIREMENTS	Db Act	FIXED	CTECH	RJH	73	76	4			
	27	4	586	30	60	30					FEDERAL APPROVALS	Db Act	FIXED	CTECH	RJH	77	82	6			
	28	4	586	30	60	40					PROVINCIAL APPROVALS	Db Act	FIXED	CTECH	RJH	77	82	6			
	29	4	586	30	60	50					MUNICIPAL APPROVALS	Db Act	FIXED	CTECH	RJH	77	82	6			
	30	3	586	30	65						CNSC OPERATING LICENCE (initial application)	Db Act	FIXED	CTECH	RJH	81	82	2			
	31	3	586	30	70						CNSC OPERATING LICENCE (maintenance and renewal)	Db Act	FIXED	CTECH	RJH	4	283	280			
	32																				
	33	2	586	35							**PUBLIC AFFAIRS**	Db Sm									
	34	3	586	35	45						PUBLIC AFFAIRS - PREFERRED SITE	Db Act	FIXED	OPG	RJH	76	76	1			
	35	3	586	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL	Db Act	FIXED	OPG	RJH	77	79	3			
	36	3	586	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION	Db Act	FIXED	OPG	RJH	80	82	3			
	37	3	586	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH	1	82	10			
	38	3	586	35	120						COMMUNITY offsets and benefits	Db Act	FIXED	OPG	RJH	80	82	3			
	39																				
	40	2	586	40							**FACILITY DESIGN AND CONSTRUCTION**	Db Sm									
	41	3	586	40	10						SITE & IMPROVEMENTS	Db Act	STEP FIXED	CTECH	AM	8	8	1			
	42	3	586	40	30						COMMON ANCILLARY FACILITIES	Db Sm									
	43	4	586	40	30	10					ADMIN AND SUPPORT FACILITIES	Db Sm									
	44	5	586	40	30	10	01				ADMIN AND VISITOR RECEPT'N BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	45	5	586	40	30	10	02				OPS SUPPT & HEALTH PHYSICS BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	46	5	586	40	30	10	03				EQUIP STORAGE AND MAINT'CE BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			

	LINE No sp sht	Level	586	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt
	47	5	586	40	30	10	05				ACTIVE SOLID WASTE HDLG BLDG	Db Act	STEP FIXED	CTECH	AM	281	282	2			
	48	5	586	40	30	10	06				SOLID WASTE STORAGE AREA	Db Act	STEP FIXED	CTECH	AM	281	282	2			
	49	5	586	40	30	10	07				ACTIVE LIQ/W TRT'MT BLDG	Db Act	STEP FIXED	CTECH	AM	281	282	2			
	50	5	586	40	30	10	08				LOW LVL LIQ/W STRG BLDG	Db Act	STEP FIXED	CTECH	AM	281	282	2			
	51	5	586	40	30	10	09				WAREHOUSE BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	52	5	586	40	30	10	10				GUARDHOUSE AND SECURITY FENCE	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	53	5	586	40	30	10	11				TRUCK INSP'N / WASH STATION	Db Act	STEP FIXED	CTECH	AM	Not required for RES					
	54	5	586	40	30	10	12				UTILITY BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	55	5	586	40	30	10	13				TEST FACILITY CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	93	94	2			
	56	4	586	40	30	20					OTHER SITE SYSTEMS	Db Sm									
	57	5	586	40	30	20	01				FIRE PROTECTION SYSTEMS	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	58	5	586	40	30	20	02				SECURITY AND COMMUNICATION SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	59	5	586	40	30	20	03				ELECTRICAL AND EMERGENCY POWER	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	60	5	586	40	30	20	04				SANITARY SEWER SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	61	5	586	40	30	20	05				POTABLE WATER SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	62	5	586	40	30	20	06				RETENTION/SEDIMENTATION POND	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	63	5	586	40	30	20	07				STORM WATER DETENTION POND	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	64	5	586	40	30	20	08				CONST'N MAT'L STOCKPILE AREA	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	65	5	586	40	30	20	09				SITE MATERIALS STORAGE AREA	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	66	5	586	40	30	20	10				ACCESS ROADS AND VEHICLE COMPOUNDS	Db Act	STEP FIXED	CTECH	AM	*	*	*			
	67	4	586	40	30	30					CONST'N INDIRECTS ANCILLARY FACILITIES	Db Act	STEP FIXED	CTECH	AM	93	94	2			
	68	3	586	40	650						ENERGY CONSUMPTION	Db Act	STEP FIXED	CTECH	AM	94	94	1			
	69										*** Existing buildings and services adopted by RES facility.**										
	70	2	586	45							**FACILITY OPERATION**	Db Sm									
	71	3	586	45	20						OPERATIONS - EXTENDED MONITORING	Db Sm									
	72	4	586	45	20	05					PROGRAM MANAGEMENT	Db Act	STEP FIXED	CTECH	AM	4	283	280			
	73	4	586	45	20	40					MONITORING AND SURVEILLANCE	Db Act	STEP FIXED	CTECH	AM	4	283	280			
	74	4	586	45	20	50					OPERATION INDIRECTS (MONITORING)	Db Act	STEP FIXED	CTECH	AM	4	283	280			
	75	4	586	45	20	60					COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)	Db Act	STEP FIXED	CTECH	AM	55	283	229			
	76	4	586	45	20	70					FUEL INTEGRITY MONITORING (25 YEARLY)	Db Act	STEP FIXED	CTECH	AM	4	283	280			
	77	3	586	45	30						OPERATIONS - FACILITY REPEATS	Db Sm									
	78	4	586	45	30	20					SILOS 100 YEAR REPLACEMENT										
	79	4	586	45	30	20	10				DEMOLISH EXISTING STORAGE SILOS	Db Act	STEP FIXED	CTECH	AM	83	84	2			
	80	5	586	45	30	20	20				SILO CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	83	84	2			
	81	5	586	45	30	20	30				TRANSFER OPERATIONS	Db Act	STEP FIXED	CTECH	AM	83	84	2			
	82	5	586	45	30	20	40				WASTE DISPOSAL	Db Act	STEP FIXED	CTECH	AM	183	184	2			
	83	4	586	45	30	30					SILOS 200 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	209	210	2			
	84	4	586	45	30	40					SILOS 300 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	281	282	2			
	85	3	586	45	40						OPERATIONS - REPACKAGING	Db Sm									
	86	4	586	45	40	05					PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)	Db Act	STEP FIXED	CTECH	AM	81	283	13			
	87	5	586	45	40	10	40				COMMON ANCILLARY FACILITIES (REPLACEMENT)	Db Act	STEP FIXED	CTECH	GA	93	283	9			

	LINE No sp sht	Level	586	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt
	88	6	586	45	40	10	600	30			ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)	Db Act	STEP FIXED	CTECH	GA	83	283	7			
	89	4	586	45	40	40					BASKET TO BASKET 300 YEAR REPACKAGING	Db Sm									
	90	5	586	45	40	40	05				CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)	Db Act	STEP FIXED	CTECH	AM	281	282	2			
	91	5	586	45	40	40	10				PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)	Db Sm									
	92	6	586	45	40	40	10	20			RPBB EQUIP. DESIGN, SUPPLY & INSTALL	Db Sm									
	93	7	586	45	40	40	10	20	10		RECEIPT & TRANSFER (EQUIP)	Db Act	STEP FIXED	CTECH	AM	281	282	2			
	94	7	586	45	40	40	10	20	20		BASKET TO BASKET FUEL TRANSFER	Db Act	STEP FIXED	CTECH	AM	281	282	2			
	95	7	586	45	40	40	10	20	30		BASKET DECONTAMINATION	Db Act	STEP FIXED	CTECH	AM	281	282	2			
	96	6	586	45	40	40	10	30			RPBB BUILDING DESIGN AND CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	281	282	2			
	97	6	586	45	40	40	10	60			BUILDING SERVICES (RPB)	Db Act	STEP FIXED	CTECH	AM	281	282	2			
	98	6	586	45	40	40	10	70			COMMISSIONING (RPB)	Db Act	STEP FIXED	CTECH	AM	281	281	1			
	99	6	586	45	40	40	10	80			CONST'N INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM	281	282	2			
	100	5	586	45	40	40	400				CONSTRUCTION MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM	281	282	2			
	101	5	586	45	40	40	500				COMMISSIONING MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM	283	283	1			
	102	5	586	45	40	40	600				REPACKAGING OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM	283	283	1			
	103	5	586	45	40	40	700				OPERATION INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM	283	283	1			
	104	5	586	45	40	40	800				STORAGE OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM	283	283	1			
	105																				
	106	2	586	55							**ENVIRONMENTAL MANAGEMENT SYSTEM**	Db Sm									
	107	3	586	55	10						EA & MONITORING PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH	4	283	280			
	108	3	586	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT	Db Act	FIXED	OPG	RJH	77	79	3			
	109	3	586	55	40						GROUNDWATER MONITORING	Db Act	FIXED	OPG	RJH	4	283	280			
	110	3	586	55	50						RADIOLOGICAL BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH	4	283	280			
	111	3	586	55	60						NON-RAD BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH	4	283	280			
	112	3	586	55	80						HUMAN HEALTH MONITORING	Db Act	FIXED	OPG	RJH	4	283	280			
	113																				
	114	2	586	90							**PROGRAM MANAGEMENT (Yrs 01 to 03)**	Db Act	STEP FIXED	CTECH	AM	1	3	3			

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt
1	1	587								**SILOS IN STORAGE BUILDINGS (SSB) - AECL CHALK RIVER**										
2	2	587	15							**SITING**	Db Sm									
3	3	587	15	10						TECHNICAL SITING MANAGEMENT	Db Act	FIXED	OPG	RJH	1	7	7			
4	3	587	15	70						PREFERRED SITE	Db Sm									
5	4	587	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING	Db Act	FIXED	OPG	RJH	4	4	1			
6	4	587	15	70	30					PREFERRED SITE - CHARACTERIZATION	Db Act	FIXED	OPG	RJH	4	4	1			
7																				
8	2	587	20							**SYSTEM DEVELOPMENT**	Db Sm									
9	3	587	20	02						SYSTEM DEVELOPMENT MANAGEMENT	Db Act	FIXED	CTECH	AM	276	282	7			
10	3	587	20	05						SYSTEM OPTIMIZATION	Db Act	FIXED	CTECH	AM	276	279	4			
11	3	587	20	20						PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)	Db Act	FIXED	CTECH	AM	276	282	7			
12	3	587	20	30						STORAGE SYSTEM ENG'NG	Db Act	FIXED	CTECH	AM	276	282	7			
13	3	587	20	40						SECURITY & SAFEGUARD ENG'NG	Db Act	FIXED	CTECH	AM	278	278	1			
14																				
15	2	587	25							**SAFETY ASSESSMENT**	Db Sm									
16	3	587	25	10						SAFETY ASSESSMENT MANAGEMENT	Db Act	FIXED	OPG	RJH	1	10	10			
17	3	587	25	30						SA - SITING	Db Act	FIXED	OPG	RJH	3	4	2			
18	3	587	25	40						SA - OPERATING LICENSE	Db Act	FIXED	OPG	RJH	9	10	2			
19	3	587	25	50						SA - FACILITY OPERATIONS	Db Act	FIXED	OPG	RJH	11	283	28			
20	3	587	25	70						SA - DECOMMISSIONING (Processing Facilities)	Db Act	FIXED	OPG	RJH	282	283	2			
21																				
22	2	587	30							**LICENSING & APPROVALS**	Db Sm									
23	3	587	30	30						LIAISON WITH CNSC	Db Act	FIXED	CTECH	RJH	1	4	4			
24	3	587	30	50						CNSC CONSTRUCTION LICENCE	Db Act	FIXED	CTECH	RJH	5	10	6			
25	3	587	30	60						OTHER GOVN'MT APPROVALS	Db Act	FIXED	CTECH	RJH						
26	4	587	30	60	10					APPROVAL REQUIREMENTS	Db Act	FIXED	CTECH	RJH	1	4	4			
27	4	587	30	60	30					FEDERAL APPROVALS	Db Act	FIXED	CTECH	RJH	5	10	6			
28	4	587	30	60	40					PROVINCIAL APPROVALS	Db Act	FIXED	CTECH	RJH	5	10	6			
29	4	587	30	60	50					MUNICIPAL APPROVALS	Db Act	FIXED	CTECH	RJH	5	10	6			
30	3	587	30	65						CNSC OPERATING LICENCE (initial application)	Db Act	FIXED	CTECH	RJH	9	10	2			
31	3	587	30	70						CNSC OPERATING LICENCE (maintenance and renewal)	Db Act	FIXED	CTECH	RJH	11	283	273			
32																				
33	2	587	35							**PUBLIC AFFAIRS**	Db Sm									
34	3	587	35	45						PUBLIC AFFAIRS - PREFERRED SITE	Db Act	FIXED	OPG	RJH	4	4	1			
35	3	587	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL	Db Act	FIXED	OPG	RJH	5	7	3			
36	3	587	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION	Db Act	FIXED	OPG	RJH	8	10	3			
37	3	587	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH	1	10	10			
38	3	587	35	120						COMMUNITY OFFSETS AND BENEFITS	Db Act	FIXED	OPG	RJH	8	10	3			
39																				
40	2	587	40							**FACILITY DESIGN AND CONSTRUCTION**	Db Sm									
41	3	587	40	10						SITE & IMPROVEMENTS	Db Act	STEP FIXED	CTECH	AM	8	8	1			
42	3	587	40	30						COMMON ANCILLARY FACILITIES	Db Sm									
43	4	587	40	30	10					ADMIN AND SUPPORT FACILITIES	Db Sm									
44	5	587	40	30	10	01				ADMIN AND VISITOR RECEPT'N BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			
45	5	587	40	30	10	02				OPS SUPPT & HEALTH PHYSICS BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			
46	5	587	40	30	10	03				EQUIP STORAGE AND MAINT'CE BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			

LINE No	sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt	
47		5	587	40	30	10	05				ACTIVE SOLID WASTE HDLG BLDG	Db Act	STEP FIXED	CTECH	AM	281	282	2				
48		5	587	40	30	10	06				SOLID WASTE STORAGE AREA	Db Act	STEP FIXED	CTECH	AM	281	282	2				
49		5	587	40	30	10	07				ACTIVE LIQ/W TRT'MT BLDG	Db Act	STEP FIXED	CTECH	AM	281	282	2				
50		5	587	40	30	10	08				LOW LVL LIQ/W STRG BLDG	Db Act	STEP FIXED	CTECH	AM	281	282	2				
51		5	587	40	30	10	09				WAREHOUSE BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
52		5	587	40	30	10	10				GUARDHOUSE AND SECURITY FENCE	Db Act	STEP FIXED	CTECH	AM	*	*	*				
53		5	587	40	30	10	11				TRUCK INSP'N / WASH STATION	Db Act	STEP FIXED	CTECH	AM	Not required for RES						
54		5	587	40	30	10	12				UTILITY BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
55		5	587	40	30	10	13				TEST FACILITY CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	93	94	2				
56		4	587	40	30	20					OTHER SITE SYSTEMS	Db Sm										
57		5	587	40	30	20	01				FIRE PROTECTION SYSTEMS	Db Act	STEP FIXED	CTECH	AM	*	*	*				
58		5	587	40	30	20	02				SECURITY AND COMMUNICATION SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
59		5	587	40	30	20	03				ELECTRICAL AND EMERGENCY POWER	Db Act	STEP FIXED	CTECH	AM	*	*	*				
60		5	587	40	30	20	04				SANITARY SEWER SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
61		5	587	40	30	20	05				POTABLE WATER SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
62		5	587	40	30	20	06				RETENTION/SEDIMENTATION POND	Db Act	STEP FIXED	CTECH	AM	*	*	*				
63		5	587	40	30	20	07				STORM WATER DETENTION POND	Db Act	STEP FIXED	CTECH	AM	*	*	*				
64		5	587	40	30	20	08				CONST'N MAT'L STOCKPILE AREA	Db Act	STEP FIXED	CTECH	AM	*	*	*				
65		5	587	40	30	20	09				SITE MATERIALS STORAGE AREA	Db Act	STEP FIXED	CTECH	AM	*	*	*				
66		5	587	40	30	20	10				ACCESS ROADS AND VEHICLE COMPOUNDS	Db Act	STEP FIXED	CTECH	AM	*	*	*				
67		4	587	40	30	30					CONST'N INDIRECTS ANCILLARY FACILITIES	Db Act	STEP FIXED	CTECH	AM	93	94	2				
68		3	587	40	40						STORAGE DESIGN & CONSTRUCTION (BUILDING)											
69		4	587	40	40	10					STORAGE BUILDING DESIGN & CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	10	10	1				
70		4	587	40	40	20					STORAGE BUILDING SERVICES DESIGN & INSTALLATION	Db Act	STEP FIXED	CTECH	AM	10	10	1				
71		4	587	40	40	30					STORAGE BUILDING CONSTRUCTION INDIRECTS	Db Act	STEP FIXED	CTECH	AM	10	10	1				
72		3	587	40	650						ENERGY CONSUMPTION	Db Act	STEP FIXED	CTECH	AM	94	94	1				
73											*** Existing buildings and services adopted by RES facility.**											
74		2	587	45							**FACILITY OPERATION**	Db Sm										
75		3	587	45	20						OPERATIONS - EXTENDED MONITORING	Db Sm										
76		4	587	45	20	05					PROGRAM MANAGEMENT	Db Act	STEP FIXED	CTECH	AM	11	283	273				
77		4	587	45	20	40					MONITORING AND SURVEILLANCE	Db Act	STEP FIXED	CTECH	AM	11	283	273				
78		4	587	45	20	50					OPERATION INDIRECTS (MONITORING)	Db Act	STEP FIXED	CTECH	AM	11	283	273				
79		4	587	45	20	60					COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)	Db Act	STEP FIXED	CTECH	AM	55	283	229				
80		4	587	45	20	70					FUEL INTEGRITY MONITORING (25 YEARLY)	Db Act	STEP FIXED	CTECH	AM	6	283	278				
81		3	587	45	30						OPERATIONS - FACILITY REPEATS	Db Sm										
82		4	587	45	30	20					SILOS 100 YEAR REPLACEMENT											
83		4	587	45	30	20	10				DEMOLISH EXISTING STORAGE SILOS	Db Act	STEP FIXED	CTECH	AM	109	110	2				
84		5	587	45	30	20	20				SILO CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	109	110	2				
85		5	587	45	30	20	30				TRANSFER OPERATIONS	Db Act	STEP FIXED	CTECH	AM	109	110	2				
86		5	587	45	30	20	40				WASTE DISPOSAL	Db Act	STEP FIXED	CTECH	AM	109	110	2				
87		4	587	45	30	30					SILOS 200 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	209	210	2				
88		4	587	45	30	40					SILOS 300 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	281	282	2				
89		4	587	45	30	50					STORAGE BUILDINGS 100 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	109	110	2				

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt	
90	4	587	45	30	60					STORAGE BUILDINGS 200 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	209	210	2				
91	4	587	45	30	70					STORAGE BUILDINGS 300 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	281	282	2				
92	3	587	45	40						OPERATIONS - REPACKAGING	Db Sm										
93	4	587	45	40	05					PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)	Db Act	STEP FIXED	CTECH	AM	107	283	13				
94	5	587	45	40	10	40				COMMON ANCILLARY FACILITIES (REPLACEMENT)	Db Act	STEP FIXED	CTECH	GA	93	283	9				
95	6	587	45	40	10	600	30			ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)	Db Act	STEP FIXED	CTECH	GA	109	283	7				
96	4	587	45	40	40					BASKET TO BASKET 300 YEAR REPACKAGING	Db Sm										
97	5	587	45	40	40	05				CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)	Db Act	STEP FIXED	CTECH	AM	281	282	2				
98	5	587	45	40	40	10				PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)	Db Sm										
99	6	587	45	40	40	10	20			RPBB EQUIP. DESIGN, SUPPLY & INSTALL	Db Sm										
100	7	587	45	40	40	10	20	10		RECEIPT & TRANSFER (EQUIP)	Db Act	STEP FIXED	CTECH	AM	281	282	2				
101	7	587	45	40	40	10	20	20		BASKET TO BASKET FUEL TRANSFER	Db Act	STEP FIXED	CTECH	AM	281	282	2				
102	7	587	45	40	40	10	20	30		BASKET DECONTAMINATION	Db Act	STEP FIXED	CTECH	AM	281	282	2				
103	6	587	45	40	40	10	30			RPBB BUILDING DESIGN AND CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	281	282	2				
104	6	587	45	40	40	10	60			BUILDING SERVICES (RPB)	Db Act	STEP FIXED	CTECH	AM	281	282	2				
105	6	587	45	40	40	10	70			COMMISSIONING (RPB)	Db Act	STEP FIXED	CTECH	AM	281	281	1				
106	6	587	45	40	40	10	80			CONST'N INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM	281	282	2				
107	5	587	45	40	40	400				CONSTRUCTION MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM	281	282	2				
108	5	587	45	40	40	500				COMMISSIONING MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM	283	283	1				
109	5	587	45	40	40	600				REPACKAGING OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM	283	283	1				
110	5	587	45	40	40	700				OPERATION INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM	283	283	1				
111	5	587	45	40	40	800				STORAGE OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM	283	283	1				
112																					
113	2	587	55							**ENVIRONMENTAL MANAGEMENT SYSTEM**	Db Sm										
114	3	587	55	10						EA & MONITORING PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH	4	283	280				
115	3	587	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT	Db Act	FIXED	OPG	RJH	5	7	3				
116	3	587	55	40						GROUNDWATER MONITORING	Db Act	FIXED	OPG	RJH	11	283	273				
117	3	587	55	50						RADIOLOGICAL BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH	11	283	273				
118	3	587	55	60						NON-RAD BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH	11	283	273				
119	3	587	55	80						HUMAN HEALTH MONITORING	Db Act	FIXED	OPG	RJH	11	283	273				
120																					
121	2	587	90							**PROGRAM MANAGEMENT (Yrs 01 to 10)**	Db Act	STEP FIXED	CTECH	AM	1	10	10				

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt
1	1	588								**SILOS IN SHALLOW TRENCHES (SST) - AECL CHALK RIVER**										
2	2	588	15							**SITING**	Db Sm									
3	3	588	15	10						TECHNICAL SITING MANAGEMENT	Db Act	FIXED	OPG	RJH	1	7	7			
4	3	588	15	70						PREFERRED SITE	Db Sm									
5	4	588	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING	Db Act	FIXED	OPG	RJH	4	4	1			
6	4	588	15	70	30					PREFERRED SITE - CHARACTERIZATION	Db Act	FIXED	OPG	RJH	4	4	1			
7																				
8	2	588	20							**SYSTEM DEVELOPMENT**	Db Sm									
9	3	588	20	02						SYSTEM DEVELOPMENT MANAGEMENT	Db Act	FIXED	CTECH	AM	276	282	7			
10	3	588	20	05						SYSTEM OPTIMIZATION	Db Act	FIXED	CTECH	AM	276	279	4			
11	3	588	20	20						PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)	Db Act	FIXED	CTECH	AM	276	282	7			
12	3	588	20	30						STORAGE SYSTEM ENG'NG	Db Act	FIXED	CTECH	AM	276	282	7			
13	3	588	20	40						SECURITY & SAFEGUARD ENG'NG	Db Act	FIXED	CTECH	AM	278	278	1			
14																				
15	2	588	25							**SAFETY ASSESSMENT**	Db Sm									
16	3	588	25	10						SAFETY ASSESSMENT MANAGEMENT	Db Act	FIXED	OPG	RJH	1	10	10			
17	3	588	25	30						SA - SITING	Db Act	FIXED	OPG	RJH	3	4	2			
18	3	588	25	40						SA - OPERATING LICENSE	Db Act	FIXED	OPG	RJH	6	7	2			
19	3	588	25	50						SA - FACILITY OPERATIONS	Db Act	FIXED	OPG	RJH	11	283	28			
20	3	588	25	70						SA - DECOMMISSIONING (Processing Facilities)	Db Act	FIXED	OPG	RJH	282	283	2			
21																				
22	2	588	30							**LICENSING & APPROVALS**	Db Sm									
23	3	588	30	30						LIAISON WITH CNSC	Db Act	FIXED	CTECH	RJH	1	4	4			
24	3	588	30	50						CNSC CONSTRUCTION LICENCE	Db Act	FIXED	CTECH	RJH	5	10	6			
25	3	588	30	60						OTHER GOVN'MT APPROVALS	Db Act	FIXED	CTECH	RJH						
26	4	588	30	60	10					APPROVAL REQUIREMENTS	Db Act	FIXED	CTECH	RJH	1	4	4			
27	4	588	30	60	30					FEDERAL APPROVALS	Db Act	FIXED	CTECH	RJH	5	10	6			
28	4	588	30	60	40					PROVINCIAL APPROVALS	Db Act	FIXED	CTECH	RJH	5	10	6			
29	4	588	30	60	50					MUNICIPAL APPROVALS	Db Act	FIXED	CTECH	RJH	5	10	6			
30	3	588	30	65						CNSC OPERATING LICENCE (initial application)	Db Act	FIXED	CTECH	RJH	9	10	2			
31	3	588	30	70						CNSC OPERATING LICENCE (maintenance and renewal)	Db Act	FIXED	CTECH	RJH	11	283	273			
32																				
33	2	588	35							**PUBLIC AFFAIRS**	Db Sm									
34	3	588	35	45						PUBLIC AFFAIRS - PREFERRED SITE	Db Act	FIXED	OPG	RJH	4	4	1			
35	3	588	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL	Db Act	FIXED	OPG	RJH	5	7	3			
36	3	588	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION	Db Act	FIXED	OPG	RJH	8	10	3			
37	3	588	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH	1	10	10			
38	3	588	35	120						COMMUNITY offsets and benefits	Db Act	FIXED	OPG	RJH	8	10	3			
39																				
40	2	588	40							**FACILITY DESIGN AND CONSTRUCTION**	Db Sm									
41	3	588	40	10						SITE & IMPROVEMENTS	Db Act	STEP FIXED	CTECH	AM	8	8	1			
42	3	588	40	30						COMMON ANCILLARY FACILITIES	Db Sm									
43	4	588	40	30	10					ADMIN AND SUPPORT FACILITIES	Db Sm									
44	5	588	40	30	10	01				ADMIN AND VISITOR RECEPT'N BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			
45	5	588	40	30	10	02				OPS SUPPT & HEALTH PHYSICS BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			
46	5	588	40	30	10	03				EQUIP STORAGE AND MAINT'CE BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			
47	5	588	40	30	10	05				ACTIVE SOLID WASTE HDLG BLDG	Db Act	STEP FIXED	CTECH	AM	281	282	2			

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt	
48	5	588	40	30	10	06				SOLID WASTE STORAGE AREA	Db Act	STEP FIXED	CTECH	AM	281	282	2				
49	5	588	40	30	10	07				ACTIVE LIQ/W TRT'MT BLDG	Db Act	STEP FIXED	CTECH	AM	281	282	2				
50	5	588	40	30	10	08				LOW LVL LIQ/W STRG BLDG	Db Act	STEP FIXED	CTECH	AM	281	282	2				
51	5	588	40	30	10	09				WAREHOUSE BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
52	5	588	40	30	10	10				GUARDHOUSE AND SECURITY FENCE	Db Act	STEP FIXED	CTECH	AM	*	*	*				
53	5	588	40	30	10	11				TRUCK INSP'N / WASH STATION	Db Act	STEP FIXED	CTECH	AM	Not required for RES						
54	5	588	40	30	10	12				UTILITY BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
55	5	588	40	30	10	13				TEST FACILITY CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	93	94	2				
56	4	588	40	30	20					OTHER SITE SYSTEMS	Db Sm										
57	5	588	40	30	20	01				FIRE PROTECTION SYSTEMS	Db Act	STEP FIXED	CTECH	AM	*	*	*				
58	5	588	40	30	20	02				SECURITY AND COMMUNICATION SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
59	5	588	40	30	20	03				ELECTRICAL AND EMERGENCY POWER	Db Act	STEP FIXED	CTECH	AM	*	*	*				
60	5	588	40	30	20	04				SANITARY SEWER SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
61	5	588	40	30	20	05				POTABLE WATER SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
62	5	588	40	30	20	06				RETENTION/SEDIMENTATION POND	Db Act	STEP FIXED	CTECH	AM	*	*	*				
63	5	588	40	30	20	07				STORM WATER DETENTION POND	Db Act	STEP FIXED	CTECH	AM	*	*	*				
64	5	588	40	30	20	08				CONST'N MAT'L STOCKPILE AREA	Db Act	STEP FIXED	CTECH	AM	*	*	*				
65	5	588	40	30	20	09				SITE MATERIALS STORAGE AREA	Db Act	STEP FIXED	CTECH	AM	*	*	*				
66	5	588	40	30	20	10				ACCESS ROADS AND VEHICLE COMPOUNDS	Db Act	STEP FIXED	CTECH	AM	*	*	*				
67	4	588	40	30	30					CONST'N INDIRECTS ANCILLARY FACILITIES	Db Act	STEP FIXED	CTECH	AM	93	94	2				
68	3	588	40	40						STORAGE DESIGN & CONSTRUCTION (CHAMBERS)	Db Act	STEP FIXED	CTECH	AM	9	9	1				
69	3	588	40	50						STORAGE DESIGN & CONSTRUCTION (SILOS)	Db Act	STEP FIXED	CTECH	AM	10	10	1				
70	3	588	40	650						ENERGY CONSUMPTION	Db Act	STEP FIXED	CTECH	AM	94	94	1				
71										*** Existing buildings and services adopted by RES facility.**												
72	2	588	45							**FACILITY OPERATION**	Db Sm										
73	3	588	45	10						OPERATIONS FUEL TRANSFER	Db Sm										
74	4	588	45	10	05					PROGRAM MANAGEMENT	Db Act	STEP FIXED	CTECH	AM	9	11	3				
75	4	588	45	10	25					MONITORING AND SURVEILLANCE (FUEL TRANSFER)	Db Act	STEP FIXED	CTECH	AM	11	11	1				
76	4	588	45	10	30					OPERATION INDIRECTS (FUEL TRANSFER)	Db Act	STEP FIXED	CTECH	AM	11	11	1				
77	4	588	45	10	40					STORAGE OPERATIONS	Db Act	STEP FIXED	CTECH	AM	11	11	1				
78	3	588	45	20						OPERATIONS - EXTENDED MONITORING	Db Sm										
79	4	588	45	20	05					PROGRAM MANAGEMENT	Db Act	STEP FIXED	CTECH	AM	12	283	272				
80	4	588	45	20	40					MONITORING AND SURVEILLANCE	Db Act	STEP FIXED	CTECH	AM	12	283	272				
81	4	588	45	20	50					OPERATION INDIRECTS (MONITORING)	Db Act	STEP FIXED	CTECH	AM	12	283	272				
82	4	588	45	20	60					COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)	Db Act	STEP FIXED	CTECH	AM	95	283	189				
83	4	588	45	20	70					FUEL INTEGRITY MONITORING (25 YEARLY)	Db Act	STEP FIXED	CTECH	AM	6	283	278				
84	3	588	45	30						OPERATIONS - FACILITY REPEATS	Db Sm										
85	4	588	45	30	20					SILOS 100 YEAR REPLACEMENT											
86	4	588	45	30	20	10				DEMOLISH EXISTING STORAGE SILOS	Db Act	STEP FIXED	CTECH	AM	109	110	2				

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt	
87	5	588	45	30	20	20				SILO CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	109	110	2				
88	5	588	45	30	20	30				TRANSFER OPERATIONS	Db Act	STEP FIXED	CTECH	AM	109	110	2				
89	5	588	45	30	20	40				WASTE DISPOSAL	Db Act	STEP FIXED	CTECH	AM	109	110	2				
90	4	588	45	30	30					SILOS 200 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	209	210	2				
91	4	588	45	30	40					SILOS 300 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	281	282	2				
92	4	588	45	30	50					STORAGE CHAMBER 200 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	209	210	2				
93	3	588	45	40						OPERATIONS - REPACKAGING	Db Sm										
94	4	588	45	40	05					PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)	Db Act	STEP FIXED	CTECH	AM	107	283	177				
95	5	588	45	40	10	40				COMMON ANCILLARY FACILITIES (REPLACEMENT)	Db Act	STEP FIXED	CTECH	GA	93	283	9				
96	6	588	45	40	10	600	30			ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)	Db Act	STEP FIXED	CTECH	GA	109	283	175				
97	4	588	45	40	40					BASKET TO BASKET 300 YEAR REPACKAGING	Db Sm										
98	5	588	45	40	40	05				CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)	Db Act	STEP FIXED	CTECH	AM	281	282	2				
99	5	588	45	40	40	10				PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)	Db Sm										
100	6	588	45	40	40	10	20			RPBB EQUIP. DESIGN, SUPPLY & INSTALL	Db Sm										
101	7	588	45	40	40	10	20	10		RECEIPT & TRANSFER (EQUIP)	Db Act	STEP FIXED	CTECH	AM	281	282	2				
102	7	588	45	40	40	10	20	20		BASKET TO BASKET FUEL TRANSFER	Db Act	STEP FIXED	CTECH	AM	281	282	2				
103	7	588	45	40	40	10	20	30		BASKET DECONTAMINATION	Db Act	STEP FIXED	CTECH	AM	281	282	2				
104	6	588	45	40	40	10	30			RPBB BUILDING DESIGN AND CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	281	282	2				
105	6	588	45	40	40	10	60			BUILDING SERVICES (RPB)	Db Act	STEP FIXED	CTECH	AM	281	282	2				
106	6	588	45	40	40	10	70			COMMISSIONING (RPB)	Db Act	STEP FIXED	CTECH	AM	281	281	1				
107	6	588	45	40	40	10	80			CONST'N INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM	281	282	2				
108	5	588	45	40	40	400				CONSTRUCTION MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM	281	282	2				
109	5	588	45	40	40	500				COMMISSIONING MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM	283	283	1				
110	5	588	45	40	40	600				REPACKAGING OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM	283	283	1				
111	5	588	45	40	40	700				OPERATION INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM	283	283	1				
112	5	588	45	40	40	800				STORAGE OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM	283	283	1				
113																					
114	2	588	55							**ENVIRONMENTAL MANAGEMENT SYSTEM**	Db Sm										
115	3	588	55	10						EA & MONITORING PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH	4	283	280				
116	3	588	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT	Db Act	FIXED	OPG	RJH	5	7	3				
117	3	588	55	40						GROUNDWATER MONITORING	Db Act	FIXED	OPG	RJH	11	283	273				
118	3	588	55	50						RADIOLOGICAL BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH	11	283	273				
119	3	588	55	60						NON-RAD BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH	11	283	273				
120	3	588	55	80						HUMAN HEALTH MONITORING	Db Act	FIXED	OPG	RJH	11	283	273				
121																					
122	2	588	90							**PROGRAM MANAGEMENT (Yrs 01 to 10)**	Db Act	STEP FIXED	CTECH	AM	1	10	10				

APPENDIX C

C1 Estimating Workbooks for Whiteshell Site

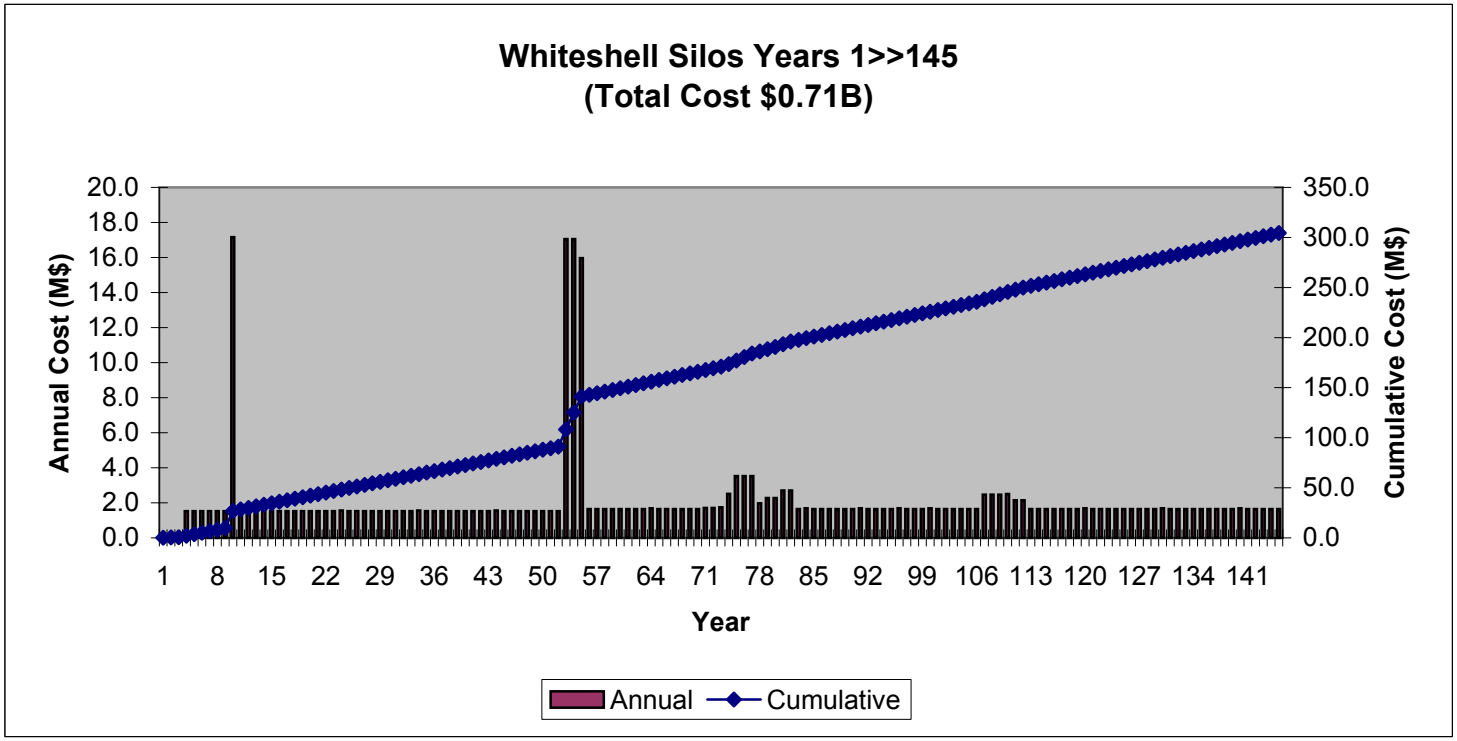
WBS No 589 – Silos
WBS No 590 – SSB
WBS No 591 – SST

Estimating Workbooks are presented in this section and are also available on the CD.

RES ALTERNATIVE **FUEL OWNER** **AECL**
WBS No 589
WHITESHELL
SILOS

Lev 2	WBS Name	Sheet Totals ($k)
15	Siting	824
20	System Development	6,548
25	Safety Assessment	2,163
30	Licensing & Approvals	23,417
35	Public Affairs	1,718
40	Facility Design & Construction	20,520
45	Facility Operation	628,694
55	Environmental Assessment and Monitoring	25,795
90	Program Management	219
	Total Cost ($k)	**709,898**

Whiteshell Silos Alternative	**709,898**
Siting Phase	**15,404**
Siting	824
EA	2,501
System Development	6,548
SA	682
L&A	2,910
Public Affairs	1,718
Program Mgmt	219
Construction Phase	**20,520**
Transition to Standalone	18,033
Before 100-yr Repackaging	2,487
Operations Phase	**673,974**
Repeat & Repackaging	*220,493*
Silos - 100 yrs	2,106
Silos - 200 yrs	2,106
Silos - 300 yrs	2,007
Repackaging B to B - 300 yrs	203,623
PM for Repeats & Repackaging	10,651
Extended Monitoring	*453,481*
Program Mgmt	113,847
Monitoring Surveliance	430
Operation Indirects	263,288
Common Ancillary Services Ops	28,097
Fuel Integrity Monitoring	2,538
SA - Ops & Decommissioning	1,481
L&A - Ops Licence Renewal	20,507
Environmental Monitoring	23,293


Whiteshell Silos Years 1>>145
(Total Cost $0.71B)
Annual Cost (M$)
Cumulative Cost (M$)
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
1 8 15 22 29 36 43 50 57 64 71 78 85 92 99 106 113 120 127 134 141
Year
Annual
Cumulative

REACTOR EXTENDED STORE — SILOS

ACTIVITY SUMMARY TO DATA TRANSFER — WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
589	15							Siting	Labour	STEP	OPG	RJH	1	77	7	NO DATA TO FILL		452.2
589	15							Siting	Materials and Equipment	STEP	OPG	RJH	1	77	7			
589	15							Siting	Other	STEP	OPG	RJH	1	77	7			97.0
589	15							Siting	Contingency	STEP	OPG	RJH	1	77	7			274.6

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	452		452.2
Materials and Equipment			
Other	97		97.0
Contingency	274.6		274.6
Total	824		824

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE

1	2	3	4	5	6	7	8	WBS Description / Detail	Cost Category	Factor	Labour CES	Labour Factor	Labour RES	Materials and other Equipment CES	Materials and other Equipment Factor	Materials and other Equipment RES	Other CES	Other Factor	Other RES	Contingency CES	Contingency Factor	Contingency RES	TOTAL Cost $K	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A: Use appropriate CES cost	B: Apply Factor	C: Calc RES cost value	D: Use appropriate CES cost	E: Apply Factor	F: Calc RES cost value	G: Use appropriate CES cost	H: Apply Factor	I: Calc RES cost value	J: Use appropriate CES cost	K: Apply Factor	L: Calc RES cost value	M: Total Cost is calculated	Add Basis of estimate Note Ref Number
589	15							**Siting**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
589	15	10						SITING MANAGEMENT																
								RES is 7 yrs vs 13 yrs for CES and shared amongst 7 sites due to efficencies of multiple sites assume a factor of 0.05	Labour	0.05	4897.7	0.05	244.885										245	
									Materials and Equipment	0.05					0.05									
									Other	0.05							1,300	0.05	65				65	
									Contingency	50%										50%	1.0	154.9	155	
589	15	70						PREFERRED SITE																
589	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING																
								Assume cost is 10% of a CES greenfield site	Labour	0.1	588.3	0.1	58.83										59	
									Materials and Equipment	0.1					0.1									
									Other	0.1							120	0.1	12				12	
									Contingency	50%										50%	1.0	35.4	35	
589	15	70	30					PREFERRED SITE - CHARACTERISATION																
								Assume cost is 10% of a CES greenfield site	Labour	0.1	1484.8	0.1	148.48										148	
									Materials and Equipment	0.1					0.1									
									Other	0.1							200	0.1	20				20	
									Contingency	0.5										50%	1.0	84.2	84	

Total	**824**
Check: Should = 0	

Labour	Materials and other Equipment	Other	Contingency
Total 452	Total	Total 97	Total 274.6
Check: Should = 0	Check: Should = 0	Check: Should = 0	Check: Should = 0

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
589	20							System Development	Labour	STEP	CTECH	AM	274	280	7			NO DATA TO FILL	4140.5
589	20							System Development	Materials and Equipment	STEP	CTECH	AM	274	280	7				430.0
589	20							System Development	Other	STEP	CTECH	AM	274	280	7				163.4
589	20							System Development	Contingency	STEP	CTECH	AM	274	280	7				1814.2

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	4141		4140.5
Materials and Equipment	430		430.0
Other	163		163.4
Contingency	1814.2		1814.2
Total	6548		6548

INSTRUCTIONS

Insert lower level WBS numbers as required

Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required

Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15

ACTIVITY DETAIL ESTIMATE

											A	B	C	D	E	F	G	H	I	J	K	L	M	
WBS LEVEL								WBS Description / Detail	Cost Category	Factor	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	TOTAL	
1	2	3	4	5	6	7	8				Labour			Materials and other Equipment			Other			Contingency			Cost $k	
589	20							**System Development**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
589	20	2						SYSTEM DEVELOPMENT MANAGEMENT																
								Assume smaller size management team as for CES 50%, but shared between Whiteshell (WL) and Chalk River(CRL), with a 5% allowance for operating on both sites. Also for resident storage option selected as future storage method an additional 50% is deducted.	Labour	0.13	6690.40	0.13	878.12										878
								No entry in CES alternative cost category	Materials and Equipment															
								Assume smaller size management team as for CES 50%, but shared between Whiteshell (WL) and Chalk River(CRL), with a 5% allowance for operating on both sites. Also for resident storage option selected as future storage method an additional 50% is deducted.	Other	0.13						300.00	0.13	39.38					39
								Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	275.2		275
589	20	5						SYSTEM OPTIMIZATION																

			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 30%	Labour	0.18	3303.70	0.18	607.05									607
			No entry in CES alternative cost category	Materials and Equipment															
			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 30%	Other	0.18					120.00	0.18	22.05					22
			Percentage for contingency assumed same as for CES	Contingency	30%								30%	1.00	188.73	189
589	20	20	PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)																
			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Labour	0.08	20750.10	0.08	1634.07									1,634
			Allow reduction due to no cask related feasibilty studies and no fuel container dismantling techniques carried out in this RES alternative, and shared between WL and CRL	Materials and Equipment	0.10				4300.00	0.10	430.00						430
			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Other	0.08					895.00	0.08	70.48					70
			Percentage for contingency assumed same as for CES	Contingency	50%								50%	1.00	1067.28	1,067
589	20	30	STORAGE SYSTEM ENG'NG																
			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Labour	0.08	8143.20	0.08	641.28									641
			No entry in CES alternative cost category	Materials and Equipment															

			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Other	0.08				200.00	0.08	15.75				16
			Percentage for contingency assumed same as for CES	Contingency	25%							25%	1.00	164.26	164
589	20	40	SECURITY & SAFEGUARD ENG'NG												
			Divide between WL and CRL Assume additional documentation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Smaller site than CES therefore a further factor of 50% is included	Labour	0.26	1447.70	0.26	380.02							380
			No entry in CES alternative cost category	Materials and Equipment											
			Divide between WL & CRL. Assume additional documentation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Smaller site than CES therefore a further factor of 50% is included	Other	0.26				60.00	0.26	15.75				16
			Percentage for contingency assumed same as for CES	Contingency	30%							30%	1.0	118.7	119
														Total	**6,548**
														Check: Should = 0	
						Total		4,141	Total		430	Total		163	Total	1,814.2
						Check: Should = 0			Check: Should = 0			Check: Should = 0			Check: Should = 0	

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
589	25							Safety Assessment	Labour	STEP	OPG	RJH	1	281	40			1303.5
589	25							Safety Assessment	Materials and Equipment	STEP	OPG	RJH	1	281	40			
589	25							Safety Assessment	Other	STEP	OPG	RJH	1	281	40			241.5
589	25							Safety Assessment	Contingency	STEP	OPG	RJH	1	281	40			618.0

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %
Check total	**Total Cost $k**	

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost		
Labour	1303		1303.5
Materials and Equipment			
Other	242		241.5
Contingency	618.0		618.0
Total	2163		2163

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
589	25							**Safety Assessment**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
589	25	10						SAFETY ASSESSMENT MANAGEMENT																
								RES = 10 yrs vs CES = 17 yrs. Share costs over 7 sites.	Labour	0.05	5218.2	0.05	260.91										261
									Materials and Equipment	0.05					0.05									
									Other	0.05							850	0.05	42.5				43
									Contingency	40%										40%	1.0	121.4	121
589	25	30						SA - SITING																
									Labour		2287.5													
									Materials and Equipment															
									Other								3,850							
									Contingency	40%										40%	1.0			
589	25	40						SA - OPERATING LICENSE																
									Labour	0.1	1540.5	0.1	154.05										154	
									Materials and Equipment	0.1					0.1									
									Other	0.1							300	0.1	30				30	
									Contingency	40%										40%	1.0	73.6	74	
589	25	50						SA - FACILITY OPERATIONS																
								RES spans Y4 to Y281 or 278 yrs vs 330 yrs for CES. RES has 0.08 staff and CES has 1 staff. Factor is 278/330 x 0.08/1 = 0.067	Labour	0.067	9604.8	0.067	643.5216										644

				Materials and Equipment	1				1								
			Equivalent annual expenses at $0.5K/a x 278 yrs	Other	1						139	1	139				139
				Contingency	40%									40%	1.0	313.0	313
589	25	70	SA - DECOMMISSIONING (Processing Facilities)														
			RES has 1 decommissioning events - while CES has 3. Costs can be shared between sites with similar technology; thus factor to 0.15	Labour	0.1	2449.9	0.1	244.99									245
				Materials and Equipment	0.1				0.1								
				Other	0.1						300	0.1	30				30
				Contingency	40%									40%	1.0	110.0	110
																Total	**2,163**
																Check: Should = 0	
						Total		1,303	Total			Total		242	Total		618.0
						Check: Should = 0			Check: Should = 0			Check: Should = 0			Check: Should = 0		

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
589	30							Licensing & Approvals	Labour	STEP	OPG	RJH	4	281	278			3114.3
589	30							Licensing & Approvals	Materials and Equipment	STEP	OPG	RJH	4	281	278			
589	30							Licensing & Approvals	Other	STEP	OPG	RJH	4	281	278			15619.2
589	30							Licensing & Approvals	Contingency	STEP	OPG	RJH	4	281	278			4683.4

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %
Check total	**Total Cost $k**	

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	3114	*0.0*	3114.3
Materials and Equipment			
Other	15619		15619.2
Contingency	4683.4	*0.0*	4683.4
Total	23417		23417

INSTRUCTIONS

								A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																					**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8															
589																						
589	30							**Licensing & Approvals**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
589	30	30						LIAISON WITH CNSC																
								Duration 4 yrs vs 10 yrs in CES and cost shared between 7 sites. Thus factor is 0.057. However due to inefficiencies of multiple sites increase to 0.2	Labour	0.2	555	0.2	111											111
									Materials and Equipment	0.2					0.2										
									Other	0.2							40	0.2	8					8
									Contingency	0.25										25%	1.0	29.8		30
589	30	50						CNSC CONSTRUCTION LICENCE																
									Labour	0.2	2631	0.2	526.2											526
								Some inefficiencies gained due to multiple sites	Materials and Equipment	0.2					0.2									
									Other	0.2							6,264	0.2	1252.8					1,253
									Contingency	0.25										25%	1.0	444.8		445
589	30	60						OTHER GOVN'MT APPROVALS																
589	30	60	10					APPROVAL REQUIREMENTS																
								Duration 4 yrs vs 10 yrs in CES and cost shared between 7 sites. Thus factor is 0.057. However due to inefficiencies of multiple sites increase to 0.2	Labour	0.2	337	0.2	67.4											67

					Materials and Equipment	0.2				0.2								
					Other	0.2						0.2						
					Contingency	0.25								25%	1.0	16.9		17
589	30	60	30	FEDERAL APPROVALS														
					Labour	0.2	133	0.2	26.6									27
					Materials and Equipment	0.2				0.2								
					Other	0.2						0.2						
					Contingency	0.25								25%	1.0	6.7		7
589	30	60	40	PROVINCIAL APPROVALS														
					Labour	0.2	133	0.2	26.6									27
					Materials and Equipment	0.2				0.2								
					Other	0.2						0.2						
					Contingency	0.25								25%	1.0	6.7		7
589	30	60	50	MUNICIPAL APPROVALS														
					Labour	0.2	133	0.2	26.6									27
					Materials and Equipment	0.2				0.2								
					Other	0.2						0.2						
					Contingency	0.25								25%	1.0	6.7		7
589	30	65		CNSC OPERATING LICENCE (Initial Application)														
					Labour	0.2	513	0.2	102.6									103
					Materials and Equipment	0.2				0.2								
					Other	0.2					902	0.2	180.4					180
					Contingency	0.25								25%	1.0	70.8		71
589	30	70		CNSC OPERATING LICENCE (Maintenance & Renewal)														
				CES duration is 330 years. Costs incurred in RES during period Y4 to Y281 or 278 years. RES has 0.08 staff vs CES with 1 staff. Factor is 278/330 x 0.08/1 = 0.068	Labour	0.068	32754	0.068	2227.272									2,227
					Materials and Equipment	1				1								
				Expenses at $51K/a x 278 yrs	Other	1					14,178	1	14178					14,178
					Contingency	0.25								25%	1.0	4,101.3		4,101
																	Total	**23,417**
																	Check: Should = 0	
							Total		3,114	Total		Total		15,619	Total		4,683.4	
							Check: Should = 0			Check: Should = 0		Check: Should = 0			Check: Should = 0			

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
589	35							Public Affairs	Labour	STEP	OPG	RJH	1	80	10			683.8
589	35							Public Affairs	Materials and Equipment	STEP	OPG	RJH	1	80	10			
589	35							Public Affairs	Other	STEP	OPG	RJH	1	80	10			461.8
589	35							Public Affairs	Contingency	STEP	OPG	RJH	1	80	10			572.8

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %
Check total	**Total Cost $k**	

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost		
Labour	684		683.8
Materials and Equipment			
Other	462		461.8
Contingency	572.8		572.8
Total	1718		1718

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
589	35							**Public Affairs**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
589	35	45						PUBLIC AFFAIRS - PREFERRED SITE																
									Labour	0.05	3046.2	0.05	152.31										152	
									Materials and Equipment	0.05				0.05										
									Other	0.05							600	0.05	30				30	
									Contingency	50%										50%	1.0	91.2	91	
589	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL																
									Labour	0.05	4569.3	0.05	228.465										228	
									Materials and Equipment	0.05				0.05										
									Other	0.05							1,450	0.05	72.5				73	
									Contingency	50%										50%	1.0	150.5	150	
589	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION																
									Labour	0.05	2528.9	0.05	126.445										126	
									Materials and Equipment	0.05				0.05										
									Other	0.05							800	0.05	40				40	
									Contingency	50%										50%	1.0	83.2	83	
589	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT																
									Labour	0.05	3530.8	0.05	176.54										177	

				Materials and Equipment	0.05			0.05								
				Other	0.05					170	0.05	8.5				9
				Contingency	50%								50%	1.0	92.5	93
589	35	120	Community Offsets & Benefits													
				Labour	0.15	0.15										
				Materials and Equipment	0.15			0.15								
				Other	0.15					2,072	0.15	310.8				311
				Contingency	50%								50%	1.0	155.4	155
															Total	**1,718**
															Check: Should = 0	
						Total	684	Total		Total	462	Total			572.8	
						Check: Should = 0		Check: Should = 0		Check: Should = 0		Check: Should = 0				

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
589	40							Facility Design & Construction	Labour	STEP	CTECH	AM	10	280	271			NO DATA TO FILL	5778.9
589	40							Facility Design & Construction	Materials and Equipment	STEP	CTECH	AM	10	280	271				8467.3
589	40							Facility Design & Construction	Other	STEP	CTECH	AM	10	280	271				36.6
589	40							Facility Design & Construction	Contingency	STEP	CTECH	AM	10	280	271				6237.4

INSTRUCTIONS

Check: Total minus budget Should = 0 | Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	5779		5778.9
Materials and Equipment	8467		8467.3
Other	37		36.6
Contingency	6237.4		6237.4
Total	20520		20520

INSTRUCTIONS

									A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																					**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8															
589	40							**Facility Design & Construction**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
589	40	10						SITE IMPROVEMENTS																
								a 10% allowance of the CES costs, applied to the site improvements	Labour	0.10	45,930.4	0.1	4,593.0										4,593
									Materials and Equipment	0.10				58,350.0	0.1	5,835.0								5,835
								no property acquisition required	Other								3,375.0							
								Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	5,214.0		5,214
589	40	30						COMMON ANCILLARY FACILITIES																
589	40	30	10					ADMIN AND SUPPORT FACILITIES																
589	40	30	10	1				ADMIN AND VISITOR RECEPTION BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in	Labour		486.3										comment 7			
									Materials and Equipment					784.2										
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0			
589	40	30	10	2				OPS SUPPT & HEALTH PHYSICS BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in	Labour		1,294.8										comment 7			
									Materials and Equipment					1,612.6										
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0			
589	40	30	10	3				EQUIP STORAGE AND MAINT'CE BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in	Labour		1,262.1										comment 7			
									Materials and Equipment					1,675.0										
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0			

589 40	30	10	5	ACTIVE SOLID WASTE HDLG BLDG															
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	459.9	0.3	138.0										138
					Materials and Equipment	0.3					1,135.0	0.3	340.5						341
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	143.5	144
589 40	30	10	6	SOLID WASTE STORAGE AREA															
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	458.8	0.3	137.6										138
					Materials and Equipment	0.3					437.5	0.3	131.3						131
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	80.7	81
589 40	30	10	7	ACTIVE LIQ/W TRT'MT BLDG															
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	359.4	0.3	107.8										108
					Materials and Equipment	0.3					1,727.0	0.3	518.1						518
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	187.8	188
589 40	30	10	8	LOW LVL LIQ/W STRG BLDG															
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	373.7	0.3	112.1										112
					Materials and Equipment	0.3					1,426.0	0.3	427.8						428
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	162.0	162
589 40	30	10	9	WAREHOUSE BLDG															
				Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour		470.9										comment 7		
					Materials and Equipment						550.0								
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0		
589 40	30	10	10	GUARDHOUSE AND SECURITY FENCE															
				Building and security exist therefore new building and fence not required. Allowance for refurbishment covered in ***/45/20/50	Labour		631.2										comment 7		
					Materials and Equipment						553.7								
					Other														
				Increased contingency than CES due to RES facility footprint size not confirmed and therefore length of fence, not yet known	Contingency	20%										20%	1.0		
589 40	30	10	11	TRUCK INSP'N / WASH STATION															
				not req'd as no fuel transported off site	Labour		872.2										comment 7		
					Materials and Equipment						1,075.0								
					Other								389.4						
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0		
589 40	30	10	12	UTILITY BLDG															
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	1,023.2	0.3	307.0										307
					Materials and Equipment	0.3					1,257.0	0.3	377.1						377
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	205.2	205
589 40	30	10	13	TEST FACILITY															
				Taken as being independent of fuel inventory stored. Same size bldg as CES, facility will be shared by Whiteshell and Chalk River , therefore cost will be 50% of CES costs	Labour	0.5	766.8	0.5	383.4										383
					Materials and Equipment	0.5					1,675.0	0.5	837.5						838

				No entry in CES alternative cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	20%				20%	1.0	244.2	244	
589	40	30	20	OTHER SITE SYSTEMS										
589	40	30	20	1 FIRE PROTECTION SYSTEMS										
				assumed aailable and turned over to RES during transition	Labour		1,022.2					comment 7		
					Materials and Equipment			676.2						
				No entry in CES alternative cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	25%				25%	1.0			
589	40	30	20	2 SECURITY AND COMMUNICATION SYSTEM										
				assumed aailable and turned over to RES during transition	Labour		607.5					comment 7		
					Materials and Equipment			600.0						
				No entry in CES alternative cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	25%				25%	1.0			
589	40	30	20	3 ELECTRICAL AND EMERGENCY POWER										
				assumed aailable and turned over to RES during transition	Labour		1,939.6					comment 7		
					Materials and Equipment			1,932.0						
				No entry in CES alternative cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	25%				25%	1.0			
589	40	30	20	4 SANITARY SEWER SYSTEM										
				assumed aailable and turned over to RES during transition	Labour		339.2					comment 7		
					Materials and Equipment			310.5						
				No entry in CES alternative cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	25%				25%	1.0			
589	40	30	20	5 POTABLE WATER SYSTEM										
				assumed aailable and turned over to RES during transition	Labour		371.6					comment 7		
					Materials and Equipment			148.0						
				No entry in CES alternative cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	25%				25%	1.0			
589	40	30	20	6 RETENTION/SEDIMENTATION POND										
				assumed aailable and turned over to RES during transition	Labour		874.4					comment 7		
					Materials and Equipment			189.6						
				No entry in CES alternative cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	30%				30%	1.0			
589	40	30	20	7 STORM WATER DETENTION POND										
				assumed aailable and turned over to RES during transition	Labour		387.8					comment 7		
					Materials and Equipment			93.5						
				No entry in CES alternative cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	30%				30%	1.0			
589	40	30	20	8 CONST'N MAT'L STOCKPILE AREA										
				not req'd, concrete brought in as req'd from off-site	Labour		1,039.2					comment 7		
					Materials and Equipment			625.0						
				No entry in CES alternative cost category	Other									
				Percentage for contingency assumed same as for CES	Contingency	15%				15%	1.0			
589	40	30	20	9 SITE MATERIALS STORAGE AREA										
				assumed aailable and turned over to RES during transition	Labour		1,169.5					comment 7		
					Materials and Equipment			655.0						

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
589	45							Facility Operation	Labour	STEP	CTECH	AM	4	281	278			NO DATA TO FILL	297996.2
589	45							Facility Operation	Materials and Equipment	STEP	CTECH	AM	4	281	278				111503.0
589	45							Facility Operation	Other	STEP	CTECH	AM	4	281	278				89473.3
589	45							Facility Operation	Contingency	STEP	CTECH	AM	4	281	278				129721.0

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	297996		297996.2
Materials and Equipment	111503		111503.0
Other	89473		89473.3
Contingency	129721	*0.0*	129721.0
Total	628694	*0.0*	628694

INSTRUCTIONS

										A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																						**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																
589	45							**Facility Operation**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
589	45	20						OPERATIONS - EXTENDED MONITORING																
589	45	20	5					PROGRAM MANAGEMENT																
								Entries in CES DET applicable to RES but duration 278 years RES & 300 years CES therefore278/300 = 0.927. Program management spread over 7 sites with Whiteshell assumed to have 0.8 staff vs 9 in CES. Thus combined factor	Labour	0.082	312,354.0	0.1	25,728.7											25,729	6
								No entry in CES alternative cost category	Materials and Equipment															
								Annual cost = $258/a x 268yrs	Other	1.00							69,144.0	1.0	69,144.0				69,144	4,5
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	18,974.5	18,975	
589	45	20	40					MONITORING AND SURVEILLANCE -EXTENDED MONITORING																
								CES monitoring and surveillance duration was 300 yrs for 4717 baskets, RES is 278 years for 9 baskets. Chalk River assumed to have 0.5 staff for RES vs 5 in CES. Combined factor based on duration, fuel inventory and staffing levels.	Labour	0.0002	49,716.0	0.0	8.8											9	6
								annual costs = $1k/a x 278 years	Materials and Equipment	1.00				278.0	1.0	278.0							278	7
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	143.4	143	
589	45	20	50					OPERATION INDIRECTS (EXTENDED MONITORING)																
									Labour	0.19	875,048.0	0.2	166,945.4										166,945	6

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
589	45							Facility Operation	Labour	STEP	CTECH	AM	4	281	278			NO DATA TO FILL	297996.2
589	45							Facility Operation	Materials and Equipment	STEP	CTECH	AM	4	281	278				111503.0
589	45							Facility Operation	Other	STEP	CTECH	AM	4	281	278				89473.3
589	45							Facility Operation	Contingency	STEP	CTECH	AM	4	281	278				129721.0

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	297996		297996.2
Materials and Equipment	111503		111503.0
Other	89473		89473.3
Contingency	129721	*0.0*	129721.0
Total	628694	*0.0*	628694

INSTRUCTIONS

										A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																						**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**		**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																
589	45							**Facility Operation**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
589	45	20						OPERATIONS - EXTENDED MONITORING																
589	45	20	5					PROGRAM MANAGEMENT																
								Entries in CES DET applicable to RES but duration 278 years RES & 300 years CES therefore278/300 = 0.927. Program management spread over 7 sites with Whiteshell assumed to have 0.8 staff vs 9 in CES. Thus combined factor	Labour	0.082	312,354.0	0.1	25,728.7											25,729	6
								No entry in CES alternative cost category	Materials and Equipment															
								Annual cost = $258/a x 268yrs	Other	1.00						69,144.0	1.0	69,144.0					69,144	4.5
								Percentage for contingency assumed same as for CES	Contingency	20%									20%	1.0	18,974.5	18,975	
589	45	20	40					MONITORING AND SURVEILLANCE -EXTENDED MONITORING																
								CES monitoring and surveillance duration was 300 yrs for 4717 baskets, RES is 278 years for 9 baskets. Chalk River assumed to have 0.5 staff for RES vs 5 in CES. Combined factor based on duration, fuel inventory and staffing levels.	Labour	0.0002	49,716.0	0.0	8.8											9	6
								annual costs = $1k/a x 278 years	Materials and Equipment	1.00				278.0	1.0	278.0						278	7
								No entry in CES alternative cost category	Other														
								Percentage for contingency assumed same as for CES	Contingency	50%									50%	1.0	143.4	143	
589	45	20	50					OPERATION INDIRECTS (EXTENDED MONITORING)																

					Entries in CES DET applicable to RES but duration 278years RES & 300 years CES. Staff for RES = 7 vs 34 in CES. Combined factor = 278/300 x 7/34. M&E costs are $75k/a x 278 years	Labour	0.19	875,048.0	0.2	166,945.4											166,945	6
						Materials and Equipment	1.00				20,850.0	1.0	20,850.0										20,850	7
					Armed response = $50k/a + energy costs at $3k/a. total = $53k x 278 years	Other	1.00							14,734.0	1.0	14,734.0							14,734	7
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	60,758.8				60,759	
589	45	20	60		COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)																				
					RES has duration 227 years, CES has 300 years. RES staff is 1 vs 5 in CES. Factor is 227/300 x 1/5	Labour	0.15	148,529.0	0.2	22,477.4											22,477	6
					No entry in CES alternative cost category	Materials and Equipment																		
					No entry in CES alternative cost category	Other																		
					Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	5,619.3				5,619	
589	45	20	70		FUEL INTEGRITY MONITORING (25 YEARLY)																				
					RES has duration 278 years, CES has 300 years. RES staff is 0.1 vs 0.5 in CES. Factor is 278/300 x 0.1/0.5	Labour	0.2	4,631.0	0.2	858.3											858	6
						Materials and Equipment	1.0				695.0	1.0	695.0										695	7
						Other	1.0							139.0	1.0	139.0							139	7
					Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	846.1				846	
589	45	30			OPERATIONS - FACILITY REPEATS																				
589	45	30	20		SILOS 100 YEAR REPLACEMENT																				
589	45	30	20	10	DEMOLISH EXISTING STORAGE SILOS																				
					costs taken from CES basket vault demolition, rated at $104 per tonne of reinforced concrete. Each silo = 115 tonne x 16 silos =1,840Te. Split 50/50 labour/materials	Labour	920.00	0.104	920.0	95.7											96	3
						Materials and Equipment	920.00				0.104	920.0	95.7										96	3
					No costs in this category	Other																		
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	57.4				57	
589	45	30	20	20	SILO CONSTRUCTION																				
					Assume same costs as for initial construction of the storage silos. 16 silos constructed at this point to house standard and non standard fuelcost per silo = $60K. Allow 67% labour 33% materials.	Labour	10.72	60.0	10.7	643.2											643	1
						Materials and Equipment	5.28				60.0	5.3	316.8										317	1
					No costs in this category	Other																		
					Percentage for contingency for silos construction assumed same as for CES basket vaults construction	Contingency	30%										30%	1.0	288.0				288	
589	45	30	20	30	TRANSFER OPERATIONS																				
						Labour	0.0005	990.0	0.00	0.5													0	
					smaller fuel inventory for RES 1 silo with 9 baskets, 1 spare silo and 14 silos with non standard waste/fuel. Assume transfer ops based on 9 baskets therefore shorter duration for transfer operations due to fuel ratio 9/4717. Labour reduced, existing site staff will undertake first 200 year operations.																	
					No costs in this category	Materials and Equipment																		
					Armed response included at rate of $50k/a based on 2 years duration - see note 8.	Other	1							100.0	1.0	100.0							100	8

						Percentage for contingency assumed same as for CES	Contingency	30%							30%	1.0	30.1	30		
589	45	30	20	40		WASTE DISPOSAL														
						No costs in this category	Labour													
						No costs in this category	Materials and Equipment													
						costs taken from CES basket vault waste disposal, rated at $200 per tonne of reinforced concrete. Each silo = 115 tonne x 16 silos =1,840Te.	Other	1840				0.2	1,840.0	368.0				368	3	
							Contingency	30%							30%	1.0	110.4	110		
589	45	30	30			SILOS 200 YEAR REPLACEMENT														
						assumed same as 100 yr replacement	Labour			739.4								739		
						assumed same as 100 yr replacement	Materials and Equipment					412.5						412		
						assumed same as 100 yr replacement	Other							468.0				468		
						assumed same as 100 yr replacement	Contingency										486.0	486		
589	45	30	40			SILOS 300 YEAR REPLACEMENT														
						assumed same as 100 yr replacement	Labour			740.8								741		
						assumed same as 100 yr replacement	Materials and Equipment					412.5						412		
						assumed same as 100 yr replacement	Other							368.0				368	9	
						Percentage for contingency assumed same as for CES	Contingency										486.0	486		
589	45	40				OPERATIONS - REPACKAGING														
589	45	40	5			PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)														
							Labour	0.02	389,170.0	0.0	8,875.8							8,876		
						Entries in CES DET applicable to RES but duration 13 years RES 100yr=(2license+2const/ops 109-112) + 200yr=(2license+2const/ops 209-212)+ 300yr=(2license+2const'n+1ops 277-281) compared to 114 years CES therefore13/114 of labour costs spread project management over 7 sites and acknowledge inefficiency use 20% factor														
						No entry in CES alternative cost category	Materials and Equipment													
						see note 4. no property tax assumed this site	Other												4	
						Percentage for contingency assumed same as for CES	Contingency	20%							20%	1.0	1,775.2	1,775		
589	45	40	10	40		COMMON ANCILLARY FACILITIES (REPLACEMENT)			comment 7											
						only require full ancillary buildings (13) at 300yr RPBB event, for 100 & 200yr facility repeats, the replacement of 7 ancillary buildings is required. Therefore combined factor = ((7/13)*2) + 1	Labour	2.1	21,056.2	2.1	43,732.1							43,732		
							Materials and Equipment	2.1			29,785.1	2.1	61,861.4					61,861		
						No entry in CES alternative cost category	Other													
						Percentage for contingency assumed same as for CES	Contingency	22%							22%	1.0	23,230.6	23,231		
589	45	40	10	600	30	ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)														
						duration 7 years RES compared to 30 years CES. Factor =7/30	Labour	0.2	11,882.0	0.2	2,772.5							2,772	2	
						No entry in CES alternative cost category	Materials and Equipment													
						No entry in CES alternative cost category	Other													
						Percentage for contingency assumed same as for CES	Contingency	25%							25%	1.0	693.1	693		
589	45	40	40			BASKET TO BASKET 300 YEAR REPACKAGING														
589	45	40	40	05		CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)														

							assumed same facility as CES therefore factor = 1	Labour	1.0	476.1	1.0	476.1									476
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				354.6	1.0	354.6						355
							assumed same facility as CES therefore factor = 1	Other	1.0							228.4	1.0	228.4			228
							same contingency as for CES	Contingency	30%										30%	1.0	317.7	318
589	45	40	40	10			PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)															
589	45	40	40	10	20		RPBB EQUIP. DESIGN, SUPPLY & INSTALL															
589	45	40	40	10	20	10	RECEIPT & TRANSFER (EQUIP)															
							assumed same facility as CES therefore factor = 1	Labour	1.0	70.8	1.0	70.8									71
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				1,415.0	1.0	1,415.0						1,415
							assumed same facility as CES therefore factor = 1	Other	1.0							74.3	1.0	74.3			74
							same contingency as for CES	Contingency	30%										30%	1.0	468.0	468
589	45	40	40	10	20	20	BASKET TO BASKET FUEL TRANSFER															
							assumed same facility as CES therefore factor = 1	Labour	1.0	2,319.4	1.0	2,319.4									2,319
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				11,597.0	1.0	11,597.0						11,597
							assumed same facility as CES therefore factor = 1	Other	1.0							695.8	1.0	695.8			696
							same contingency as for CES	Contingency	30%										30%	1.0	4,383.7	4,384
589	45	40	40	10	20	30	BASKET DECONTAMINATION															
							assumed same facility as CES therefore factor = 1	Labour	1.0	854.6	1.0	854.6									855
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,563.0	1.0	4,563.0						4,563
							assumed same facility as CES therefore factor = 1	Other	1.0							256.4	1.0	256.4			256
							same contingency as for CES	Contingency	30%										30%	1.0	1,702.2	1,702
589	45	40	40	10	30		RPBB BUILDING DESIGN AND CONSTRUCTION															
							assumed same facility as CES therefore factor = 1	Labour	1.0	4,160.0	1.0	4,160.0									4,160
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,280.0	1.0	4,280.0						4,280
							assumed same facility as CES therefore factor = 1	Other	1.0							832.0	1.0	832.0			832
							same contingency as for CES	Contingency	30%										30%	1.0	2,781.6	2,782
589	45	40	40	10	60		BUILDING SERVICES (RPB)															
							assumed same facility as CES therefore factor = 1	Labour	1.0	4,447.8	1.0	4,447.8									4,448
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,153.8	1.0	4,153.8						4,154
							assumed same facility as CES therefore factor = 1	Other	1.0							1,309.4	1.0	1,309.4			1,309
							same contingency as for CES	Contingency	25%										25%	1.0	2,477.8	2,478
589	45	40	40	10	70		COMMISSIONING (RPB)															
							assumed same facility as CES therefore factor = 1	Labour	1.0	668.2	1.0	668.2									668
							No entry in CES alternative cost category	Materials and Equipment													
							assumed same facility as CES therefore factor = 1	Other	1.0							126.3	1.0	126.3			126
							same contingency as for CES	Contingency	50%										50%	1.0	397.3	397

589	45	40	40	10	80	CONST'N INDIRECTS (RPB)																
						assumed same facility as CES therefore factor = 1	Labour	1.0	6,299.6	1.0	6,299.6											6,300
						No entry in CES alternative cost category	Materials and Equipment																	
						assumed same facility as CES therefore factor = 1	Other	1.0					241.5	1.0	241.5									242
						same contingency as for CES	Contingency	30%								30%	1.0	1,962.3				1,962
589	45	40	40	400		CONSTRUCTION MANAGEMENT (RPB)																
						assumed same facility as CES therefore factor = 1	Labour	1.0	4,690.6	1.0	4,690.6											4,691
						No entry in CES alternative cost category	Materials and Equipment																	
						No entry in CES alternative cost category	Other																	
						same contingency as for CES	Contingency	30%								30%	1.0	1,407.2				1,407
589	45	40	40	500		COMMISSIONING MANAGEMENT (RPB)																
						assumed same facility as CES therefore factor = 1	Labour	1.0	113.3	1.0	113.3											113
						No entry in CES alternative cost category	Materials and Equipment																	
						assumed same facility as CES therefore factor = 1	Other	1.0					13.5	1.0	13.5									14
						same contingency as for CES	Contingency	50%								50%	1.0	63.4				63
589	45	40	40	600		REPACKAGING OPERATIONS (RPB)																
						Labour for repackaging operations for CES is for a fuel inventory of 4717 baskets. RES has 9 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 9/4717	Labour	0.002	3,960.8	0.0	7.6											8
						the same factor for labour is used for procurement of new baskets	Materials and Equipment	0.002				23,585.0	0.0	45.0										45
						the same factor for labour is used for waste disposal of old baskets	Other	0.002					378.0	0.0	0.7									1
						same contingency as for CES	Contingency	30%								30%	1.0	16.0				16
589	45	40	40	700		OPERATION INDIRECTS (RPB)																
						operation indirect labour costs for CES are for a duration of 10 yrs RES operations are for 1 yr max therefore a factor of 0.1 is used	Labour	0.1	2,678.3	0.1	267.8											268
						Assume same spares and consumables required as identical equipment is used for both CES & RES. Therefore factor = 1	Materials and Equipment	1.0				172.8	1.0	172.8										173
						Assume energy consumption for running of facility can be factored relative to duration of facility operation = 1/10yrs = 0.1. Armed response included at rate of $50k/a based on 1 year duration - see note 8.	Other	1.0					374.0	1.0	374.0									374	8
						same contingency as for CES	Contingency	30%								30%	1.0	244.4				244
589	45	40	40	800		STORAGE OPERATIONS (RPB)																

Labour for storage operations for CES is for a fuel inventory of 4717 baskets. RES has 9 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 9/4717	Labour	0.002	990.2	0.0	1.9					2
No entry in CES alternative cost category	Materials and Equipment									
No entry in CES alternative cost category	Other									
same contingency as for CES	Contingency	30%					30%	1.0	0.6	1

								Total	**628,694**
								Check: Should = 0	
	Total	297,996	Total	111,503	Total	89,473	Total	129,721.0	
	Check: Should = 0		Check: Should = 0		Check: Should = 0		Check: Should = 0		

BASIS OF ESTIMATE NOTES - Insert references and notes

1 Cost information on silos extracted from OPG R.Heystee email date 11-01-03 : 'PLGS dry canister costs for RES costing' cost includes; materials supply, construction, testing and project management: $60K per canister Fall 2001 dollars. Labour and materials split approx. 33% materials/67%labour

2 ancillary ops factored from CES CVSB. In CES this cost was for a 30 year period (covering 1 facility repeat and 1 repackaging event). for RES this covers 100/200&300year facility repeats & 300y repackaging 3x8 (1 demolish prev (y83). 2 const,n of 222 silos (y84,85) 5 ops for transfer) = 24

3 costs for silos demolition and waste diposal based on unit cost factors obtained for demolition of basket storage vaults in CVSB alternative

4 It is assumed that there is no property tax on facilities located on the Whiteshell site. Reference note 5 on table 18 - Cost Estimate Report 1105/MD18084/REP/19

5 258k$/a made up of expenses from table 18 in report (15+118+50+50+25). No property tax or PST included.

6 staffing levels obtained from table 17 in cost estimate report 1105/MD18084/REP/19

7 annual costs for Labour/M&E and Other, obtained from table 18 in cost estimate report 1105/MD18084/REP/19

8 armed response costs during 'fuel handling' based on rate of $100k/a. But, due to $50k/a for armed response included in extended monitoring, this means an additional $50k/a is to be included for the duration of the facility repeat transfers/repackaging events ($50k + $50k = $100k)

9 armed response not captured in 300 yr facility repeat for fuel transfers, as it is covered in basket repackaging at 300yr event

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
589	55							Environmental Assessment and Monitoring	Labour	STEP	OPG	RJH	4	281	278			NO DATA TO FILL	14130.0
589	55							Environmental Assessment and Monitoring	Materials and Equipment	STEP	OPG	RJH	4	281	278				4170.0
589	55							Environmental Assessment and Monitoring	Other	STEP	OPG	RJH	4	281	278				1542.0
589	55							Environmental Assessment and Monitoring	Contingency	STEP	OPG	RJH	4	281	278				5952.6

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	14130	*0.0*	14130.0
Materials and Equipment	4170		4170.0
Other	1542	*0.0*	1542.0
Contingency	5952.6		5952.6
Total	25795	*0.0*	25795

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
589	55							**Environmental Assessment and Monitoring**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
589	55	10						EA & MONITORING PROGRAM MANAGEMENT																
								Costs are incurred over the period Y4 to Y281 or 278 yrs vs 347 yrs in CES. RES has 0.1 staff vs 2 staff in CES. Factor is 278/347 x 0.1/2 = 0.04	Labour	0.04	70306	0.04	2812.24										2,812
									Materials and Equipment	1				1										
								Expenses at $1.5K/a x 278 yrs	Other	1							417	1	417					417
									Contingency	0.3										3229.24	0.3	968.772		969
589	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT																
								Assume C/L & EA process spans 3 years (Y75 to Y77) with with some preparation work in Y74; ie total of 4 years. Due to multiple sites with same technology can share costs	Labour	0.2	7471	0.2	1494.2										1,494
									Materials and Equipment	0.2				0.2										
									Other	0.2							2,150	0.2	430					430
									Contingency	0.3										1924.2	0.3	577.26		577
589	55	40						GROUNDWATER MONITORING																

			Costs span the period Y4 to Y281 or 278 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.6 in CES. Factor is 278/330 x 0.02/0.6 = 0.028.	Labour	0.028	37158	0.028	1040.424												1,040
			M&E at $3K/a x 278 yrs	Materials and Equipment	1				834	1	834									834
			Expenses at $2K/a x 278 yrs	Other	1							556	1	556						556
				Contingency	0.3										2430.424	0.3	729.1272			729
589	55	50	RADIOLOGICAL BIOSPHERE MONITORING																	
			Costs span the period Y4 to Y281 or 278 yrs vs 330 ys for CES. RES staff is 0.1 vs 3.3 staff in CES. Factor is 0.025	Labour	0.025	217280	0.025	5432												5,432
			M&E at $9K/a x 278 yrs	Materials and Equipment	1				2502	1	2502									2,502
				Other	1								1							
				Contingency	0.3										7934	0.3	2380.2			2,380
589	55	60	NON-RAD BIOSPHERE MONITORING																	
			Costs span the period Y4 to Y281 or 278 yrs vs 330 in CES. RES staff is 0.05 staff vs 0.8 staff in CES. Factor is 278/330 x 0.05/0.8 = 0.052	Labour	0.052	53590	0.052	2786.68												2,787
			M&E at $3K/a x 278 yrs	Materials and Equipment	1				834	1	834									834
				Other	1								1							
				Contingency	0.3										3620.68	0.3	1086.204			1,086
589	55	80	HUMAN HEALTH MONITORING																	
			Costs span the period Y4 to Y281 or 278 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.17 in CES. Factor is 278/330 x 0.02/0.17 = 0.098	Labour	0.098	5760	0.098	564.48												564
				Materials and Equipment	1					1										
			Expenses at 0.5K/a x 278 yrs	Other	1							139	1	139						139
				Contingency	0.3										703.48	0.3	211.044			211
				Total				14,130	Total		4,170	Total		1,542	Total		5,952.6			
				Check: Should = 0					Check: Should = 0			Check: Should = 0			Check: Should = 0					

Total	**25,795**
Check: Should = 0	

BASIS OF ESTIMATE NOTES - Insert references and notes

1

2

REACTOR EXTENDED STORE — SILOS — 0

ACTIVITY SUMMARY TO DATA TRANSFER — WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
589	90	0	0	0	0	0	0	Program Management	Labour	STEP	CTECH	AM	1	3	3	0	0	NO DATA TO FILL	128.6
589	90	0	0	0	0	0	0	Program Management	Materials and Equipment	STEP	CTECH	AM	1	3	3	0	0		0.0
589	90	0	0	0	0	0	0	Program Management	Other	STEP	CTECH	AM	1	3	3	0	0		54.2
589	90	0	0	0	0	0	0	Program Management	Contingency	STEP	CTECH	AM	1	3	3	0	0		36.5

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost
Labour	129
Materials and Equipment	0
Other	54
Contingency	36.5
Total	219

Check: Total minus budget Should = 0

Budget costs to Years by %

Check total	Total Cost $k
0%	
0.0	128.6
0.0	0.0
0.0	54.2
0.0	36.5
0.0	219

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
589	90							**Program Management**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
								Program management shared between 7 reactor sites at percentages based on table 18 in cost estimate report. 7% for Whiteshell			total for 7 sites	Factor	RES	total for 7 sites	Factor	RES	total for 7 sites	Factor	RES	CES	Factor	RES		
								based on 5 staff. Assume 3 x OPG01, 2 x OPG03 for 3 year duration	Labour	0.07	1836.6327	0.07	128.564289										129	
								no entry	Materials and Equipment	0				0	0	0							0	
								the following expenses: Public affairs, overheads, insurance, community compensation & legal fees as table 18	Other	0.07							774	0.07	54.18				54	
								Contingency as CES value	Contingency	20%										20%	1.0	36.5	37	

Total	129	Total	0	Total	54	Total	36.5
Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0

Total	**219**
Check: Should = 0	**0**

BASIS OF ESTIMATE NOTES - Insert references and notes

1

2

RES ALTERNATIVE
WBS No 589
SILOS
WHITESHELL

Cost Category	Total K$
Labour	327,728
Materials and Equipment	124,570
Other	107,689
Contingency	149,911
Total Cost	**709,898**

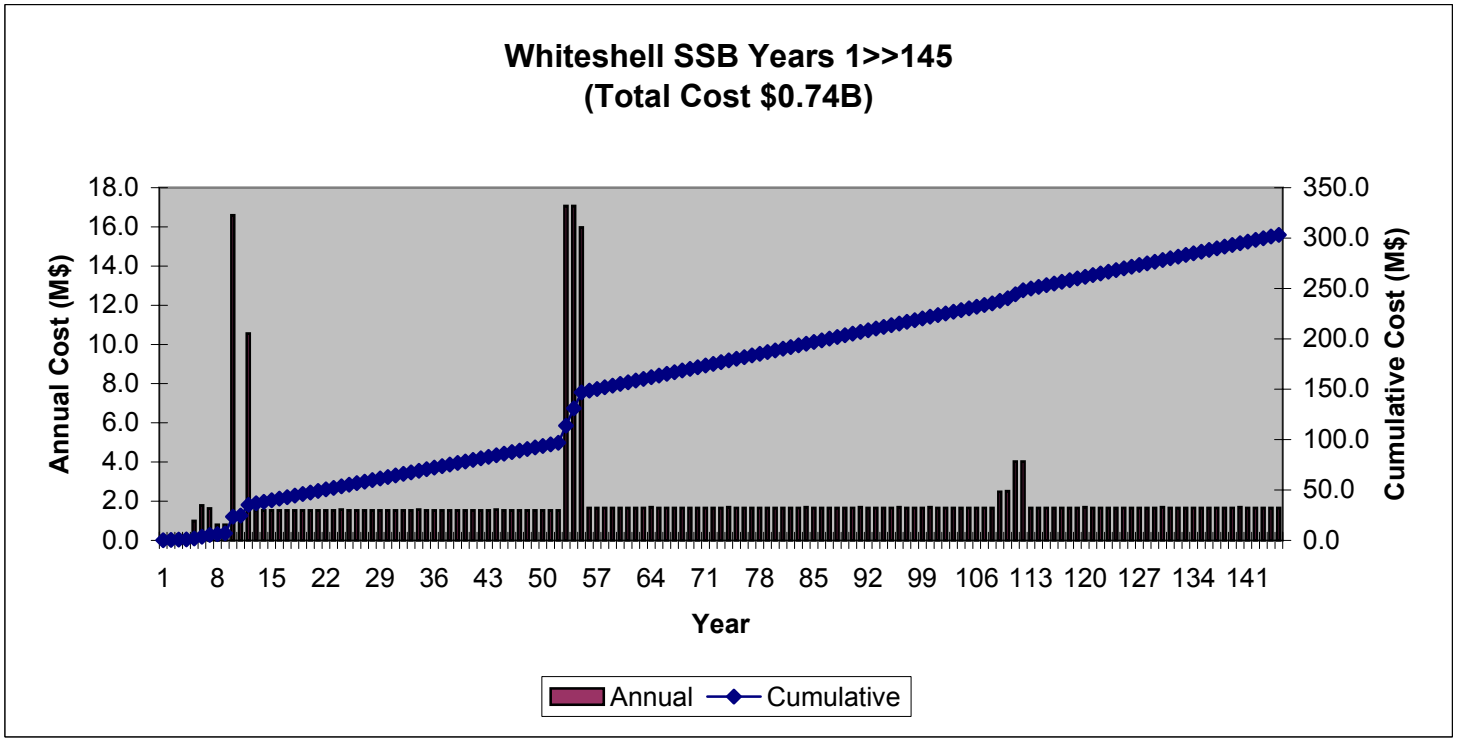
709,898

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	Responsible	Cost Category	WBS Type	Start Year	End Year	Dur'n	Contingency	Total K$
589	15							RJH	Labour	STEP	1	77	7		452
589	15							RJH	Materials and Equipment	STEP	1	77	7		
589	15							RJH	Other	STEP	1	77	7		97
589	15							RJH	Contingency	STEP	1	77	7		275
589	20							AM	Labour	STEP	274	280	7		4,141
589	20							AM	Materials and Equipment	STEP	274	280	7		430
589	20							AM	Other	STEP	274	280	7		163
589	20							AM	Contingency	STEP	274	280	7		1,814
589	25							RJH	Labour	STEP	1	281	40		1,303
589	25							RJH	Materials and Equipment	STEP	1	281	40		
589	25							RJH	Other	STEP	1	281	40		242
589	25							RJH	Contingency	STEP	1	281	40		618
589	30							RJH	Labour	STEP	4	281	278		3,114
589	30							RJH	Materials and Equipment	STEP	4	281	278		
589	30							RJH	Other	STEP	4	281	278		15,619
589	30							RJH	Contingency	STEP	4	281	278		4,683
589	35							RJH	Labour	STEP	1	80	10		684
589	35							RJH	Materials and Equipment	STEP	1	80	10		
589	35							RJH	Other	STEP	1	80	10		462
589	35							RJH	Contingency	STEP	1	80	10		573
589	40							AM	Labour	STEP	10	280	271		5778.94
589	40							AM	Materials and Equipment	STEP	10	280	271		8467.25
589	40							AM	Other	STEP	10	280	271		36.63
589	40							AM	Contingency	STEP	10	280	271		6237.375
589	45							AM	Labour	STEP	4	281	278		297,996
589	45							AM	Materials and Equipment	STEP	4	281	278		111,503
589	45							AM	Other	STEP	4	281	278		89,473
589	45							AM	Contingency	STEP	4	281	278		129,721
589	55							RJH	Labour	STEP	4	281	278		14,130
589	55							RJH	Materials and Equipment	STEP	4	281	278		4,170
589	55							RJH	Other	STEP	4	281	278		1,542
589	55							RJH	Contingency	STEP	4	281	278		5,953
589	90							AM	Labour	STEP	1	3	3		129
589	90							AM	Materials and Equipment	STEP	1	3	3		
589	90							AM	Other	STEP	1	3	3		54
589	90							AM	Contingency	STEP	1	3	3		37

RES ALTERNATIVE **FUEL OWNER** **AECL**
WBS No 590
WHITESHELL
SILOS IN STORAGE BUILDINGS **(SSB)**

Lev 2	WBS Name	Sheet Totals ($k)
15	Siting	824
20	System Development	11,703
25	Safety Assessment	2,130
30	Licensing & Approvals	22,843
35	Public Affairs	1,718
40	Facility Design & Construction	30,081
45	Facility Operation	648,129
55	Environmental Assessment and Monitoring	25,454
90	Program Management	1,216
	Total Cost ($k)	**744,099**

Whiteshell SSB Alternative	**744,099**
Siting Phase	**21,556**
Siting	824
EA	2,501
System Development	11,703
SA	682
L&A	2,910
Public Affairs	1,718
Program Mgmt	1,216
Construction Phase	**30,081**
Initial Construction	25,203
Transition to Standalone	4,878
Operations Phase	**692,462**
Repeat & Repackaging	*249,174*
Silos - 100 yrs	2,106
Silos - 200 yrs	2,106
Silos - 300 yrs	2,007
Storage Buildings - 100 yrs	9,561
Storage Buildings - 200 yrs	9,561
Storage Buildings - 300 yrs	9,561
Repackaging B to B - 300 yrs	203,623
PM for Repeats & Repackaging	10,651
Extended Monitoring	*443,288*
Program Mgmt	113,157
Monitoring Survelliance	416
Operation Indirects	254,765
Common Ancillary Services Ops	28,097
Fuel Integrity Monitoring	2,520
SA - Ops & Decommissioning	1,448
L&A - Ops Licence Renewal	19,933
Environmental Monitoring	22,952


Whiteshell SSB Years 1>>145
(Total Cost $0.74B)
Annual Cost (M$)
Cumulative Cost (M$)
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
1 8 15 22 29 36 43 50 57 64 71 78 85 92 99 106 113 120 127 134 141
Year
Annual
Cumulative

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
590	15							Siting	Labour	STEP	OPG	RJH	1	9	7			NO DATA TO FILL	452.2
590	15							Siting	Materials and Equipment	STEP	OPG	RJH	1	9	7				
590	15							Siting	Other	STEP	OPG	RJH	1	9	7				97.0
590	15							Siting	Contingency	STEP	OPG	RJH	1	9	7				274.6

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	452		452.2
Materials and Equipment			
Other	97		97.0
Contingency	274.6		274.6
Total	824		824

Check: Total minus budget Should = 0

Budget costs to Years by %

INSTRUCTIONS

Insert lower level WBS numbers as required

Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required

Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15

ACTIVITY DETAIL ESTIMATE

										A	B	C	D	E	F	G	H	I	J	K	L	M	
WBS LEVEL								WBS Description / Detail	Cost Category	Factor	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	TOTAL Cost $k	Add Basis of estimate Note Ref Number
1	2	3	4	5	6	7	8				Labour			Materials and other Equipment			Other			Contingency				
590	15							**Siting**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
590	15	10						SITING MANAGEMENT																
								RES is 7 yrs vs 13 yrs for CES and shared amongst 7 sites	Labour	0.05	4897.7	0.05	244.885									245
									Materials and Equipment	0.05				0.05									
									Other	0.05						1,300	0.05	65				65
									Contingency	50%										50%	1.0	154.9	155
590	15	70						PREFERRED SITE																
590	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING																
								Assume cost is 10% of a CES greenfield site	Labour	0.1	588.3	0.1	58.83									59
									Materials and Equipment	0.1				0.1									
									Other	0.1						120	0.1	12				12
									Contingency	50%										50%	1.0	35.4	35
590	15	70	30					PREFERRED SITE - CHARACTERISATION																
								Assume cost is 10% of a CES greenfield site	Labour	0.1	1484.8	0.1	148.48									148	
									Materials and Equipment	0.1				0.1									
									Other	0.1						200	0.1	20				20	
									Contingency	0.5										50%	1.0	84.2	84	

Total		452 Total		Total		97 Total	274.6
Check: Should = 0		Check: Should = 0		Check: Should = 0		Check: Should = 0	

Total 824

Check: Should = 0

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
590	20	0	0	0	0	0	0	System Development	Labour	STEP	CTECH	AM	274	280	7	0	0	NO DATA TO FILL	7727.6
590	20	0	0	0	0	0	0	System Development	Materials and Equipment	STEP	CTECH	AM	274	280	7	0	0		430.0
590	20	0	0	0	0	0	0	System Development	Other	STEP	CTECH	AM	274	280	7	0	0		304.8
590	20	0	0	0	0	0	0	System Development	Contingency	STEP	CTECH	AM	274	280	7	0	0		3240.8

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost
Labour	7728
Materials and Equipment	430
Other	305
Contingency	3240.8
Total	11703

Check: Total minus budget Should = 0

Budget costs to Years by %

Check total	Total Cost $k
0%	
0.0	7727.6
0.0	430.0
0.0	304.8
0.0	3240.8
0.0	11703

INSTRUCTIONS

Insert lower level WBS numbers as required

Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required

Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15

ACTIVITY DETAIL ESTIMATE

											A	B	C	D	E	F	G	H	I	J	K	L	M	
WBS LEVEL								WBS Description / Detail	Cost Category	Factor	Labour			Materials and other Equipment			Other			Contingency			TOTAL	
1	2	3	4	5	6	7	8				Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
590	20							**System Development**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
590	20	2						SYSTEM DEVELOPMENT MANAGEMENT																
								Assume same size management team as for CES. Therefore factor = 1/2. Assume additional documeNtation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. SSB not fully new technology but not existing on site - therefore a 50% reduction utilised	Labour	0.26	6690.40	0.26	1756.23											1,756
								No entry in CES alternative cost category	Materials and Equipment	0.00				0.00	0.00	0.00								0
								Assume same size management team as for CES. Therefore factor = 1/2. Assume additional documeNtation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. SSB not fully new technology but not existing on site - therefore a 50% reduction utilised	Other	0.26							300.00	0.26	78.75					79
								Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	550.5		550
590	20	5						SYSTEM OPTIMIZATION																

			Divide between WL and CRL. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Also for storage building technology not in existance but not really 'new technology' an additional 40% is deducted	Labour	0.32	3303.70	0.32	1040.67										1,041
			No entry in CES alternative cost category	Materials and Equipment	0				0.00	0.00	0.00							0
			Divide between WL and CRL. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Also for storage building technology not in existance but not really 'new technology' an additional 40% is deducted	Other	0.32							120.00	0.32	37.80				38
			Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.00	323.54	324
590	20	20	PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)															
			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Labour	0.16	20750.10	0.16	3268.14										3,268
			Allow reduction due to no cask related feasibilty studies and no fuel container dismantling techniques carried out in this RES alternative, and shared between WL and CRL	Materials and Equipment	0.10				4300.00	0.10	430.00							430
			Assume system development shared between 2 sites (WL & CRL) Therefore factor = 1/2. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work required therefore a further reduction of 70%	Other	0.16							895.00	0.16	140.96				141
			Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.00	1919.55	1,920
590	20	30	STORAGE SYSTEM ENG'NG															
			Divide between WL and CRL. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Also for relatively sim[le storage building engineering (smaller scale than CES) an additional 70% is deducted	Labour	0.16	8143.20	0.16	1282.55										1,283
			No entry in CES alternative cost category	Materials and Equipment	0				0.00	0.00	0.00							0
			Divide between WL and CRL. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Also for relatively sim[le storage building engineering (smaller scale than CES) an additional 70% is deducted	Other	0.16							200.00	0.16	31.50				32
			Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.00	328.51	329

590	20	40	SECURITY & SAFEGUARD ENG'NG																
			Divide between WL and CRL Assume additional documentation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Smaller site than CES therefore a further factor of 50% is included	Labour	0.26	1447.70	0.26	380.02									380
			No entry in CES alternative cost category	Materials and Equipment	0				0.00	0.00	0.00								0
			Divide between WL & CRL. Assume additional documentation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Smaller site than CES therefore a further factor of 50% is included	Other	0.26							60.00	0.26	15.75					16
			Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	118.7		119

Total	**11,703**
Check: Should = 0	**0**

						Total	7,728	Total		430	Total		305	Total			3,240.8		
						Check: Should = 0	0	Check: Should = 0		0	Check: Should = 0		0	Check: Should = 0			0		

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
590	25							Safety Assessment	Labour	STEP	OPG	RJH	1	281	40			1284.3
590	25							Safety Assessment	Materials and Equipment	STEP	OPG	RJH	1	281	40			
590	25							Safety Assessment	Other	STEP	OPG	RJH	1	281	40			237.5
590	25							Safety Assessment	Contingency	STEP	OPG	RJH	1	281	40			608.7

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %
Check total	**Total Cost $k**	

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost		
Labour	1284		1284.3
Materials and Equipment			
Other	238		237.5
Contingency	608.7		608.7
Total	2130		2130

INSTRUCTIONS

										A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																						**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																
590	25							**Safety Assessment**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
590	25	10						SAFETY ASSESSMENT MANAGEMENT																
								RES = 10 yrs vs CES = 17 yrs. Share costs over 7 sites.	Labour	0.05	5218.2	0.05	260.91										261
									Materials and Equipment	0.05				0.05									
									Other	0.05						850	0.05	42.5					43
									Contingency	40%									40%	1.0	121.4		121
590	25	30						SA - SITING																
								Limited siting work leads to no SA work	Labour		2287.5												
									Materials and Equipment														
									Other							3,850							
									Contingency	40%									40%	1.0			
590	25	40						SA - OPERATING LICENSE																
									Labour	0.10	1540.5	0.1	154.05										154
									Materials and Equipment	0.10				0.1									
									Other	0.10						300	0.1	30					30
									Contingency	40%									40%	1.0	73.6		74
590	25	50						SA - FACILITY OPERATIONS																
								RES spans Y13 to Y281 or 269 yrs vs 330 yrs for CES. RES has 0.08 staff and CES has 1 staff. Factor is 269/330 x 0.08/1 = 0.065	Labour	0.065	9604.8	0.065	624.312										624

				Materials and Equipment	1				1									
			Equivalent annual expenses at $0.5K/a x 269 yrs	Other	1						135	1	135					135
				Contingency	40%									40%	1.0	303.7		304
590	25	70	SA - DECOMMISSIONING (Processing Facilities)															
			RES has 1 decommissioning events - while CES has 3. Costs can be shared between sites with similar technology; thus factor to 0.15	Labour	0.1	2449.9	0.1	244.99										245
				Materials and Equipment	0.1				0.1									
				Other	0.1						300	0.1	30					30
				Contingency	40%									40%	1.0	110.0		110

																	Total	**2,130**
																	Check: Should = 0	
						Total		1,284	Total			Total		238	Total			608.7
						Check: Should = 0			Check: Should = 0			Check: Should = 0			Check: Should = 0			

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE — SILOS IN STORAGE BUILDINGS (SSB)

ACTIVITY SUMMARY TO DATA TRANSFER — WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $k
590	30							Licensing & Approvals	Labour	STEP	OPG	RJH	3	281	279		NO DATA TO FILL	3114.3
590	30							Licensing & Approvals	Materials and Equipment	STEP	OPG	RJH	3	281	279			
590	30							Licensing & Approvals	Other	STEP	OPG	RJH	3	281	279			15160.2
590	30							Licensing & Approvals	Contingency	STEP	OPG	RJH	3	281	279			4568.6

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check: Total minus budget Should = 0 / Check total	Total Cost $k	Budget costs to Years by %
Labour	3114	0.0	3114.3	
Materials and Equipment				
Other	15160		15160.2	
Contingency	4568.6		4568.6	
Total	22843	0.0	22843	

INSTRUCTIONS

Insert lower level WBS numbers as required	Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A: Use appropriate CES cost	B: Apply Factor	C: Calc RES cost value	D: Use appropriate CES cost	E: Apply Factor	F: Calc RES cost value	G: Use appropriate CES cost	H: Apply Factor	I: Calc RES cost value	J: Use appropriate CES cost	K: Apply Factor	L: Calc RES cost value	M: Total Cost is calculated	Add Basis of estimate Note Ref Number

ACTIVITY DETAIL ESTIMATE

WBS LEVEL 1	2	3	4	5	6	7	8	WBS Description / Detail	Cost Category	Factor	Labour CES	Labour Factor	Labour RES	Materials and other Equipment CES	Factor	RES	Other CES	Factor	RES	Contingency CES	Factor	RES	TOTAL Cost $k
590																							
590	30							**Licensing & Approvals**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	
590	30	30						LIAISON WITH CNSC															
								Duration 4 yrs vs 10 yrs in CES and cost shared between 7 sites. Thus factor is 0.057. However due to inefficiencies of multiple sites increase to 0.2	Labour	0.2	555	0.2	111										111
									Materials and Equipment	0.2					0.2								
									Other	0.2							40	0.2	8				8
									Contingency	0.25										25%	1.0	29.8	30
590	30	50						CNSC CONSTRUCTION LICENCE															
								Some inefficiencies gained due to multiple sites	Labour	0.2	2631	0.2	526.2										526
									Materials and Equipment	0.2					0.2								
									Other	0.2							6,264	0.2	1252.8				1,253
									Contingency	0.25										25%	1.0	444.8	445
590	30	60						OTHER GOVN'MT APPROVALS															
590	30	60	10					APPROVAL REQUIREMENTS															

				Duration 4 yrs vs 10 yrs in CES and cost shared between 7 sites. Thus factor is 0.057. However due to inefficiencies of multiple sites increase to 0.2	Labour	0.2	337	0.2	67.4										67
					Materials and Equipment	0.2				0.2										
					Other	0.2						0.2								
					Contingency	0.25										25%	1.0	16.9		17
590	30	60	30	FEDERAL APPROVALS																
					Labour	0.2	133	0.2	26.6											27
					Materials and Equipment	0.2				0.2										
					Other	0.2						0.2								
					Contingency	0.25										25%	1.0	6.7		7
590	30	60	40	PROVINCIAL APPROVALS																
					Labour	0.2	133	0.2	26.6											27
					Materials and Equipment	0.2				0.2										
					Other	0.2						0.2								
					Contingency	0.25										25%	1.0	6.7		7
590	30	60	50	MUNICIPAL APPROVALS																
					Labour	0.2	133	0.2	26.6											27
					Materials and Equipment	0.2				0.2										
					Other	0.2						0.2								
					Contingency	0.25										25%	1.0	6.7		7
590	30	65		CNSC OPERATING LICENCE (Initial Application)																
					Labour	0.2	513	0.2	102.6											103
					Materials and Equipment	0.2				0.2										
					Other	0.2							902	0.2	180.4					180
					Contingency	0.25										25%	1.0	70.8		71
590	30	70		CNSC OPERATING LICENCE (Maintenance & Renewal)																
				CES duration is 330 years. Costs incurred in RES during period Y13 to Y281 or 269 years. RES has 0.08 staff vs CES with 1 staff. Factor is 269/330 x 0.08/1 = 0.068	Labour	0.068	32754	0.068	2227.272										2,227
					Materials and Equipment	1				1										
				Expenses at $51K/a x 269 yrs	Other	1							13,719	1	13719					13,719
					Contingency	0.25										25%	1.0	3,986.6		3,987

																			Total	**22,843**
																			Check: Should = 0	

							Total	3,114	Total				Total	15,160	Total				4,568.6	
							Check: Should = 0		Check: Should = 0				Check: Should = 0		Check: Should = 0					

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
590	35							Public Affairs	Labour	STEP	OPG	RJH	1	12	10			683.8
590	35							Public Affairs	Materials and Equipment	STEP	OPG	RJH	1	12	10			
590	35							Public Affairs	Other	STEP	OPG	RJH	1	12	10			461.8
590	35							Public Affairs	Contingency	STEP	OPG	RJH	1	12	10			572.8

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %
Check total	**Total Cost $k**	

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	684		683.8
Materials and Equipment			
Other	462		461.8
Contingency	572.8		572.8
Total	1718		1718

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
590	35							**Public Affairs**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
590	35	45						PUBLIC AFFAIRS - PREFERRED SITE																
									Labour	0.05	3046.2	0.05	152.31										152	
									Materials and Equipment	0.05				0.05										
									Other	0.05							600	0.05	30				30	
									Contingency	50%										50%	1.0	91.2	91	
590	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL																
									Labour	0.05	4569.3	0.05	228.465										228	
									Materials and Equipment	0.05				0.05										
									Other	0.05							1,450	0.05	72.5				73	
									Contingency	50%										50%	1.0	150.5	150	
590	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION																
									Labour	0.05	2528.9	0.05	126.445										126	
									Materials and Equipment	0.05				0.05										
									Other	0.05							800	0.05	40				40	
									Contingency	50%										50%	1.0	83.2	83	
590	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT																
									Labour	0.05	3530.8	0.05	176.54										177	

				Materials and Equipment	0.05			0.05						
				Other	0.05					170	0.05	8.5		9
				Contingency	50%								50% 1.0 92.5	93
590	35	120	Community Offsets & Benefits											
				Labour	0.15	0.15								
				Materials and Equipment	0.15			0.15						
				Other	0.15					2,072	0.15	310.8		311
				Contingency	50%								50% 1.0 155.4	155
													Total	**1,718**
													Check: Should = 0	
						Total	684	Total		Total		462	Total	572.8
						Check: Should = 0		Check: Should = 0		Check: Should = 0			Check: Should = 0	

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
590	40							Facility Design & Construction	Labour	STEP	CTECH	AM	10	280	271			NO DATA TO FILL	9910.3
590	40							Facility Design & Construction	Materials and Equipment	STEP	CTECH	AM	10	280	271				11019.3
590	40							Facility Design & Construction	Other	STEP	CTECH	AM	10	280	271				707.5
590	40							Facility Design & Construction	Contingency	STEP	CTECH	AM	10	280	271				8443.7

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	9910		9910.3
Materials and Equipment	11019		11019.3
Other	707		707.5
Contingency	8443.7		8443.7
Total	30081		30081

INSTRUCTIONS

Insert lower level WBS numbers as required

Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required

Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15

ACTIVITY DETAIL ESTIMATE

WBS LEVEL 1	2	3	4	5	6	7	8	WBS Description / Detail	Cost Category	Factor	A Use appropriate CES cost	B Apply Factor	C Calc RES cost value	D Use appropriate CES cost	E Apply Factor	F Calc RES cost value	G Use appropriate CES cost	H Apply Factor	I Calc RES cost value	J Use appropriate CES cost	K Apply Factor	L Calc RES cost value	M Total Cost is calculated	Add Basis of estimate Note Ref Number
											Labour			Materials and other Equipment			Other			Contingency			TOTAL	
											CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	Cost $k	
590	40							**Facility Design & Construction**																
590	40	10						SITE IMPROVEMENTS																
								a 10% allowance of the CES costs, applied to the site improvements	Labour	0.10	45,930.4	0.1	4,593.0										4,593
									Materials and Equipment	0.10				58,350.0	0.1	5,835.0							5,835
								no property acquisition required	Other								3,375.0						
								Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	5,214.0	5,214
590	40	30						COMMON ANCILLARY FACILITIES																
590	40	30	10					ADMIN AND SUPPORT FACILITIES																
590	40	30	10	1				ADMIN AND VISITOR RECEPTION BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour		486.3											comment 7	
									Materials and Equipment					784.2									
								No entry in CES alternative cost category	Other														
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0		
590	40	30	10	2				OPS SUPPT & HEALTH PHYSICS BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour		1,294.8											comment 7	
									Materials and Equipment					1,612.6									
								No entry in CES alternative cost category	Other														
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0		
590	40	30	10	3				EQUIP STORAGE AND MAINT'CE BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour		1,262.1											comment 7	
									Materials and Equipment					1,675.0									

				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0		
590	40	30	10	5	ACTIVE SOLID WASTE HDLG BLDG														
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	459.9	0.3	138.0										138
					Materials and Equipment	0.3				1,135.0	0.3	340.5							341
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	143.5	144
590	40	30	10	6	SOLID WASTE STORAGE AREA														
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	458.8	0.3	137.6										138
					Materials and Equipment	0.3				437.5	0.3	131.3							131
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	80.7	81
590	40	30	10	7	ACTIVE LIQ/W TRT'MT BLDG														
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	359.4	0.3	107.8										108
					Materials and Equipment	0.3				1,727.0	0.3	518.1							518
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	187.8	188
590	40	30	10	8	LOW LVL LIQ/W STRG BLDG														
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	373.7	0.3	112.1										112
					Materials and Equipment	0.3				1,426.0	0.3	427.8							428
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	162.0	162
590	40	30	10	9	WAREHOUSE BLDG														
				Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour		470.9										comment 7		
					Materials and Equipment					550.0									
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0		
590	40	30	10	10	GUARDHOUSE AND SECURITY FENCE														
				Building and security exist therefore new building and fence not required. Allowance for refurbishment covered in ***/45/20/50	Labour		631.2										comment 7		
					Materials and Equipment					553.7									
					Other														
				Increased contingency than CES due to RES facility footprint size not confirmed and therefore length of fence, not yet known	Contingency	20%										20%	1.0		
590	40	30	10	11	TRUCK INSP'N / WASH STATION														
				not req'd as no fuel transported off site	Labour		872.2										comment 7		
					Materials and Equipment					1,075.0									
					Other							389.4							
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0		
590	40	30	10	12	UTILITY BLDG														
				A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	1,023.2	0.3	307.0										307
					Materials and Equipment	0.3				1,257.0	0.3	377.1							377
				No entry in CES alternative cost category	Other														
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	205.2	205

590 40	30	10	13	TEST FACILITY																			
				Taken as being independent of fuel inventory stored. Same size bldg as CES, facility will be shared by Whiteshell and Chalk River , therefore cost will be 50% of CES costs.	Labour	0.5	766.8	0.5	383.4													383
					Materials and Equipment	0.5				1,675.0	0.5	837.5												838
				No entry in CES alternative cost category	Other																			
				Percentage for contingency assumed same as for CES	Contingency	20%														20%	1.0	244.2		244
590 40	30	20		OTHER SITE SYSTEMS																			
590 40	30	20	1	FIRE PROTECTION SYSTEMS																			
				assumed aailable and turned over to RES during transition	Labour		1,022.2												comment 7				
					Materials and Equipment					676.2													
				No entry in CES alternative cost category	Other																		
				Percentage for contingency assumed same as for CES	Contingency	25%														25%	1.0			
590 40	30	20	2	SECURITY AND COMMUNICATION SYSTEM																			
				assumed aailable and turned over to RES during transition	Labour		607.5												comment 7				
					Materials and Equipment					600.0													
				No entry in CES alternative cost category	Other																		
				Percentage for contingency assumed same as for CES	Contingency	25%														25%	1.0			
590 40	30	20	3	ELECTRICAL AND EMERGENCY POWER																			
				assumed aailable and turned over to RES during transition	Labour		1,939.6												comment 7				
					Materials and Equipment					1,932.0													
				No entry in CES alternative cost category	Other																		
				Percentage for contingency assumed same as for CES	Contingency	25%														25%	1.0			
590 40	30	20	4	SANITARY SEWER SYSTEM																			
				assumed aailable and turned over to RES during transition	Labour		339.2												comment 7				
					Materials and Equipment					310.5													
				No entry in CES alternative cost category	Other																		
				Percentage for contingency assumed same as for CES	Contingency	25%														25%	1.0			
590 40	30	20	5	POTABLE WATER SYSTEM																			
				assumed aailable and turned over to RES during transition	Labour		371.6												comment 7				
					Materials and Equipment					148.0													
				No entry in CES alternative cost category	Other																		
				Percentage for contingency assumed same as for CES	Contingency	25%														25%	1.0			
590 40	30	20	6	RETENTION/SEDIMENTATION POND																			
				assumed aailable and turned over to RES during transition	Labour		874.4												comment 7				
					Materials and Equipment					189.6													
				No entry in CES alternative cost category	Other																		
				Percentage for contingency assumed same as for CES	Contingency	30%														30%	1.0			
590 40	30	20	7	STORM WATER DETENTION POND																			
				assumed aailable and turned over to RES during transition	Labour		387.8												comment 7				
					Materials and Equipment					93.5													

	No entry in CES alternative cost category	Other															
	Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0			
590 40 30 20 8	CONST'N MAT'L STOCKPILE AREA																
	not req'd, concrete brought in as req'd from off-site	Labour		1,039.2												comment 7	
		Materials and Equipment					625.0										
	No entry in CES alternative cost category	Other															
	Percentage for contingency assumed same as for CES	Contingency	15%										15%	1.0			
590 40 30 20 9	SITE MATERIALS STORAGE AREA																
	assumed aailable and turned over to RES during transition	Labour		1,169.5												comment 7	
		Materials and Equipment					655.0										
	No entry in CES alternative cost category	Other															
	Percentage for contingency assumed same as for CES	Contingency	15%										15%	1.0			
590 40 30 20 10	ACCESS ROADS AND VEHICLE COMPOUNDS																
	assumed aailable and turned over to RES during transition	Labour		1,319.9												comment 7	
		Materials and Equipment					1,866.9										
	No entry into cost category	Other															
	Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0			
590 40 30 30	CONST'N INDIRECTS ANCILLARY FACILITIES																
	assumed aailable and turned over to RES during transition	Labour		4,406.4												comment 7	
		Materials and Equipment					6,610.9										
	No entry into cost category	Other															
	Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0			
590 40 40	STORAGE CONSTRUCTION																
590 40 40 10	STORAGE BUILDING DESIGN & CONSTRUCTION																
	The materials & labour costs for CES are based on const'n of 4 storage buildings. For RES these costs are factored to suit 1 building which is approx half the footprint size of a single CES bldg. Combined factor based on building quantity and footprint size (using 6/10 rule).	Labour	0.29	10,080.0	0.29	2,894.7											2,895
		Materials and Equipment	0.29				6,770.0	0.29	1,944.2								1,944
	expenses factor taken same as labour	Other	0.29							2,016.0	0.29	578.9					579
	Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	1,625.4		1,625
590 40 40 20	STORAGE BUILDING SERVICES DESIGN & INSTALLATION																
	The materials & labour costs for CES are based on const'n of 4 storage buildings. For RES these costs are factored to suit 1 building which is approx half the footprint size of a single CES bldg. Combined factor based on building quantity and footprint size (using 6/10 rule).	Labour	0.29	835.2	0.29	239.8											240
		Materials and Equipment	0.29				764.8	0.29	219.6								220
	expenses factor taken same as labour	Other	0.29							320.0	0.29	91.9					92
	Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	165.4		165
590 40 40 30	STORAGE BUILDING CONSTRUCTION INDIRECTS																

		The labour costs for CES are based on const'n of 4 storage buildings. For RES these costs are factored to suit 1 building which is approx half the footprint size of a single CES bldg. Combined factor based on building quantity and footprint size (using 6/10 rule).The design part of the labour costs is shared 50/50 between whiteshell & chalk river sites.	Labour	0.29	3,471.2	0.29	996.8												997
		The materials costs for CES are based on const'n of 4 storage buildings. For RES these costs are factored to suit 1 building which is approx half the footprint size of a single CES bldg. Combined factor based on building quantity and footprint size (using 6/10 rule).	Materials and Equipment	0.29				1,351.8	0.29	388.2									388
		No entry into cost category	Other																
		Percentage for contingency assumed same as for CES	Contingency	30%											30%	1.0	415.5		416
590	40	650	ENERGY CONSUMPTION																
		No entry into cost category	Labour																
		No entry into cost category	Materials and Equipment																
		consumption for the construction of storage chamber and ancillary buildings	Other	0.10						366.3	0.1	36.6							37
		Contingency included in cost (built into power consumption calculation)	Contingency													1.0			

								Total	**30,081**
								Check: Should = 0	
			Total	9,910	Total	11,019	Total	707	Total 8,443.7
			Check: Should = 0		Check: Should = 0		Check: Should = 0		Check: Should = 0

BASIS OF ESTIMATE NOTES - Insert references and notes

1
2

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
590	45							Facility Operation	Labour	STEP	CTECH	AM	6	281	276			NO DATA TO FILL	304146.3
590	45							Facility Operation	Materials and Equipment	STEP	CTECH	AM	6	281	276				118470.1
590	45							Facility Operation	Other	STEP	CTECH	AM	6	281	276				91265.8
590	45							Facility Operation	Contingency	STEP	CTECH	AM	6	281	276				134247.1

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	304146		304146.3
Materials and Equipment	118470		118470.1
Other	91266		91265.8
Contingency	134247		134247.1
Total	648129	*0.0*	648129

INSTRUCTIONS

					A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																		**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
590	45							**Facility Operation**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
590	45	20						OPERATIONS - EXTENDED MONITORING																
590	45	20	5					PROGRAM MANAGEMENT																
								Entries in CES DET applicable to RES but duration 269 years RES & 300 years CES therefore 269/300 = 0.91 . Program management spread over 7 sites with Whiteshell assumed to have 0.8 staff vs 9 in CES. Thus combined factor	Labour	0.080	312,354.0	0.1	24,895.8											24,896	6
								No entry in CES alternative cost category	Materials and Equipment																
								Annual cost = $258/a x 269yrs	Other	1.00							69,402.0	1.0	69,402.0				69,402	4,5
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	18,859.6	18,860	
590	45	20	40					MONITORING AND SURVEILLANCE -EXTENDED MONITORING																
								CES monitoring and surveillance duration was 300 yrs for 4717 baskets, RES is 269 years for 9 baskets. Whiteshell assumed to have 0.5 staff for RES vs 5 in CES. Combined factor based on duration, fuel inventory and staffing levels.	Labour	0.0002	49,716.0	0.0	8.5											9	6
								annual costs = $1k/a x 269 years	Materials and Equipment	1.00				269.0	1.0	269.0							269	7
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	138.8	139	
590	45	20	50					OPERATION INDIRECTS (EXTENDED MONITORING)																

					Entries in CES DET applicable to RES but duration 269 years RES & 300 years CES. Staff for RES = 7 vs 34 in CES. Combined factor = 269/300 x 7/34. M&E costs are $75k/a x 269 years	Labour	0.18	875,048.0	0.2	161,540.7										161,541	6
						Materials and Equipment	1.00				20,175.0	1.0	20,175.0								20,175	7
					Armed response = $50k/a + energy costs at $3k/a. total = $53k x 273 years	Other	1.00							14,257.0	1.0	14,257.0					14,257	7
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	58,791.8	58,792		
590	45	20	60		COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)																		
					RES has duration 227 years, CES has 300 years. RES staff is 1 vs 5 in CES. Factor is 227/300 x 1/5	Labour	0.15	148,529.0	0.2	22,477.4										22,477	6
					No entry in CES alternative cost category	Materials and Equipment																
					No entry in CES alternative cost category	Other																
					Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	5,619.3	5,619		
590	45	20	70		FUEL INTEGRITY MONITORING (25 YEARLY)																		
					RES has duration 276 years, CES has 300 years. RES staff is 0.1 vs 0.5 in CES. Factor is 276/300 x 0.1/0.5	Labour	0.2	4,631.0	0.2	852.1										852	6
						Materials and Equipment	1.0				690.0	1.0	690.0								690	7
						Other	1.0							138.0	1.0	138.0					138	7
					Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	840.1	840		
590	45	30			OPERATIONS - FACILITY REPEATS																		
590	45	30	20		SILOS 100 YEAR REPLACEMENT																		
590	45	30	20	10	DEMOLISH EXISTING STORAGE SILOS																		
					costs taken from CES basket vault demolition, rated at $104 per tonne of reinforced concrete. Each silo = 115 tonne x 16 silos =1,840Te. Split 50/50 labour/materials	Labour	920.00	0.104	920.0	95.7										96	3
						Materials and Equipment	920.00				0.104	920.0	95.7								96	3
					No costs in this category	Other																
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	57.4	57		
590	45	30	20	20	SILO CONSTRUCTION																		
					Assume same costs as for initial construction of the storage silos. 16 silos constructed at this point to house standard and non standard fuelcost per silo = $60K. Allow 67% labour 33% materials.	Labour	10.72	60.0	10.7	643.2										643	1
						Materials and Equipment	5.28				60.0	5.3	316.8								317	1
					No costs in this category	Other																
					Percentage for contingency for silos construction assumed same as for CES basket vaults construction	Contingency	30%										30%	1.0	288.0	288		
590	45	30	20	30	TRANSFER OPERATIONS																		
						Labour	0.0005	990.0	0.00	0.5										0.4793		
					Smaller fuel inventory for RES = 1 silo with 9 baskets, 1 spare silo and 14 silos with non standard waste/fuel. Assume transfer ops based on fuel only ie 9 baskets therefore ratio = 9/4717. Labour costs reduced, existing site staff will undertake operations for first 200 years.																	
					No costs in this category	Materials and Equipment																
					Armed response included at rate of $50k/a based on 2 years duration - see note 8.	Other	1							100.0	1.0	100.0					100	8
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	30.1	30.1438		

590	45	30	20	40	WASTE DISPOSAL															
					No costs in this category	Labour														
					No costs in this category	Materials and Equipment														
					costs takrn from CES basket vault waste disposal, rated at $200 per tonne of reinforced concrete. Each silo = 115 tonne x 16 silos =1,840Te.	Other	1840				0.2	1,840.0	368.0				368	3
						Contingency	30%							30%	1.0	110.4	110	
590	45	30	30		SILOS 200 YEAR REPLACEMENT															
					assumed same as 100 yr replacement	Labour			739.4								739			
					assumed same as 100 yr replacement	Materials and Equipment					412.5						412			
					assumed same as 100 yr replacement	Other							468.0				468			
					assumed same as 100 yr replacement	Contingency										486.0	486			
590	45	30	40		SILOS 300 YEAR REPLACEMENT															
					assumed same as 100 yr replacement	Labour			740.8								741			
					assumed same as 100 yr replacement	Materials and Equipment					412.5						412			
					assumed same as 100 yr replacement	Other							368.0				368	9		
					assumed same as 100 yr replacement	Contingency										486.0	486			
590	45	30	50		STORAGE BUILDINGS 100 YEAR REPLACEMENT															
					Costs equal totals of RES costs for Design & Construction, Services & Installation, and Construction Indirects brought forward from the initial construction phase	Labour	1.00	4,131.4	1.0	4,131.4							4,131			
						Materials and Equipment	1.00				2,552.0	1.0	2,552.0				2,552			
						Other	1.00					670.8	1.0	670.8			671			
					Percentage for contingency assumed same as for CES	Contingency	30%							30%	1.0	2,206.3	2,206			
590	45	30	60		STORAGE BUILDINGS 200 YEAR REPLACEMENT															
					Samecost sas for 100 year facility repeat	Labour	1.00	4,131.4	1.0	4,131.4							4,131			
						Materials and Equipment	1.00				2,552.0	1.0	2,552.0				2,552			
						Other	1.00					670.8	1.0	670.8			671			
					Percentage for contingency assumed same as for CES	Contingency	30%							30%	1.0	2,206.3	2,206			
590	45	30	70		STORAGE BUILDINGS 300 YEAR REPLACEMENT															
					Samecost sas for 100 year facility repeat	Labour	1.00	4,131.4	1.0	4,131.4							4,131			
						Materials and Equipment	1.00				2,552.0	1.0	2,552.0				2,552			
						Other	1.00					670.8	1.0	670.8			671			
					Percentage for contingency assumed same as for CES	Contingency	30%							30%	1.0	2,206.3	2,206			
590	45	40			OPERATIONS - REPACKAGING															
590	45	40	5		PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)															
					Entries in CES DET applicable to RES but duration 13 years RES 100yr=(2license+2const/ops 109-112) + 200yr=(2license+2const/ops 209-212)+ 300yr=(2license+2const'n+1ops 277-281) compared to 114 years CES therefore13/114 of labour costs spread project management over 7 sites and acknowledge inefficiency use 20% factor	Labour	0.02	389,170.0	0.0	8,875.8							8,876			
					No entry in CES alternative cost category	Materials and Equipment														

							see note 4. no property tax assumed this site	Other													4	
							Percentage for contingency assumed same as for CES	Contingency	20%								20%	1.0	1,775.2	1,775	
590	45	40	10	40			COMMON ANCILLARY FACILITIES (REPLACEMENT)			comment 7											
							only require full ancillary buildings (13) at 300yr RPBB event, for 100 & 200yr facility repeats, the replacement of 7 ancillary buildings is required. Therefore combined factor = ((7/13)*2) + 1	Labour	2.1	21,056.2	2.1	43,732.1							43,732	
								Materials and Equipment	2.1				29,785.1	2.1	61,861.4					61,861	
							No entry in CES alternative cost category	Other													
							Percentage for contingency assumed same as for CES	Contingency	22%								22%	1.0	23,230.6	23,231	
590	45	40	10	600	30		ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)														
							duration 7 years RES compared to 30 years CES. Factor =7/30	Labour	0.2	11,882.0	0.2	2,772.5								2,772	2
							No entry in CES alternative cost category	Materials and Equipment													
							No entry in CES alternative cost category	Other													
							Percentage for contingency assumed same as for CES	Contingency	25%								25%	1.0	693.1	693	
590	45	40	40				BASKET TO BASKET 300 YEAR REPACKAGING														
590	45	40	40	05			CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)														
							assumed same facility as CES therefore factor = 1	Labour	1.0	476.1	1.0	476.1								476	
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				354.6	1.0	354.6					355	
							assumed same facility as CES therefore factor = 1	Other	1.0							228.4	1.0	228.4		228	
							same contingency as for CES	Contingency	30%								30%	1.0	317.7	318	
590	45	40	40	10			PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)														
590	45	40	40	10	20		RPBB EQUIP. DESIGN, SUPPLY & INSTALL														
590	45	40	40	10	20	10	RECEIPT & TRANSFER (EQUIP)														
							assumed same facility as CES therefore factor = 1	Labour	1.0	70.8	1.0	70.8								71	
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				1,415.0	1.0	1,415.0					1,415	
							assumed same facility as CES therefore factor = 1	Other	1.0							74.3	1.0	74.3		74	
							same contingency as for CES	Contingency	30%								30%	1.0	468.0	468	
590	45	40	40	10	20	20	BASKET TO BASKET FUEL TRANSFER														
							assumed same facility as CES therefore factor = 1	Labour	1.0	2,319.4	1.0	2,319.4								2,319	
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				11,597.0	1.0	11,597.0					11,597	
							assumed same facility as CES therefore factor = 1	Other	1.0							695.8	1.0	695.8		696	
							same contingency as for CES	Contingency	30%								30%	1.0	4,383.7	4,384	
590	45	40	40	10	20	30	BASKET DECONTAMINATION														
							assumed same facility as CES therefore factor = 1	Labour	1.0	854.6	1.0	854.6								855	
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,563.0	1.0	4,563.0					4,563	

						assumed same facility as CES therefore factor = 1	Other	1.0					256.4	1.0	256.4					256
						same contingency as for CES	Contingency	30%								30%	1.0	1,702.2		1,702
590	45	40	40	10	30	RPBB BUILDING DESIGN AND CONSTRUCTION														
						assumed same facility as CES therefore factor = 1	Labour	1.0	4,160.0	1.0	4,160.0									4,160
						assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,280.0	1.0	4,280.0						4,280
						assumed same facility as CES therefore factor = 1	Other	1.0					832.0	1.0	832.0					832
						same contingency as for CES	Contingency	30%								30%	1.0	2,781.6		2,782
590	45	40	40	10	60	BUILDING SERVICES (RPB)														
						assumed same facility as CES therefore factor = 1	Labour	1.0	4,447.8	1.0	4,447.8									4,448
						assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,153.8	1.0	4,153.8						4,154
						assumed same facility as CES therefore factor = 1	Other	1.0					1,309.4	1.0	1,309.4					1,309
						same contingency as for CES	Contingency	25%								25%	1.0	2,477.8		2,478
590	45	40	40	10	70	COMMISSIONING (RPB)														
						assumed same facility as CES therefore factor = 1	Labour	1.0	668.2	1.0	668.2									668
						No entry in CES alternative cost category	Materials and Equipment													
						assumed same facility as CES therefore factor = 1	Other	1.0					126.3	1.0	126.3					126
						same contingency as for CES	Contingency	50%								50%	1.0	397.3		397
590	45	40	40	10	80	CONST'N INDIRECTS (RPB)														
						assumed same facility as CES therefore factor = 1	Labour	1.0	6,299.6	1.0	6,299.6									6,300
						No entry in CES alternative cost category	Materials and Equipment													
						assumed same facility as CES therefore factor = 1	Other	1.0					241.5	1.0	241.5					242
						same contingency as for CES	Contingency	30%								30%	1.0	1,962.3		1,962
590	45	40	40	400		CONSTRUCTION MANAGEMENT (RPB)														
						assumed same facility as CES therefore factor = 1	Labour	1.0	4,690.6	1.0	4,690.6									4,691
						No entry in CES alternative cost category	Materials and Equipment													
						No entry in CES alternative cost category	Other													
						same contingency as for CES	Contingency	30%								30%	1.0	1,407.2		1,407
590	45	40	40	500		COMMISSIONING MANAGEMENT (RPB)														
						assumed same facility as CES therefore factor = 1	Labour	1.0	113.3	1.0	113.3									113
						No entry in CES alternative cost category	Materials and Equipment													
						assumed same facility as CES therefore factor = 1	Other	1.0					13.5	1.0	13.5					14
						same contingency as for CES	Contingency	50%								50%	1.0	63.4		63
590	45	40	40	600		REPACKAGING OPERATIONS (RPB)														

					Labour for repackaging operations for CES is for a fuel inventory of 4717 baskets. RES has 9 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 9/4717	Labour	0.002	3,960.8	0.0	7.6											8	
					the same factor for labour is used for procurement of new baskets	Materials and Equipment	0.002				23,585.0	0.0	45.0								45	
					the same factor for labour is used for waste disposal of old baskets	Other	0.002							378.0	0.0	0.7					1	
					same contingency as for CES	Contingency	30%										30%	1.0	16.0		16	
590	45	40	40	700	OPERATION INDIRECTS (RPB)																		
					operation indirect labour costs for CES are for a duration of 10 yrs RES operations are for 1 yr max therefore a factor of 0.1 is used	Labour	0.1	2,678.3	0.1	267.8											268	
					Assume same spares and consumables required as identical equipment is used for both CES & RES. Therefore factor = 1	Materials and Equipment	1.0				172.8	1.0	172.8								173	
					Assume energy consumption for running of facility can be factored relative to duration of facility operation = 1/10yrs = 0.1. Armed response included at rate of $50k/a based on 1 year duration - see note 8.	Other	1.0							374.0	1.0	374.0					374	8
					same contingency as for CES	Contingency	30%										30%	1.0	244.4		244	
590	45	40	40	800	STORAGE OPERATIONS (RPB)																		
					Labour for storage operations for CES is for a fuel inventory of 4717 baskets. RES has 9 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 9/4717	Labour	0.002	990.2	0.0	1.9											2	
					No entry in CES alternative cost category	Materials and Equipment																
					No entry in CES alternative cost category	Other																
					same contingency as for CES	Contingency	30%										30%	1.0	0.6		1	

																					Total		**648,129**
																					Check: Should = 0		
						Total		304,146			Total		118,470			Total		91,266			Total	134,247.1	
						Check: Should = 0					Check: Should = 0					Check: Should = 0					Check: Should = 0		

BASIS OF ESTIMATE NOTES - Insert references and notes

1 Cost information on silos extracted from OPG R.Heystee email date 11-01-03 : 'PLGS dry canister costs for RES costing' cost includes; materials supply, construction, testing and project management: $60K per canister Fall 2001 dollars. Labour and materials split approx. 33% materials/67%labour

2 ancillary ops factored from CES CVSB. In CES this cost was for a 30 year period (covering 1 facility repeat and 1 repackaging event). for RES this covers 100/200&300year facility repeats & 300y repackaging 3x8 (1 demolish prev (y83). 2 const,n of 222 silos (y84,85) 5 ops for transfer) = 24

3 costs for silos demolition and waste diposal based on unit cost factors obtained for demolition of basket storage vaults in CVSB alternative

4 It is assumed that there is no property tax on facilities located on the whiteshell site. Reference note 5 on table 18 - Cost Estimate Report 1105/MD18084/REP/19

5 258k$/a made up of expenses from table 18 in report (15+118+50+50+10). No property tax or PST included.

6 staffing levels obtained from table 17 in cost estimate report 1105/MD18084/REP/19

7 annual costs for Labour/M&E and Other, obtained from table 18 in cost estimate report 1105/MD18084/REP/19

8 armed response costs during 'fuel handling' based on rate of $100k/a. But, due to $50k/a for armed response included in extended monitoring, this means an additional $50k/a is to be included for the duration of the facility repeat transfers/repackaging events ($50k + $50k = $100k)

9 armed response not captured in 300 yr facility repeat for fuel transfers, as it is covered in basket repackaging at 300yr event

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
590	55							Environmental Assessment and Monitoring	Labour	STEP	OPG	RJH	6	281	276			NO DATA TO FILL	14027.8
590	55							Environmental Assessment and Monitoring	Materials and Equipment	STEP	OPG	RJH	6	281	276				4035.0
590	55							Environmental Assessment and Monitoring	Other	STEP	OPG	RJH	6	281	276				1517.0
590	55							Environmental Assessment and Monitoring	Contingency	STEP	OPG	RJH	6	281	276				5873.9

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check: Total minus budget Should = 0	Check total	Total Cost $k	Budget costs to Years by %
Labour	14028		*0.0*	14027.8	
Materials and Equipment	4035			4035.0	
Other	1517			1517.0	
Contingency	5873.9			5873.9	
Total	25454			25454	

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
590	55							**Environmental Assessment and Monitoring**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
590	55	10						EA & MONITORING PROGRAM MANAGEMENT																
								Costs are incurred over the period Y6 to Y281 or 276 yrs vs 347 yrs in CES. RES has 0.1 staff vs 2 staff in CES. Factor is 276/347 x 0.1/2 = 0.04	Labour	0.04	70306	0.04	2812.24											2,812
									Materials and Equipment	1				1										
								Expenses at $1.5K/a x 276 yrs	Other	1							414	1	414					414
									Contingency	0.3										3226.24	0.3	967.872		968
590	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT																
								Assume C/L & EA process spans 3 years (Y7 to Y9) with some preparation work in Y6; ie total of 4 years. Due to multiple sites with same technology can share costs	Labour	0.2	7471	0.2	1494.2											1,494
									Materials and Equipment	0.2				0.2										
									Other	0.2							2,150	0.2	430					430
									Contingency	0.3										1924.2	0.3	577.26		577
590	55	40						GROUNDWATER MONITORING																

			Costs span the period Y13 to Y281 or 269 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.6 in CES. Factor is 269/330 x 0.02/0.6 = 0.027.	Labour	0.027	37158	0.027	1003.266									1,003
			M&E at $3K/a x 269 yrs	Materials and Equipment	1				807	1	807						807
			Expenses at $2K/a x 269 yrs	Other	1							538	1	538			538
				Contingency	0.3										2348.266	0.3	704.4798	704
590	55	50	RADIOLOGICAL BIOSPHERE MONITORING														
			Costs span the period Y13 to Y281 or 269 yrs vs 330 ys for CES. RES staff is 0.1 vs 3.3 staff in CES. Factor is 0.025	Labour	0.025	217280	0.025	5432									5,432
			M&E at $9K/a x 269 yrs	Materials and Equipment	1				2421	1	2421						2,421
				Other	1							1					
				Contingency	0.3										7853	0.3	2355.9	2,356
590	55	60	NON-RAD BIOSPHERE MONITORING														
			Costs span the period Y13 to Y281 or 269 yrs vs 330 in CES. RES staff is 0.05 staff vs 0.8 staff in CES. Factor is 269/330 x 0.05/0.8 = 0.051	Labour	0.051	53590	0.051	2733.09									2,733
			M&E at $3K/a x 269 yrs	Materials and Equipment	1				807	1	807						807
				Other	1							1					
				Contingency	0.3										3540.09	0.3	1062.027	1,062
590	55	80	HUMAN HEALTH MONITORING														
			Costs span the period Y13 to Y281 or 269 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.17 in CES. Factor is 269/330 x 0.02/0.17 = 0.096	Labour	0.096	5760	0.096	552.96									553
				Materials and Equipment	1					1							
			Expenses at 0.5K/a x 269 yrs	Other	1							135	1	135			135
				Contingency	0.3										687.96	0.3	206.388	206

																	Total **25,454**
																	Check: Should = 0
					Total		14,028	Total		4,035	Total		1,517	Total		5,873.9	
					Check: Should = 0			Check: Should = 0			Check: Should = 0			Check: Should = 0			

BASIS OF ESTIMATE NOTES - Insert references and notes

1

2

3

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN STORAGE BUILDINGS (SSB)
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
590	90	0	0	0	0	0	0	Program Management	Labour	STEP	CTECH	AM	1	12	12	0	0	NO DATA TO FILL	796.8
590	90	0	0	0	0	0	0	Program Management	Materials and Equipment	STEP	CTECH	AM	1	12	12	0	0		0.0
590	90	0	0	0	0	0	0	Program Management	Other	STEP	CTECH	AM	1	12	12	0	0		216.7
590	90	0	0	0	0	0	0	Program Management	Contingency	STEP	CTECH	AM	1	12	12	0	0		202.7

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
		0%	
Labour	797	*0.0*	796.8
Materials and Equipment	0	*0.0*	0.0
Other	217	*0.0*	216.7
Contingency	202.7	*0.0*	202.7
Total	1216	*0.0*	1216

INSTRUCTIONS

				A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required				Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																**TOTAL**	
WBS LEVEL				WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**		Cost $k	
1	2	3	4														
590	90			**Program Management**													
				Program management shared between 7 reactor sites at percentages based on table 18 in cost estimate report. 7% for Whiteshell			**total for 7 sites**	**Factor**	**RES**	**total for 7 sites**	**Factor**	**RES**	**total for 7 sites**	**Factor**	**RES**	**CES**	**Factor**	**RES**	
				based on 8 staff. Assume 4 x OPG01, 4 x OPG03 for 12year duration	Labour	0.07	11383.445	0.07	796.841136										797
				no entry	Materials and Equipment	0				0	0	0							0
				the following expenses: Public affairs, overheads, insurance, community compensation & legal fees as table 18	Other	0.07							3096	0.07	216.72				217
				Contingency as CES value	Contingency	20%										20%	1.0	202.7	203
							Total	797	Total		0	Total		217	Total			202.7	
							Check: Should = 0	0	Check: Should = 0		0	Check: Should = 0		0	Check: Should = 0			0	Check: Should = 0

Total	**1,216**
Check: Should = 0	**0**

BASIS OF ESTIMATE NOTES - Insert references and notes

1

2

RES ALTERNATIVE
WBS No 590
SILOS IN STORAGE BUILDINGS (SSB)
WHITESHELL

Cost Category	Total K$
Labour	342,143
Materials and Equipment	133,954
Other	109,968
Contingency	158,033
Total Cost	**744,099**

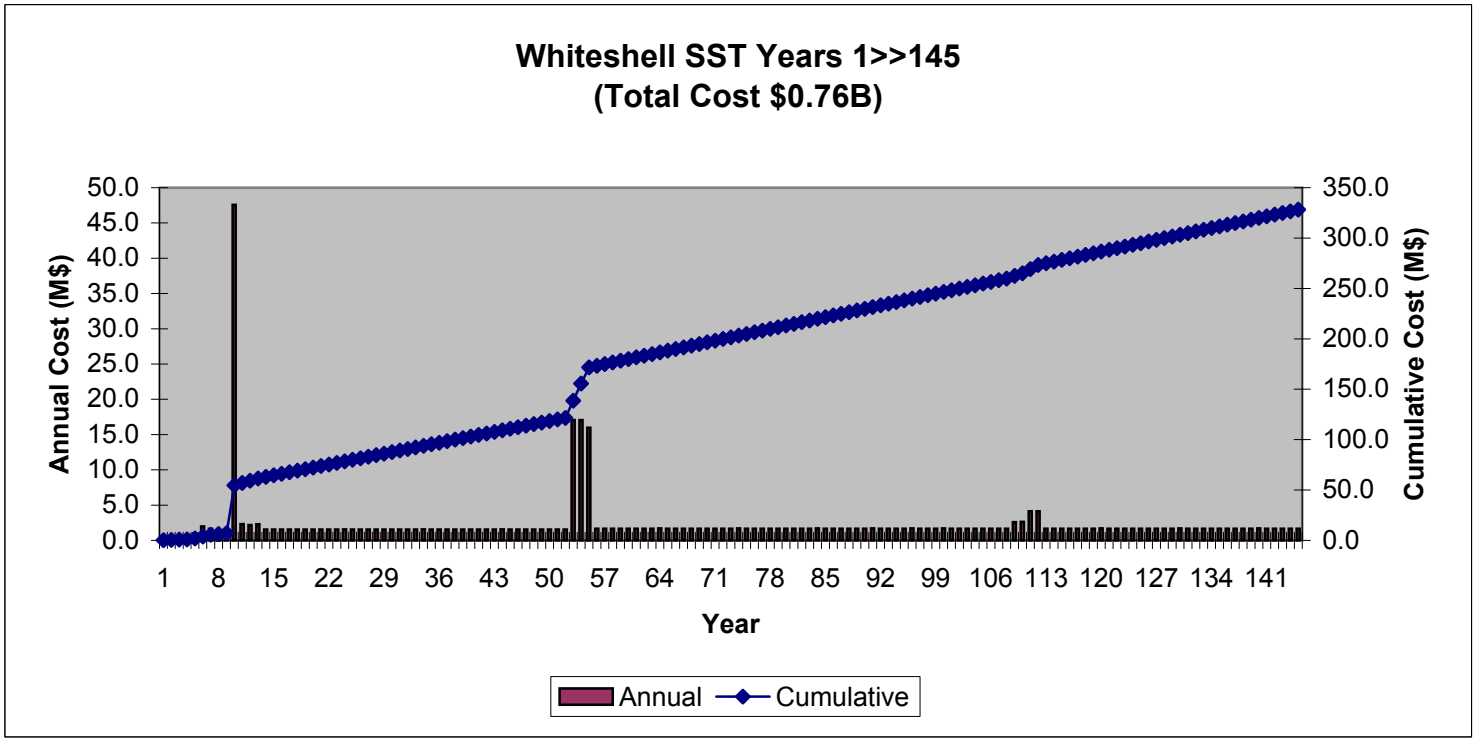
744,099

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	Responsible	Cost Category	WBS Type	Start Year	End Year	Dur'n	Contingency	Total K$
590	15	0	0	0	0	0	0	RJH	Labour	STEP	1	9	7	0	452
590	15	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	9	7	0	0
590	15	0	0	0	0	0	0	RJH	Other	STEP	1	9	7	0	97
590	15	0	0	0	0	0	0	RJH	Contingency	STEP	1	9	7	0	275
590	20	0	0	0	0	0	0	AM	Labour	STEP	274	280	7	0	7,728
590	20	0	0	0	0	0	0	AM	Materials and Equipment	STEP	274	280	7	0	430
590	20	0	0	0	0	0	0	AM	Other	STEP	274	280	7	0	305
590	20	0	0	0	0	0	0	AM	Contingency	STEP	274	280	7	0	3,241
590	25	0	0	0	0	0	0	RJH	Labour	STEP	1	281	40	0	1,284
590	25	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	281	40	0	0
590	25	0	0	0	0	0	0	RJH	Other	STEP	1	281	40	0	238
590	25	0	0	0	0	0	0	RJH	Contingency	STEP	1	281	40	0	609
590	30	0	0	0	0	0	0	RJH	Labour	STEP	3	281	279	0	3,114
590	30	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	3	281	279	0	0
590	30	0	0	0	0	0	0	RJH	Other	STEP	3	281	279	0	15,160
590	30	0	0	0	0	0	0	RJH	Contingency	STEP	3	281	279	0	4,569
590	35	0	0	0	0	0	0	RJH	Labour	STEP	1	12	10	0	684
590	35	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	12	10	0	0
590	35	0	0	0	0	0	0	RJH	Other	STEP	1	12	10	0	462
590	35	0	0	0	0	0	0	RJH	Contingency	STEP	1	12	10	0	573
590	40	0	0	0	0	0	0	AM	Labour	STEP	10	280	271	0	9910.3485
590	40	0	0	0	0	0	0	AM	Materials and Equipment	STEP	10	280	271	0	11019.2557
590	40	0	0	0	0	0	0	AM	Other	STEP	10	280	271	0	707.469839
590	40	0	0	0	0	0	0	AM	Contingency	STEP	10	280	271	0	8443.65121
590	45	0	0	0	0	0	0	AM	Labour	STEP	6	281	276	0	304,146
590	45	0	0	0	0	0	0	AM	Materials and Equipment	STEP	6	281	276	0	118,470
590	45	0	0	0	0	0	0	AM	Other	STEP	6	281	276	0	91,266
590	45	0	0	0	0	0	0	AM	Contingency	STEP	6	281	276	0	134,247
590	55	0	0	0	0	0	0	RJH	Labour	STEP	6	281	276	0	14,028
590	55	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	6	281	276	0	4,035
590	55	0	0	0	0	0	0	RJH	Other	STEP	6	281	276	0	1,517
590	55	0	0	0	0	0	0	RJH	Contingency	STEP	6	281	276	0	5,874
590	90	0	0	0	0	0	0	AM	Labour	STEP	1	12	12	0	797
590	90	0	0	0	0	0	0	AM	Materials and Equipment	STEP	1	12	12	0	0
590	90	0	0	0	0	0	0	AM	Other	STEP	1	12	12	0	217
590	90	0	0	0	0	0	0	AM	Contingency	STEP	1	12	12	0	203

RES ALTERNATIVE **FUEL OWNER** **AECL**
WBS No 591
WHITESHELL
SILOS IN SHALLOW TRENCH **(SST)**

Lev 2	WBS Name	Sheet Totals ($k)
15	Siting	1,003
20	System Development	11,937
25	Safety Assessment	2,130
30	Licensing & Approvals	22,843
35	Public Affairs	1,718
40	Facility Design & Construction	51,509
45	Facility Operation	639,900
55	Environmental Assessment and Monitoring	25,454
90	Program Management	1,216
	Total Cost ($k)	**757,710**

Whiteshell SST Alternative	**757,710**
Siting Phase	**21,969**
Siting	1,003
EA	2,501
System Development	11,937
SA	682
L&A	2,910
Public Affairs	1,718
Program Mgmt	1,216
Construction Phase	**51,509**
Initial Fuel Transfers	46,630
Transition to Standalone	4,878
Operations Phase	**684,233**
Repeat & Repackaging	*242,634*
Initial fuel Transfers	4,511
Silos - 100 yrs	2,106
Silos - 200 yrs	2,106
Silos - 300 yrs	2,007
Storage Chamber Replacement - 200 yrs	16,217
Repackaging B to B - 300 yrs	203,623
PM for Repeats & Repackaging	12,063
Extended Monitoring	*441,599*
Program Mgmt	112,737
Monitoring Surveliance	415
Operation Indirects	253,817
Common Ancillary Services Ops	28,097
Fuel Integrity Monitoring	2,201
SA - Ops & Decommissioning	1,448
L&A - Ops Licence Renewal	19,933
Environmental Monitoring	22,952


Whiteshell SST Years 1>>145
(Total Cost $0.76B)
Annual Cost (M$)
Cumulative Cost (M$)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
1 8 15 22 29 36 43 50 57 64 71 78 85 92 99 106 113 120 127 134 141
Year
Annual
Cumulative

REACTOR EXTENDED STORE — SILOS IN SHALLOW TRENCH (SST)

ACTIVITY SUMMARY TO DATA TRANSFER — WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
591	15							Siting	Labour	STEP	OPG	RJH	1	9	9			555.9
591	15							Siting	Materials and Equipment	STEP	OPG	RJH	1	9	9			
591	15							Siting	Other	STEP	OPG	RJH	1	9	9			113.0
591	15							Siting	Contingency	STEP	OPG	RJH	1	9	9			334.4

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	556		555.9
Materials and Equipment			
Other	113		113.0
Contingency	334.4		334.4
Total	1003		1003

INSTRUCTIONS

Insert lower level WBS numbers as required	Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A Use appropriate CES cost	B Apply Factor	C Calc RES cost value	D Use appropriate CES cost	E Apply Factor	F Calc RES cost value	G Use appropriate CES cost	H Apply Factor	I Calc RES cost value	J Use appropriate CES cost	K Apply Factor	L Calc RES cost value	M Total Cost is calculated	Add Basis of estimate Note Ref Number

ACTIVITY DETAIL ESTIMATE

WBS LEVEL 1	2	3	4	5	6	7	8	WBS Description / Detail	Cost Category	Factor	Labour CES	Labour Factor	Labour RES	Materials and other Equipment CES	Materials and other Equipment Factor	Materials and other Equipment RES	Other CES	Other Factor	Other RES	Contingency CES	Contingency Factor	Contingency RES	TOTAL Cost $k	
591	15							**Siting**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
591	15	10						SITING MANAGEMENT																
								RES is 7 yrs vs 13 yrs for CES and shared amongst 7 sites	Labour	0.05	4897.7	0.05	244.885										245	
									Materials and Equipment	0.05					0.05									
									Other	0.05							1,300	0.05	65				65	
									Contingency	50%										50%	1.0	154.9	155	
591	15	70						PREFERRED SITE																
591	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING																
								Assume cost is 15% of a CES greenfield site	Labour	0.15	588.3	0.15	88.245										88	
									Materials and Equipment	0.15					0.15									
									Other	0.15							120	0.15	18				18	
									Contingency	50%										50%	1.0	53.1	53	
591	15	70	30					PREFERRED SITE - CHARACTERISATION																
								Assume cost is 15% of a CES greenfield site	Labour	0.15	1484.8	0.15	222.72										223	
									Materials and Equipment	0.15					0.15									
									Other	0.15							200	0.15	30				30	
									Contingency	0.5										50%	1.0	126.4	126	

Total	1,003
Check: Should = 0	

Labour	Materials and other Equipment	Other	Contingency
Total 556	Total	Total 113	Total 334.4
Check: Should = 0	Check: Should = 0	Check: Should = 0	Check: Should = 0

BASIS OF ESTIMATE NOTES - Insert references and notes

1

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REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN SHALLOW TRENCH (SST)
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
591	20							System Development	Labour	STEP	CTECH	AM	274	280	7			NO DATA TO FILL	7932.6
591	20							System Development	Materials and Equipment	STEP	CTECH	AM	274	280	7				430.0
591	20							System Development	Other	STEP	CTECH	AM	274	280	7				279.6
591	20							System Development	Contingency	STEP	CTECH	AM	274	280	7				3294.8

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost
Labour	7901
Materials and Equipment	430
Other	311
Contingency	3294.8
Total	11937

Check: Total minus budget Should = 0

Budget costs to Years by %

Check total	Total Cost $k
	7932.6
	430.0
	279.6
	3294.8
	11937

INSTRUCTIONS

Insert lower level WBS numbers as required

Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required

Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15

ACTIVITY DETAIL ESTIMATE

WBS LEVEL								WBS Description / Detail	Cost Category	Factor	A	B	C	D	E	F	G	H	I	J	K	L	M	
1	2	3	4	5	6	7	8				Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	TOTAL	
											Labour			Materials and other Equipment			Other			Contingency			Cost $k	
591	20							**System Development**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
591	20	2						SYSTEM DEVELOPMENT MANAGEMENT																
								Assume smaller size management team as for CES 50%, but shared between NBP and HQ, with a 5% allowance for operating on both sites.	Labour	0.26	6690.40	0.26	1756.23										1,756
								No entry in CES alternative cost category	Materials and Equipment															
								Assume smaller size management team as for CES 50%, but shared between NBP and HQ, with	Other	0.26							300.00	0.26	78.75				79
								Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	550.5	550
591	20	5						SYSTEM OPTIMIZATION																
								Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is	Labour	0.37	3303.70	0.37	1214.11										1,214
								No entry in CES alternative cost category	Materials and Equipment															
								Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Assume	Other	0.37							120.00	0.37	44.10				44
								Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.00	377.46	377
591	20	20						PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)																
								Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work	Labour	0.16	20750.10	0.16	3268.14										3,268

			Allow reduction due to no cask related feasibilty studies and no fuel container dismantling techniques carried out in this RES alternative, and shared between NBP and HQ	Materials and Equipment	0.10				4300.00	0.10	430.00									430
			Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Assume	Other	0.16							895.00	0.16	140.96						141
			Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.00	1919.55			1,920
591	20	30	STORAGE SYSTEM ENG'NG																	
			Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Assume additional documetation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. No cask/module related work	Labour	0.16	8143.20	0.16	1282.55												1,283
			No entry in CES alternative cost category	Materials and Equipment																
			Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Assume	Labour	0.16							200.00	0.16	31.50						32
			Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.00	328.51			329
591	20	40	SECURITY & SAFEGUARD ENG'NG																	
			Divide between NBP and HQ. Assume additional documentation required to support individual sites eg technical specs, safety documents etc. therefore an additional 5% is included onto factor. Smaller site than CES therefore a further factor of 50% is included	Labour	0.26	1447.70	0.26	380.02												380
			No entry in CES alternative cost category	Materials and Equipment																
			Divide between NBP and HQ. Assume additional documentation required to support individual sites eg technical specs, safety documents etc.	Other	0.26							60.00	0.26	15.75						16
			Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	118.7			119

																			Total	**11,937**
																			Check: Should = 0	
						Total		7,901	Total		430	Total		311	Total		3,294.8			
						Check: Should = 0			Check: Should = 0			Check: Should = 0			Check: Should = 0					

BASIS OF ESTIMATE NOTES - Insert references and notes

1

2

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN SHALLOW TRENCH (SST)
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
591	25							Safety Assessment	Labour	STEP	OPG	RJH	1	281	40			1284.3
591	25							Safety Assessment	Materials and Equipment	STEP	OPG	RJH	1	281	40			
591	25							Safety Assessment	Other	STEP	OPG	RJH	1	281	40			237.5
591	25							Safety Assessment	Contingency	STEP	OPG	RJH	1	281	40			608.7

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	1284		1284.3
Materials and Equipment			
Other	238		237.5
Contingency	608.7		608.7
Total	2130		2130

INSTRUCTIONS

Insert lower level WBS numbers as required

Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required

Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15

ACTIVITY DETAIL ESTIMATE

										A	B	C	D	E	F	G	H	I	J	K	L	M	
WBS LEVEL								WBS Description / Detail	Cost Category	Factor	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
1	2	3	4	5	6	7	8				Labour			Materials and other Equipment			Other			Contingency			TOTAL	
																							Cost $k	
591	25							**Safety Assessment**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
591	25	10						SAFETY ASSESSMENT MANAGEMENT																
								RES = 10 yrs vs CES = 17 yrs. Share costs over 7 sites. Thus factor is 0.08. However due to inefficencies of multiple sites increase to 0.2	Labour	0.05	5218.2	0.05	260.91											261
									Materials and Equipment	0.05				0.05										
									Other	0.05						850	0.05	42.5					43
									Contingency	40%									40%	1.0	121.4		121
591	25	30						SA - SITING																
									Labour		2287.5													
									Materials and Equipment															
									Other							3,850								
									Contingency	40%									40%	1.0				
591	25	40						SA - OPERATING LICENSE																
									Labour	0.1	1540.5	0.1	154.05											154
									Materials and Equipment	0.1				0.1										
									Other	0.1						300	0.1	30					30
									Contingency	40%									40%	1.0	73.6		74
591	25	50						SA - FACILITY OPERATIONS																
								RES spans Y13 to Y281 or 269 yrs vs 330 yrs for CES. RES has 0.08 staff and CES has 1 staff. Factor is 269/330 x 0.08/1 = 0.065	Labour	0.065	9604.8	0.065	624.312											624

				Materials and Equipment	1				1									
			Equivalent annual expenses at $0.5K/a x 269 yrs	Other	1						135	1	135					135
				Contingency	40%									40%	1.0	303.7		304
591	25	70	SA - DECOMMISSIONING (Processing Facilities)															
			RES has 1 decommissioning events - while CES has 3. Costs can be shared between sites with similar technology; thus factor to 0.15	Labour	0.1	2449.9	0.1	244.99										245
				Materials and Equipment	0.1				0.1									
				Other	0.1						300	0.1	30					30
				Contingency	40%									40%	1.0	110.0		110
																	Total	**2,130**
																	Check: Should = 0	
						Total		1,284	Total			Total		238	Total			608.7
						Check: Should = 0			Check: Should = 0			Check: Should = 0			Check: Should = 0			

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE — SILOS IN SHALLOW TRENCH (SST)
ACTIVITY SUMMARY TO DATA TRANSFER — WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
591	30							Licensing & Approvals	Labour	STEP	OPG	RJH	3	281	279		NO DATA TO FILL	3114.3
591	30							Licensing & Approvals	Materials and Equipment	STEP	OPG	RJH	3	281	279			
591	30							Licensing & Approvals	Other	STEP	OPG	RJH	3	281	279			15160.2
591	30							Licensing & Approvals	Contingency	STEP	OPG	RJH	3	281	279			4568.6

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check: Total minus budget Should = 0 — Check total	Total Cost $k	Budget costs to Years by %
Labour	3114	0.0	3114.3	
Materials and Equipment				
Other	15160		15160.2	
Contingency	4568.6		4568.6	
Total	22843	0.0	22843	

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE

1	2	3	4	5	6	7	8	WBS Description / Detail	Cost Category	Factor	A Labour: Use appropriate CES cost	B Labour: Apply Factor	C Labour: Calc RES cost value	D Materials and other Equipment: Use appropriate CES cost	E Materials and other Equipment: Apply Factor	F Materials and other Equipment: Calc RES cost value	G Other: Use appropriate CES cost	H Other: Apply Factor	I Other: Calc RES cost value	J Contingency: Use appropriate CES cost	K Contingency: Apply Factor	L Contingency: Calc RES cost value	M TOTAL Cost $k: Total Cost is calculated	Add Basis of estimate Note Ref Number
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15															
591																								
591	30							**Licensing & Approvals**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
591	30	30						LIAISON WITH CNSC																
								Duration 4 yrs vs 10 yrs in CES and cost shared between 7 sites. Thus factor is 0.057. However due to inefficiencies of multiple sites increase to 0.2	Labour	0.2	555	0.2	111										111	
									Materials and Equipment	0.2					0.2									
									Other	0.2							40	0.2	8				8	
									Contingency	0.25										25%	1.0	29.8	30	
591	30	50						CNSC CONSTRUCTION LICENCE																
								Some inefficiencies gained due to multiple sites	Labour	0.2	2631	0.2	526.2										526	
									Materials and Equipment	0.2					0.2									
									Other	0.2							6,264	0.2	1252.8				1,253	
									Contingency	0.25										25%	1.0	444.8	445	
591	30	60						OTHER GOVN'MT APPROVALS																
591	30	60	10					APPROVAL REQUIREMENTS																

				Duration 4 yrs vs 10 yrs in CES and cost shared between 7 sites. Thus factor is 0.057. However due to inefficiencies of multiple sites increase to 0.2	Labour	0.2	337	0.2	67.4									67
					Materials and Equipment	0.2				0.2									
					Other	0.2					0.2								
					Contingency	0.25								25%	1.0	16.9			17
591	30	60	30	FEDERAL APPROVALS															
					Labour	0.2	133	0.2	26.6										27
					Materials and Equipment	0.2				0.2									
					Other	0.2					0.2								
					Contingency	0.25								25%	1.0	6.7			7
591	30	60	40	PROVINCIAL APPROVALS															
					Labour	0.2	133	0.2	26.6										27
					Materials and Equipment	0.2				0.2									
					Other	0.2					0.2								
					Contingency	0.25								25%	1.0	6.7			7
591	30	60	50	MUNICIPAL APPROVALS															
					Labour	0.2	133	0.2	26.6										27
					Materials and Equipment	0.2				0.2									
					Other	0.2					0.2								
					Contingency	0.25								25%	1.0	6.7			7
591	30	65		CNSC OPERATING LICENCE (Initial Application)															
					Labour	0.2	513	0.2	102.6										103
					Materials and Equipment	0.2				0.2									
					Other	0.2					902	0.2	180.4						180
					Contingency	0.25								25%	1.0	70.8			71
591	30	70		CNSC OPERATING LICENCE (Maintenance & Renewal)															
				CES duration is 330 years. Costs incurred in RES during period Y13 to Y281 or 269 years. RES has 0.08 staff vs CES with 1 staff. Factor is 269/330 x 0.08/1 = 0.068	Labour	0.068	32754	0.068	2227.272									2,227
					Materials and Equipment	1				1									
				Expenses at $51K/a x 269 yrs	Other	1					13,719	1	13719						13,719
					Contingency	0.25								25%	1.0	3,986.6			3,987

Total	**22,843**
Check: Should = 0	

Total 3,114 Total Total 15,160 Total 4,568.6

Check: Should = 0 Check: Should = 0 Check: Should = 0 Check: Should = 0

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE — SILOS IN SHALLOW TRENCH (SST)

ACTIVITY SUMMARY TO DATA TRANSFER — WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
591	35							Public Affairs	Labour	STEP	OPG	RJH	1	12	10			683.8
591	35							Public Affairs	Materials and Equipment	STEP	OPG	RJH	1	12	10			
591	35							Public Affairs	Other	STEP	OPG	RJH	1	12	10			461.8
591	35							Public Affairs	Contingency	STEP	OPG	RJH	1	12	10			572.8

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %
Check total	**Total Cost $k**	

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost		
Labour	684		683.8
Materials and Equipment			
Other	462		461.8
Contingency	572.8		572.8
Total	1718		1718

INSTRUCTIONS

										A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																						**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																
591	35							**Public Affairs**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
591	35	45						PUBLIC AFFAIRS - PREFERRED SITE																
									Labour	0.05	3046.2	0.05	152.31										152	
									Materials and Equipment	0.05				0.05										
									Other	0.05							600	0.05	30				30	
									Contingency	50%										50%	1.0	91.2	91	
591	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL																
									Labour	0.05	4569.3	0.05	228.465										228	
									Materials and Equipment	0.05				0.05										
									Other	0.05							1,450	0.05	72.5				73	
									Contingency	50%										50%	1.0	150.5	150	
591	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION																
									Labour	0.05	2528.9	0.05	126.445										126	
									Materials and Equipment	0.05				0.05										
									Other	0.05							800	0.05	40				40	
									Contingency	50%										50%	1.0	83.2	83	
591	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT																
									Labour	0.05	3530.8	0.05	176.54										177	

				Materials and Equipment	0.05			0.05								
				Other	0.05					170	0.05	8.5				9
				Contingency	50%								50%	1.0	92.5	93
591	35	120	Community Offsets & Benefits													
				Labour	0.15	0.15										
				Materials and Equipment	0.15			0.15								
				Other	0.15					2,072	0.15	310.8				311
				Contingency	50%								50%	1.0	155.4	155
															Total	**1,718**
															Check: Should = 0	
						Total	684	Total		Total		462	Total		572.8	
						Check: Should = 0		Check: Should = 0		Check: Should = 0			Check: Should = 0			

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN SHALLOW TRENCH (SST)
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
591	40							Facility Design & Construction	Labour	STEP	CTECH	AM	10	280	271			NO DATA TO FILL	18033.7
591	40							Facility Design & Construction	Materials and Equipment	STEP	CTECH	AM	10	280	271				18338.9
591	40							Facility Design & Construction	Other	STEP	CTECH	AM	10	280	271				1968.9
591	40							Facility Design & Construction	Contingency	STEP	CTECH	AM	10	280	271				13167.0

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	18034		18033.7
Materials and Equipment	18339		18338.9
Other	1969		1968.9
Contingency	13167.0		13167.0
Total	51509		51509

INSTRUCTIONS

										A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
591	40							**Facility Design & Construction**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
591	40	10						SITE IMPROVEMENTS																
								a 10% allowance of the CES costs, applied to the site improvements	Labour	0.10	45,930.4	0.1	4,593.0										4,593
									Materials and Equipment	0.10				58,350.0	0.1	5,835.0								5,835
								no property acquisition required	Other								3,375.0							
								Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	5,214.0		5,214
591	40	30						COMMON ANCILLARY FACILITIES																
591	40	30	10					ADMIN AND SUPPORT FACILITIES																
591	40	30	10	1				ADMIN AND VISITOR RECEPTION BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in	Labour		486.3										comment 7			
									Materials and Equipment					784.2										
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0			
591	40	30	10	2				OPS SUPPT & HEALTH PHYSICS BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour		1,294.8										comment 7			
									Materials and Equipment					1,612.6										
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0			
591	40	30	10	3				EQUIP STORAGE AND MAINT'CE BLDG																
								Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour		1,262.1										comment 7			
									Materials and Equipment					1,675.0										

					No entry in CES alternative cost category	Other															
					Percentage for contingency assumed same as for CES	Contingency	20%											20%	1.0		
591	40	30	10	5	ACTIVE SOLID WASTE HDLG BLDG																
					A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	459.9	0.3	138.0											138
						Materials and Equipment	0.3				1,135.0	0.3	340.5								341
					No entry in CES alternative cost category	Other															
					Percentage for contingency assumed same as for CES	Contingency	30%											30%	1.0	143.5	144
591	40	30	10	6	SOLID WASTE STORAGE AREA																
					A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	458.8	0.3	137.6											138
						Materials and Equipment	0.3				437.5	0.3	131.3								131
					No entry in CES alternative cost category	Other															
					Percentage for contingency assumed same as for CES	Contingency	30%											30%	1.0	80.7	81
591	40	30	10	7	ACTIVE LIQ/W TRT'MT BLDG																
					A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	359.4	0.3	107.8											108
						Materials and Equipment	0.3				1,727.0	0.3	518.1								518
					No entry in CES alternative cost category	Other															
					Percentage for contingency assumed same as for CES	Contingency	30%											30%	1.0	187.8	188
591	40	30	10	8	LOW LVL LIQ/W STRG BLDG																
					A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	373.7	0.3	112.1											112
						Materials and Equipment	0.3				1,426.0	0.3	427.8								428
					No entry in CES alternative cost category	Other															
					Percentage for contingency assumed same as for CES	Contingency	30%											30%	1.0	162.0	162
591	40	30	10	9	WAREHOUSE BLDG																
					Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour		470.9										comment 7			
						Materials and Equipment					550.0										
					No entry in CES alternative cost category	Other															
					Percentage for contingency assumed same as for CES	Contingency	20%											20%	1.0		
591	40	30	10	10	GUARDHOUSE AND SECURITY FENCE																
					Building and security exist therefore new building and fence not required. Allowance for refurbishment covered in ***/45/20/50	Labour		631.2										comment 7			
						Materials and Equipment					553.7										
						Other															
					Increased contingency than CES due to RES facility footprint size not confirmed and therefore length of fence, not yet known	Contingency	20%											20%	1.0		
591	40	30	10	11	TRUCK INSP'N / WASH STATION																
					not req'd as no fuel transported off site	Labour		872.2										comment 7			
						Materials and Equipment					1,075.0										
						Other							389.4								
					Percentage for contingency assumed same as for CES	Contingency	20%											20%	1.0		
591	40	30	10	12	UTILITY BLDG																
					A 30% allowance of CES costs applied to the refurbishment of the existing site facilities	Labour	0.3	1,023.2	0.3	307.0											307
						Materials and Equipment	0.3				1,257.0	0.3	377.1								377
					No entry in CES alternative cost category	Other															
					Percentage for contingency assumed same as for CES	Contingency	30%											30%	1.0	205.2	205

591 40	30	10	13	TEST FACILITY																		
				Taken as being independent of fuel inventory stored. Same size bldg as CES, facility will be shared by Whiteshell and Chalk River , therefore cost will be 50% of CES costs.	Labour	0.5	766.8	0.5	383.4												383
					Materials and Equipment	0.5				1,675.0		0.5	837.5										838
				No entry in CES alternative cost category	Other																		
				Percentage for contingency assumed same as for CES	Contingency	20%												20%		1.0	244.2		244
591 40	30	20		OTHER SITE SYSTEMS																			
591 40	30	20	1	FIRE PROTECTION SYSTEMS																			
				assumed aailable and turned over to RES during transition	Labour		1,022.2														comment 7		
					Materials and Equipment					676.2													
				No entry in CES alternative cost category	Other																		
				Percentage for contingency assumed same as for CES	Contingency	25%												25%		1.0			
591 40	30	20	2	SECURITY AND COMMUNICATION SYSTEM																			
				assumed aailable and turned over to RES during transition	Labour		607.5														comment 7		
					Materials and Equipment					600.0													
				No entry in CES alternative cost category	Other																		
				Percentage for contingency assumed same as for CES	Contingency	25%												25%		1.0			
591 40	30	20	3	ELECTRICAL AND EMERGENCY POWER																			
				assumed aailable and turned over to RES during transition	Labour		1,939.6														comment 7		
					Materials and Equipment					1,932.0													
				No entry in CES alternative cost category	Other																		
				Percentage for contingency assumed same as for CES	Contingency	25%												25%		1.0			
591 40	30	20	4	SANITARY SEWER SYSTEM																			
				assumed aailable and turned over to RES during transition	Labour		339.2														comment 7		
					Materials and Equipment					310.5													
				No entry in CES alternative cost category	Other																		
				Percentage for contingency assumed same as for CES	Contingency	25%												25%		1.0			
591 40	30	20	5	POTABLE WATER SYSTEM																			
				assumed aailable and turned over to RES during transition	Labour		371.6														comment 7		
					Materials and Equipment					148.0													
				No entry in CES alternative cost category	Other																		
				Percentage for contingency assumed same as for CES	Contingency	25%												25%		1.0			

591 40	30	20	6	RETENTION/SEDIMENTATION POND																
				assumed aailable and turned over to RES during transition	Labour		874.4											comment 7		
					Materials and Equipment					189.6										
				No entry in CES alternative cost category	Other															
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0			
591 40	30	20	7	STORM WATER DETENTION POND																
				assumed aailable and turned over to RES during transition	Labour		387.8											comment 7		
					Materials and Equipment					93.5										
				No entry in CES alternative cost category	Other															
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0			
591 40	30	20	8	CONST'N MAT'L STOCKPILE AREA																
				not req'd, concrete brought in as req'd from off-site	Labour		1,039.2											comment 7		
					Materials and Equipment					625.0										
				No entry in CES alternative cost category	Other															
				Percentage for contingency assumed same as for CES	Contingency	15%										15%	1.0			
591 40	30	20	9	SITE MATERIALS STORAGE AREA																
				assumed aailable and turned over to RES during transition	Labour		1,169.5											comment 7		
					Materials and Equipment					655.0										
				No entry in CES alternative cost category	Other															
				Percentage for contingency assumed same as for CES	Contingency	15%										15%	1.0			
591 40	30	20	10	ACCESS ROADS AND VEHICLE COMPOUNDS																
				assumed aailable and turned over to RES during transition	Labour		1,319.9											comment 7		
					Materials and Equipment					1,866.9										
				No entry into cost category	Other															
				Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0			
591 40	30	30		CONST'N INDIRECTS ANCILLARY FACILITIES																
				assumed aailable and turned over to RES during transition	Labour		4,406.4											comment 7		
					Materials and Equipment					6,610.9										
				No entry into cost category	Other															
				Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0			
591 40	40			STORAGE DESIGN & CONST'N (CHAMBERS)																
				Construction of the shallow trench storage chamber. Based on CVST CES stage 1 storage const'n of 4 chambers and access tunnel. The CES design content for stages 2,3&4 has been omitted. 1 chamber length approx 30m for RES as opposed to 4 CES chambers at length 160m. Therefore factor due to length & quantity & use 6/10 rule.	Labour	0.16	72,832.7	0.2	11,611.6													11,612
					Materials and Equipment	0.16				59,932.2	0.2	9,554.9								9,555
				expenses factor taken same as labour	Other	0.27							7,290.0	0.3	1,932.3					1,932
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	6,929.6		6,930
591 40	50			STORAGE CONSTRUCTION (SILOS)																
				Construction of 16 storage silos. 1 silo contains standard fuel, 1 silo as spare and remaining silos contain non standard fuel. Cost per silo = $60K. Allow 67% labour 33% materials.	Labour	10.72	60.0	10.72	643.2													643
					Materials and Equipment	5.28				60.0	5.28	316.8								317
				no costs in this category	Other															
				no contingency on cost	Contingency												1.0			

591 40	650	ENERGY CONSUMPTION														
		No entry into cost category	Labour													
		No entry into cost category	Materials and Equipment													
		consumption for the construction of storage chamber and ancillary buildings	Other	0.10						366.3	0.1	36.6				37
		Contingency included in cost (built into power consumption calculation)	Contingency											1.0		
															Total	**51,509**
															Check: Should = 0	
				Total	18,034	Total	18,339	Total	1,969	Total	13,167.0					
				Check: Should = 0		Check: Should = 0		Check: Should = 0		Check: Should = 0						

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN SHALLOW TRENCH (SST)
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
591	45							Facility Operation	Labour	STEP	CTECH	AM	6	281	276			306965.5
591	45							Facility Operation	Materials and Equipment	STEP	CTECH	AM	6	281	276			110906.2
591	45							Facility Operation	Other	STEP	CTECH	AM	6	281	276			90498.7
591	45							Facility Operation	Contingency	STEP	CTECH	AM	6	281	276			131529.5

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0

Budget costs to Years by %

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	306965		306965.5
Materials and Equipment	110906		110906.2
Other	90499		90498.7
Contingency	131529		131529.5
Total	639900		639900

INSTRUCTIONS

										A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																						**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																
591	45							**Facility Operation**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
591	45	10						OPERATIONS FUEL TRANSFER																
591	45	10	5					PROGRAM MANAGEMENT - INITIAL FUEL TRANSFER																
									Labour	0.02	110,251.0	0.0	2,205.0										2,205	
								Program management runs fromY11 to 13. (y11-12 const'n 13 fuel transfer ops) therefore factoring labour costs for CES which is 30 years is factored 3/30 and spread project management over 7 sites and acknowledge inefficiency use 20% factor																
								No entry in CES alternative cost category	Materials and Equipment															
								Annual cost = $258/a x 3 yrs	Other	1.00							774	1.0	774.0				774	2
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	595.8	596	
591	45	10	25					MONITORING AND SURVEILLANCE (FUEL TRANSFER)																
								RES has a reduced duration for monitoring the fuel, also the fuel inventory to be monitored is lower 9 baskets/4717baskets. No labour required, existing site staff will undertake operations.	Labour		19,456.0												
								allow slight reduction in costs for monitoring equipment	Materials and Equipment	0.75				53.0	0.8	39.8							40	
								No entry in CES alternative cost category	Other															
								Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	19.9	20	
591	45	10	30					OPERATION INDIRECTS (FUEL TRANSFER)																
								RES has a reduced duration for monitoring the fuel, also the fuel inventory to bemonitored is lower 9baskets/4717baskets and include reduction in security (CES additional fuel receipt security omitted) No labour required, existing site staff will undertake operations.	Labour														

				CES spares costs are for processing bldg. Relatively low spares for a starage chamber allow 10%	Materials and Equipment	0.1				1,284.0	0.1	128.4											128		
				additional fuel receipt security/armed response omitted. Other category is for energy consumption only.	Other	0.033							16,380.0	0.0	546.0								546		
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	202.3					202		
591	45	10	40	STORAGE OPERATIONS																					
				Smaller fuel inventory for RES = 1 silo with 9 baskets, 1 spare silo and 14 silos with non standard waste/fuel. Assume transfer ops based on fuel only ie 9 baskets therefore ratio = 9/4717 No labour required, existing site staff will undertake operations.	Labour		29,706.0																		
				none applicable to basket fuel alternatives	Materials and Equipment					300.0															
				No entry in CES alternative cost category	Other																				
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0								
591	45	20		OPERATIONS - EXTENDED MONITORING																					
591	45	20	5	PROGRAM MANAGEMENT																					
				Entries in CES DET applicable to RES but duration 268 years RES & 300 years CES therefore268/300. Program management spread over 7 sites with Whiteshell assumed to have 0.8 staff vs 9 in CES. Thus combined factor	Labour	0.079	312,354.0	0.1	24,803.2														24,803	6	
				No entry in CES alternative cost category	Materials and Equipment																				
				Annual cost = $258/a x 268 yrs	Other	1.00							69,144.0	1.0	69,144.0								69,144	1,2	
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	18,789.4					18,789		
591	45	20	40	MONITORING AND SURVEILLANCE -EXTENDED MONITORING																					
				CES monitoring and surveillance duration was 300 yrs for 4717 baskets, RES is 268 years for 9 baskets. Whiteshell assumed to have 0.5 staff for RES vs 5 in CES. Combined factor based on duration, fuel inventory and staffing levels.	Labour	0.0002	49,716.0	0.0	8.5														8	6	
				annual costs = $1k/a x 268 years	Materials and Equipment	1.00				268.0	1.0	268.0											268	7	
				No entry in CES alternative cost category	Other																				
				Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	138.2					138		
591	45	20	50	OPERATION INDIRECTS (EXTENDED MONITORING)																					
					Labour	0.18	875,048.0	0.2	160,940.2														160,940	6	
				Entries in CES DET applicable to RES but duration 268years RES & 300 years CES. Staff for RES = 7 vs 34 in CES. Combined factor = 268/300 x 7/34. M&E costs are $75k/a x 268 years	Materials and Equipment	1.00				20,100.0	1.0	20,100.0											20,100	7	
				Armed response = $50k/a + energy costs at $3k/a. total = $53k x 268 years	Other	1.00							14,204.0	1.0	14,204.0								14,204	7	
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	58,573.3					58,573		
591	45	20	60	COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)																					
				RES has duration 227 years, CES has 300 years. RES staff is 1 vs 5 in CES. Factor is 227/300 x 1/5	Labour	0.15	148,529.0	0.2	22,477.4														22,477	6	
				No entry in CES alternative cost category	Materials and Equipment																				
				No entry in CES alternative cost category	Other																				

					Percentage for contingency assumed same as for CES	Contingency	25%												25%	1.0	5,619.3	5,619	
591	45	20	70		FUEL INTEGRITY MONITORING (25 YEARLY)																	
					RES has duration 276 years, CES has 300 years. RES staff is 0.1 vs 0.5 in CES. Factor is 276/300 x 0.1/0.5	Labour	0.1	4,631.0	0.1	639.1											639	6
						Materials and Equipment	1.0				690.0	1.0	690.0								690	7
						Other	1.0							138.0	1.0	138.0					138	7
					Percentage for contingency assumed same as for CES	Contingency	50%												50%	1.0	733.5	734	
591	45	30			OPERATIONS - FACILITY REPEATS																	
591	45	30	20		SILOS 100 YEAR REPLACEMENT																	
591	45	30	20	10	DEMOLISH EXISTING STORAGE SILOS																	
					costs taken from CES basket vault demolition, rated at $104 per tonne of reinforced concrete. Each silo = 115 tonne x 16 silos =1,840Te. Split 50/50 labour/materials	Labour	920.00	0.104	920.0	95.7											96	5
						Materials and Equipment	920.00				0.104	920.0	95.7								96	5
					No costs in this category	Other																
					Percentage for contingency assumed same as for CES	Contingency	30%												30%	1.0	57.4	57	
591	45	30	20	20	SILO CONSTRUCTION																	
					Assume same costs as for initial construction of the storage silos. 16 silos constructed at this point to house standard and non standard fuelcost per silo = $60K. Allow 67% labour 33% materials.	Labour	10.72	60.0	10.7	643.2											643	3
						Materials and Equipment	5.28				60.0	5.3	316.8								317	3
					No costs in this category	Other																
					Percentage for contingency for silos construction assumed same as for CES basket vaults construction	Contingency	30%												30%	1.0	288.0	288	
591	45	30	20	30	TRANSFER OPERATIONS																	
					Smaller fuel inventory for RES = 1 silo with 9 baskets, 1 spare silo and 14 silos with non standard waste/fuel. Assume transfer ops based on fuel only ie 9 baskets therefore ratio = 9/4717. Labour reduced, existing site staff will undertake operations for first 200 years.	Labour	0.00048	990.0	0.00	0.5											0.47928	
					No costs in this category	Materials and Equipment																
					Armed response included at rate of $50k/a based on 2 years duration - see note 8.	Other	1							100.0	1.0	100.0					100	8
					Percentage for contingency assumed same as for CES	Contingency	30%												30%	1.0	30.1	30.14378	
591	45	30	20	40	WASTE DISPOSAL																	
					No costs in this category	Labour																
					No costs in this category	Materials and Equipment																
					costs taken from CES basket vault waste disposal, rated at $200 per tonne of reinforced concrete. Each silo = 115 tonne x 16 silos =1,840Te.	Other	1840							0.2	1,840.0	368.0					368	5
						Contingency	30%												30%	1.0	110.4	110	
591	45	30	30		SILOS 200 YEAR REPLACEMENT																	
					assumed same as 100 yr replacement	Labour				739.4												739	
					assumed same as 100 yr replacement	Materials and Equipment							412.5									412	
					assumed same as 100 yr replacement	Other										468.0						468	
					assumed same as 100 yr replacement	Contingency															486.0	486	
591	45	30	40		SILOS 300 YEAR REPLACEMENT																	
					assumed same as 100 yr replacement	Labour				740.8												741	
					assumed same as 100 yr replacement	Materials and Equipment							412.5									412	
					assumed same as 100 yr replacement	Other										368.0						368	9
					Percentage for contingency assumed same as for CES	Contingency															486.0	486	

591	45	30	50			STORAGE CHAMBER 200 YEAR REPLACEMENT																	
						Replacement of the shallow trench storage chamber. Based on CVST CES chambers replacement. 1 chamber length approx 70m for RES as opposed to 16 CES chambers at length 160m. Therefore factor due to length & quantity & use 6/10 rule.	Labour	0.12	110,400.0	0.1	12,737.5								12,737	
							Materials and Equipment	0.12				0.1											
							Other	0.12						2,048.4	0.1	236.3					236	
						Percentage for contingency assumed same as for CES	Contingency	25%									25%	1.0	3,243.5	3,243	
591	45	40				OPERATIONS - REPACKAGING																	
591	45	40	5			PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)																	
							Labour	0.02	440,778.0	0.0	10,052.8									10,053	
						Entries in CES DET applicable to RES but duration 13 years RES 100yr=(2license+2const/ops 109-112) + 200yr=(2license+2const/ops 209-212)+ 300yr=(2license+2const'n+1ops 277-281) compared to 114 years CES therefore13/114 of labour costs spread project management over 7 sites and acknowledge inefficiency use 20% factor													
						No entry in CES alternative cost category	Materials and Equipment																
						see note 1. no property tax assumed this site	Other																1
						Percentage for contingency assumed same as for CES	Contingency	20%									20%	1.0	2,010.6	2,011	
591	45	40	10	40		COMMON ANCILLARY FACILITIES (REPLACEMENT)			comment 7														
						only require full ancillary buildings (13) at 300yr RPBB event, for 100 & 200yr facility repeats, the replacement of 7 ancillary buildings is required. Therefore combined factor = ((7/13)*2) + 1	Labour	2.1	21,056.2	2.1	43,732.1								43,732	
							Materials and Equipment	2.1				29,785.1	2.1	61,861.4									61,861
						No entry in CES alternative cost category	Other																
						Percentage for contingency assumed same as for CES	Contingency	22%									22%	1.0	23,230.6	23,231	
591	45	40	10	600	30	ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)																	
						duration 7 years RES compared to 30 years CES. Factor =7/30	Labour	0.2	11,882.0	0.2	2,772.5									2,772	4
						No entry in CES alternative cost category	Materials and Equipment																
						No entry in CES alternative cost category	Other																
						Percentage for contingency assumed same as for CES	Contingency	25%									25%	1.0	693.1	693	
591	45	40	40			BASKET TO BASKET 300 YEAR REPACKAGING																	
591	45	40	40	05		CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)																	
						assumed same facility as CES therefore factor = 1	Labour	1.0	476.1	1.0	476.1									476	
						assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				354.6	1.0	354.6									355
						assumed same facility as CES therefore factor = 1	Other	1.0						228.4	1.0	228.4					228	
						same contingency as for CES	Contingency	30%									30%	1.0	317.7	318	
591	45	40	40	10		PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)																	
591	45	40	40	10	20	RPBB EQUIP. DESIGN, SUPPLY & INSTALL																	
591	45	40	40	10	20	10	RECEIPT & TRANSFER (EQUIP)																
						assumed same facility as CES therefore factor = 1	Labour	1.0	70.8	1.0	70.8									71	
						assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				1,415.0	1.0	1,415.0									1,415
						assumed same facility as CES therefore factor = 1	Other	1.0						74.3	1.0	74.3					74	
						same contingency as for CES	Contingency	30%									30%	1.0	468.0	468	

591	45	40	40	10	20	20	BASKET TO BASKET FUEL TRANSFER													
							assumed same facility as CES therefore factor = 1	Labour	1.0	2,319.4	1.0	2,319.4								2,319
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				11,597.0	1.0	11,597.0					11,597
							assumed same facility as CES therefore factor = 1	Other	1.0							695.8	1.0	695.8		696
							same contingency as for CES	Contingency	30%									30%	1.0	4,383.7	4,384
591	45	40	40	10	20	30	BASKET DECONTAMINATION													
							assumed same facility as CES therefore factor = 1	Labour	1.0	854.6	1.0	854.6								855
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,563.0	1.0	4,563.0					4,563
							assumed same facility as CES therefore factor = 1	Other	1.0							256.4	1.0	256.4		256
							same contingency as for CES	Contingency	30%									30%	1.0	1,702.2	1,702
591	45	40	40	10	30		RPBB BUILDING DESIGN AND CONSTRUCTION													
							assumed same facility as CES therefore factor = 1	Labour	1.0	4,160.0	1.0	4,160.0								4,160
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,280.0	1.0	4,280.0					4,280
							assumed same facility as CES therefore factor = 1	Other	1.0							832.0	1.0	832.0		832
							same contingency as for CES	Contingency	30%									30%	1.0	2,781.6	2,782
591	45	40	40	10	60		BUILDING SERVICES (RPB)													
							assumed same facility as CES therefore factor = 1	Labour	1.0	4,447.8	1.0	4,447.8								4,448
							assumed same facility as CES therefore factor = 1	Materials and Equipment	1.0				4,153.8	1.0	4,153.8					4,154
							assumed same facility as CES therefore factor = 1	Other	1.0							1,309.4	1.0	1,309.4		1,309
							same contingency as for CES	Contingency	25%									25%	1.0	2,477.8	2,478
591	45	40	40	10	70		COMMISSIONING (RPB)													
							assumed same facility as CES therefore factor = 1	Labour	1.0	668.2	1.0	668.2								668
							No entry in CES alternative cost category	Materials and Equipment												
							assumed same facility as CES therefore factor = 1	Other	1.0							126.3	1.0	126.3		126
							same contingency as for CES	Contingency	50%									50%	1.0	397.3	397
591	45	40	40	10	80		CONST'N INDIRECTS (RPB)													
							assumed same facility as CES therefore factor = 1	Labour	1.0	6,299.6	1.0	6,299.6								6,300
							No entry in CES alternative cost category	Materials and Equipment												
							assumed same facility as CES therefore factor = 1	Other	1.0							241.5	1.0	241.5		242
							same contingency as for CES	Contingency	30%									30%	1.0	1,962.3	1,962
591	45	40	40	400			CONSTRUCTION MANAGEMENT (RPB)													
							assumed same facility as CES therefore factor = 1	Labour	1.0	4,690.6	1.0	4,690.6								4,691
							No entry in CES alternative cost category	Materials and Equipment												
							No entry in CES alternative cost category	Other												
							same contingency as for CES	Contingency	30%									30%	1.0	1,407.2	1,407
591	45	40	40	500			COMMISSIONING MANAGEMENT (RPB)													
							assumed same facility as CES therefore factor = 1	Labour	1.0	113.3	1.0	113.3								113
							No entry in CES alternative cost category	Materials and Equipment												

					Description	Category	Factor	Labour base	Labour factor	Labour cost	M&E base	M&E factor	M&E cost	Other base	Other factor	Other cost	Contingency %	Contingency factor	Contingency cost	Total	Note
					assumed same facility as CES therefore factor = 1	Other	1.0							13.5	1.0	13.5				14	
					same contingency as for CES	Contingency	50%										50%	1.0	63.4	63	
591	45	40	40	600	REPACKAGING OPERATIONS (RPB)																
					Labour for repackaging operations for CES is for a fuel inventory of 4717 baskets. RES has 9 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 9/4717	Labour	0.002	3,960.8	0.0	7.6										8	
					the same factor for labour is used for procurement of new baskets	Materials and Equipment	0.002				23,585.0	0.0	45.0							45	
					the same factor for labour is used for waste disposal of old baskets	Other	0.002							378.0	0.0	0.7				1	
					same contingency as for CES	Contingency	30%										30%	1.0	16.0	16	
591	45	40	40	700	OPERATION INDIRECTS (RPB)																
					operation indirect labour costs for CES are for a duration of 10 yrs RES operations are for 1 yr max therefore a factor of 0.1 is used	Labour	0.1	2,678.3	0.1	267.8										268	
					Assume same spares and consumables required as identical equipment is used for both CES & RES. Therefore factor = 1	Materials and Equipment	1.0				172.8	1.0	172.8							173	
					Assume energy consumption for running of facility can be factored relative to duration of facility operation = 1/10yrs = 0.1. Armed response included at rate of $50k/a based on 1 year duration - see note 8.	Other	1.0							374.0	1.0	374.0				374	8
					same contingency as for CES	Contingency	30%										30%	1.0	244.4	244	
591	45	40	40	800	STORAGE OPERATIONS (RPB)																
					Labour for storage operations for CES is for a fuel inventory of 4717 baskets. RES has 9 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 9/4717	Labour	0.002	990.2	0.0	1.9										2	
					No entry in CES alternative cost category	Materials and Equipment															
					No entry in CES alternative cost category	Other															
					same contingency as for CES	Contingency	30%										30%	1.0	0.6	1	

Total	**639,900**
Check: Should = 0	

Total 306,965	Total 110,906	Total 90,499	Total 131,529.5
Check: Should = 0	Check: Should = 0	Check: Should = 0	Check: Should = 0

BASIS OF ESTIMATE NOTES - Insert references and notes

1 It is assumed that there is no property tax on facilities located on the Whiteshell site. Reference note 5 on table 18 - Cost Estimate Report 1105/MD18084/REP/19

2 258k$/a made up of expenses from table 18 in report (15+118+50+50+25). No property tax or PST included.

3 Cost information on silos extracted from OPG R.Heystee email date 11-01-03 : 'PLGS dry canister costs for RES costing' cost includes; materials supply, construction, testing and project management: $60K per canister Fall 2001 dollars. Labour and materials split approx. 33% materials/67%labour

4 ancillary ops factored from CES CVSB. In CES this cost was for a 30 year period (covering 1 facility repeat and 1 repackaging event). for RES this covers 100/200&300year facility repeats & 300y repackaging 3x8 (1 demolish prev (y83). 2 const,n of 222 silos (y84,85) 5 ops for transfer) = 24

5 costs for silos demolition and waste diposal based on unit cost factors obtained for demolition of basket storage vaults in CVSB alternative

6 staffing levels obtained from table 17 in cost estimate report 1105/MD18084/REP/19

7 annual costs for Labour/M&E and Other, obtained from table 18 in cost estimate report 1105/MD18084/REP/19

8 armed response costs during 'fuel handling' based on rate of $100k/a. But, due to $50k/a for armed response included in extended monitoring, this means an additional $50k/a is to be included for the duration of the facility repeat transfers/repackaging events ($50k + $50k = $100k)

9 armed response not captured in 300 yr facility repeat for fuel transfers, as it is covered in basket repackaging at 300yr event

REACTOR EXTENDED STORE — SILOS IN SHALLOW TRENCH (SST)

ACTIVITY SUMMARY TO DATA TRANSFER — WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency	Total $K
591	55							Environmental Assessment and Monitoring	Labour	STEP	OPG	RJH	6	281	276			14027.8
591	55							Environmental Assessment and Monitoring	Materials and Equipment	STEP	OPG	RJH	6	281	276			4035.0
591	55							Environmental Assessment and Monitoring	Other	STEP	OPG	RJH	6	281	276			1517.0
591	55							Environmental Assessment and Monitoring	Contingency	STEP	OPG	RJH	6	281	276			5873.9

NO DATA TO FILL

INSTRUCTIONS

Check: Total minus budget Should = 0		Budget costs to Years by %
Check total	**Total Cost $k**	

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	14028	*0.0*	14027.8
Materials and Equipment	4035		4035.0
Other	1517		1517.0
Contingency	5873.9		5873.9
Total	25454		25454

INSTRUCTIONS

Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		A	B	C	D	E	F	G	H	I	J	K	L	M	
											Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																							**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																	
591	55							**Environmental Assessment and Monitoring**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
591	55	10						EA & MONITORING PROGRAM MANAGEMENT																
								Costs are incurred over the period Y6 to Y281 or 276 yrs vs 347 yrs in CES. RES has 0.1 staff vs 2 staff in CES. Factor is 276/347 x 0.1/2 = 0.04	Labour	0.04	70306	0.04	2812.24										2,812
									Materials and Equipment	1				1										
								Expenses at $1.5K/a x 276 yrs	Other	1							414	1	414					414
									Contingency	0.3										3226.24	0.3	967.872		968
591	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT																
								Assume C/L & EA process spans 3 years (Y7 to Y9) with with some preparation work in Y6; ie total of 4 years. Due to multiple sites with same technology can share costs	Labour	0.2	7471	0.2	1494.2										1,494
									Materials and Equipment	0.2				0.2										
									Other	0.2							2,150	0.2	430					430
									Contingency	0.3										1924.2	0.3	577.26		577

591	55	40	GROUNDWATER MONITORING														
			Costs span the period Y13 to Y281 or 269 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.6 in CES. Factor in 269/330 x 0.02/0.6 = 0.027	Labour	0.027	37158	0.027	1003.266								1,003
			M&E at $3K/a x 269 yrs	Materials and Equipment	1				807	1	807						807
			Expenses at $2K/a x 269 yrs	Other	1							538	1	538			538
				Contingency	0.3										2348.266	0.3	704.4798	704
591	55	50	RADIOLOGICAL BIOSPHERE MONITORING														
			Costs span the period Y13 to Y281 or 269 yrs vs 330 ys for CES. RES staff is 0.1 vs 3.3 staff in CES. Factor is 0.025	Labour	0.025	217280	0.025	5432									5,432
			M&E at $9K/a x 269 yrs	Materials and Equipment	1				2421	1	2421						2,421
				Other	1							1					
				Contingency	0.3										7853	0.3	2355.9	2,356
591	55	60	NON-RAD BIOSPHERE MONITORING														
			Costs span the period Y13 to Y281 or 269 yrs vs 330 in CES. RES staff is 0.05 staff vs 0.8 staff in CES. Factor is 269/330 x 0.05/0.8 = 0.051	Labour	0.051	53590	0.051	2733.09									2,733
			M&E at $3K/a x 269 yrs	Materials and Equipment	1				807	1	807						807
				Other	1							1					
				Contingency	0.3										3540.09	0.3	1062.027	1,062
591	55	80	HUMAN HEALTH MONITORING														
			Costs span the period Y13 to Y281 or 269 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.17 in CES. Factor is 269/330 x 0.02/0.17 = 0.096	Labour	0.096	5760	0.096	552.96									553
				Materials and Equipment	1					1							
			Expenses at 0.5K/a x 269 yrs	Other	1							135	1	135			135
				Contingency	0.3										687.96	0.3	206.388	206

Total				**25,454**
Check: Should = 0				
Total	14,028	Total	4,035	Total 1,517 Total 5,873.9
Check: Should = 0	Check: Should = 0		Check: Should = 0	Check: Should = 0

BASIS OF ESTIMATE NOTES - Insert references and notes

1

2

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SILOS IN SHALLOW TRENCH (SST)
WHITESHELL

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	WBS Desc	Cost Category	Type	Owner	Responsible	Start Yr	End Yr	Dur'n	Total Hrs	Contingency		Total $K
591	90	0	0	0	0	0	0	0 Program Management	Labour	STEP	CTECH	AM	1	12	12	0	0	NO DATA TO FILL	796.8
591	90	0	0	0	0	0	0	0 Program Management	Materials and Equipment	STEP	CTECH	AM	1	12	12	0	0		0.0
591	90	0	0	0	0	0	0	0 Program Management	Other	STEP	CTECH	AM	1	12	12	0	0		216.7
591	90	0	0	0	0	0	0	0 Program Management	Contingency	STEP	CTECH	AM	1	12	12	0	0		202.7

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost
Labour	797
Materials and Equipment	0
Other	217
Contingency	202.7
Total	1216

Check: Total minus budget Should = 0

Budget costs to Years by %

Check total	Total Cost $k
0%	
0.0	796.8
0.0	0.0
0.0	216.7
0.0	202.7
0.0	1216

INSTRUCTIONS

										A	B	C	D	E	F	G	H	I	J	K	L	M	
Insert lower level WBS numbers as required								Insert Activity description @ Row 23 and subordinate activities identified by WBS - Estimator to add further detail as required	Insert cost category name in all estimate lines - Hint; copy and text paste from rows 12 thro 15		Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Use appropriate CES cost	Apply Factor	Calc RES cost value	Total Cost is calculated	Add Basis of estimate Note Ref Number
ACTIVITY DETAIL ESTIMATE																						**TOTAL**	
WBS LEVEL								WBS Description / Detail	Cost Category	**Factor**	**Labour**		**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
1	2	3	4	5	6	7	8																
591	90							**Program Management**															
								Program management shared between 7 reactor sites at percentages based on table 18 in cost estimate report. 7% for Chalk River			**total for 7 sites**	**Factor**	**RES**	**total for 7 sites**	**Factor**	**RES**	**total for 7 sites**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
								based on 8 staff. Assume 4 x OPG01, 4 x OPG03 for 12year duration	Labour	0.07	11383.445	0.07	796.841136										797	
								no entry	Materials and Equipment	0				0	0	0							0	
								the following expenses: Public affairs, overheads, insurance, community compensation & legal fees as table 18	Other	0.07						3096	0.07	216.72					217	
								Contingency as CES value	Contingency	20%									20%	1.0	202.7	203	

Total	797	Total	0	Total	217	Total	202.7
Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0

Total	**1,216**
Check: Should = 0	**0**

BASIS OF ESTIMATE NOTES - Insert references and notes

1

2

RES ALTERNATIVE
WBS No 591
SILOS IN SHALLOW TRENCH (SST)
WHITESHELL

Cost Category	Total K$
Labour	353,394
Materials and Equipment	133,710
Other	110,453
Contingency	160,152
Total Cost	**757,710**

757,710

WBS_1	WBS_2	WBS_3	WBS_4	WBS_5	WBS_6	WBS_7	WBS_8	Responsible	Cost Category	WBS Type	Start Year	End Year	Dur'n	Contingency	Total K$
591	15	0	0	0	0	0	0	RJH	Labour	STEP	1	9	9	0	556
591	15	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	9	9	0	0
591	15	0	0	0	0	0	0	RJH	Other	STEP	1	9	9	0	113
591	15	0	0	0	0	0	0	RJH	Contingency	STEP	1	9	9	0	334
591	20	0	0	0	0	0	0	AM	Labour	STEP	274	280	7	0	7,933
591	20	0	0	0	0	0	0	AM	Materials and Equipment	STEP	274	280	7	0	430
591	20	0	0	0	0	0	0	AM	Other	STEP	274	280	7	0	280
591	20	0	0	0	0	0	0	AM	Contingency	STEP	274	280	7	0	3,295
591	25	0	0	0	0	0	0	RJH	Labour	STEP	1	281	40	0	1,284
591	25	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	281	40	0	0
591	25	0	0	0	0	0	0	RJH	Other	STEP	1	281	40	0	238
591	25	0	0	0	0	0	0	RJH	Contingency	STEP	1	281	40	0	609
591	30	0	0	0	0	0	0	RJH	Labour	STEP	3	281	279	0	3,114
591	30	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	3	281	279	0	0
591	30	0	0	0	0	0	0	RJH	Other	STEP	3	281	279	0	15,160
591	30	0	0	0	0	0	0	RJH	Contingency	STEP	3	281	279	0	4,569
591	35	0	0	0	0	0	0	RJH	Labour	STEP	1	12	10	0	684
591	35	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	12	10	0	0
591	35	0	0	0	0	0	0	RJH	Other	STEP	1	12	10	0	462
591	35	0	0	0	0	0	0	RJH	Contingency	STEP	1	12	10	0	573
591	40	0	0	0	0	0	0	AM	Labour	STEP	10	280	271	0	18033.7163
591	40	0	0	0	0	0	0	AM	Materials and Equipment	STEP	10	280	271	0	18338.9245
591	40	0	0	0	0	0	0	AM	Other	STEP	10	280	271	0	1968.94697
591	40	0	0	0	0	0	0	AM	Contingency	STEP	10	280	271	0	13167.0053
591	45	0	0	0	0	0	0	AM	Labour	STEP	6	281	276	0	306,965
591	45	0	0	0	0	0	0	AM	Materials and Equipment	STEP	6	281	276	0	110,906
591	45	0	0	0	0	0	0	AM	Other	STEP	6	281	276	0	90,499
591	45	0	0	0	0	0	0	AM	Contingency	STEP	6	281	276	0	131,529
591	55	0	0	0	0	0	0	RJH	Labour	STEP	6	281	276	0	14,028
591	55	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	6	281	276	0	4,035
591	55	0	0	0	0	0	0	RJH	Other	STEP	6	281	276	0	1,517
591	55	0	0	0	0	0	0	RJH	Contingency	STEP	6	281	276	0	5,874
591	90	0	0	0	0	0	0	AM	Labour	STEP	1	12	12	0	797
591	90	0	0	0	0	0	0	AM	Materials and Equipment	STEP	1	12	12	0	0
591	90	0	0	0	0	0	0	AM	Other	STEP	1	12	12	0	217
591	90	0	0	0	0	0	0	AM	Contingency	STEP	1	12	12	0	203

C2 Cost Estimate Schedules for Whiteshell Site

WBS No 589 – Silos
WBS No 590 – SSB
WBS No 591 – SST

Cost estimate schedules to lowest WBS level are presented in this section and are also available on the CD.

	LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt	
	1	1	589								**SILOS WHITESHELL**											
	2	2	589	15							**SITING**	Db Sm										
	3	3	589	15	10						TECHNICAL SITING MANAGEMENT	Db Act	FIXED	OPG	RJH	1	77	7				
	4	3	589	15	70						PREFERRED SITE	Db Sm										
	5	4	589	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING	Db Act	FIXED	OPG	RJH	74	74	1				
	6	4	589	15	70	30					PREFERRED SITE - CHARACTERIZATION	Db Act	FIXED	OPG	RJH	74	74	1				
	7																					
	8	2	589	20							**SYSTEM DEVELOPMENT**	Db Sm										
	9	3	589	20	02						SYSTEM DEVELOPMENT MANAGEMENT	Db Act	FIXED	CTECH	AM	274	280	7				
	10	3	589	20	05						SYSTEM OPTIMIZATION	Db Act	FIXED	CTECH	AM	274	277	4				
	11	3	589	20	20						PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)	Db Act	FIXED	CTECH	AM	274	280	7				
	12	3	589	20	30						STORAGE SYSTEM ENG'NG	Db Act	FIXED	CTECH	AM	274	280	7				
	13	3	589	20	40						SECURITY & SAFEGUARD ENG'NG	Db Act	FIXED	CTECH	AM	276	276	1				
	14																					
	15	2	589	25							**SAFETY ASSESSMENT**	Db Sm										
	16	3	589	25	10						SAFETY ASSESSMENT MANAGEMENT	Db Act	FIXED	OPG	RJH	1	80	10				
	17	3	589	25	30						SA - SITING	Db Act	FIXED	OPG	RJH	72	73	2				
	18	3	589	25	40						SA - OPERATING LICENSE	Db Act	FIXED	OPG	RJH	79	80	2				
	19	3	589	25	50						SA - FACILITY OPERATIONS	Db Act	FIXED	OPG	RJH	4	281	28				
	20	3	589	25	70						SA - DECOMMISSIONING (Processing Facilities)	Db Act	FIXED	OPG	RJH	280	281	2				
	21																					
	22	2	589	30							**LICENSING & APPROVALS**	Db Sm										
	23	3	589	30	30						LIAISON WITH CNSC	Db Act	FIXED	CTECH	RJH	71	74	4				
	24	3	589	30	50						CNSC CONSTRUCTION LICENCE	Db Act	FIXED	CTECH	RJH	75	77	3				
	25	3	589	30	60						OTHER GOVN'MT APPROVALS	Db Act	FIXED	CTECH	RJH							
	26	4	589	30	60	10					APPROVAL REQUIREMENTS	Db Act	FIXED	CTECH	RJH	71	74	4				
	27	4	589	30	60	30					FEDERAL APPROVALS	Db Act	FIXED	CTECH	RJH	75	80	6				
	28	4	589	30	60	40					PROVINCIAL APPROVALS	Db Act	FIXED	CTECH	RJH	75	80	6				
	29	4	589	30	60	50					MUNICIPAL APPROVALS	Db Act	FIXED	CTECH	RJH	75	80	6				
	30	3	589	30	65						CNSC OPERATING LICENCE (initial application)	Db Act	FIXED	CTECH	RJH	79	80	2				
	31	3	589	30	70						CNSC OPERATING LICENCE (maintenance and renewal)	Db Act	FIXED	CTECH	RJH	4	281	278				
	32																					
	33	2	589	35							**PUBLIC AFFAIRS**	Db Sm										
	34	3	589	35	45						PUBLIC AFFAIRS - PREFERRED SITE	Db Act	FIXED	OPG	RJH	74	74	1				
	35	3	589	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL	Db Act	FIXED	OPG	RJH	75	77	3				
	36	3	589	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION	Db Act	FIXED	OPG	RJH	78	80	3				
	37	3	589	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH	1	80	10				
	38	3	589	35	120						COMMUNITY offsets and benefits	Db Act	FIXED	OPG	RJH	78	80	3				
	39																					
	40	2	589	40							**FACILITY DESIGN AND CONSTRUCTION**	Db Sm										
	41	3	589	40	10						SITE & IMPROVEMENTS	Db Act	STEP FIXED	CTECH	AM	10	10	1				
	53	3	589	40	30						COMMON ANCILLARY FACILITIES	Db Sm										
	54	4	589	40	30	10					ADMIN AND SUPPORT FACILITIES	Db Sm										

	LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt	
	55	5	589	40	30	10	01				ADMIN AND VISITOR RECEPT'N BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	56	5	589	40	30	10	02				OPS SUPPT & HEALTH PHYSICS BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	57	5	589	40	30	10	03				EQUIP STORAGE AND MAINT'CE BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	59	5	589	40	30	10	05				ACTIVE SOLID WASTE HDLG BLDG	Db Act	STEP FIXED	CTECH	AM	279	280	2				
	60	5	589	40	30	10	06				SOLID WASTE STORAGE AREA	Db Act	STEP FIXED	CTECH	AM	279	280	2				
	61	5	589	40	30	10	07				ACTIVE LIQ/W TRT'MT BLDG	Db Act	STEP FIXED	CTECH	AM	279	280	2				
	62	5	589	40	30	10	08				LOW LVL LIQ/W STRG BLDG	Db Act	STEP FIXED	CTECH	AM	279	280	2				
	63	5	589	40	30	10	09				WAREHOUSE BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	64	5	589	40	30	10	10				GUARDHOUSE AND SECURITY FENCE	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	65	5	589	40	30	10	11				TRUCK INSP'N / WASH STATION	Db Act	STEP FIXED	CTECH	AM	Not required for RES						
	66	5	589	40	30	10	12				UTILITY BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	67	5	589	40	30	10	13				TEST FACILITY CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	53	54	2				
	68	4	589	40	30	20					OTHER SITE SYSTEMS	Db Sm										
	69	5	589	40	30	20	01				FIRE PROTECTION SYSTEMS	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	70	5	589	40	30	20	02				SECURITY AND COMMUNICATION SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	71	5	589	40	30	20	03				ELECTRICAL AND EMERGENCY POWER	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	72	5	589	40	30	20	04				SANITARY SEWER SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	73	5	589	40	30	20	05				POTABLE WATER SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	74	5	589	40	30	20	06				RETENTION/SEDIMENTATION POND	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	75	5	589	40	30	20	07				STORM WATER DETENTION POND	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	76	5	589	40	30	20	08				CONST'N MAT'L STOCKPILE AREA	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	77	5	589	40	30	20	09				SITE MATERIALS STORAGE AREA	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	78	5	589	40	30	20	10				ACCESS ROADS AND VEHICLE COMPOUNDS	Db Act	STEP FIXED	CTECH	AM	*	*	*				
	79	4	589	40	30	30					CONST'N INDIRECTS ANCILLARY FACILITIES	Db Act	STEP FIXED	CTECH	AM	53	54	2				
	80	3	589	40	650						ENERGY CONSUMPTION	Db Act	STEP FIXED	CTECH	AM	54	54	1				
	81										*** Existing buildings and services adopted by RES facility.**											
	82	2	589	45							**FACILITY OPERATION**	Db Sm										
	83	3	589	45	20						OPERATIONS - EXTENDED MONITORING	Db Sm										
	84	4	589	45	20	05					PROGRAM MANAGEMENT	Db Act	STEP FIXED	CTECH	AM	4	281	278				
	85	4	589	45	20	40					MONITORING AND SURVEILLANCE	Db Act	STEP FIXED	CTECH	AM	4	281	278				
	86	4	589	45	20	50					OPERATION INDIRECTS (MONITORING)	Db Act	STEP FIXED	CTECH	AM	4	281	278				
	87	4	589	45	20	60					COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)	Db Act	STEP FIXED	CTECH	AM	55	281	227				
	88	4	589	45	20	70					FUEL INTEGRITY MONITORING (25 YEARLY)	Db Act	STEP FIXED	CTECH	AM	4	281	278				
	89	3	589	45	30						OPERATIONS - FACILITY REPEATS	Db Sm										
	90	4	589	45	30	20					SILOS 100 YEAR REPLACEMENT											
	91	4	589	45	30	20	10				DEMOLISH EXISTING STORAGE SILOS	Db Act	STEP FIXED	CTECH	AM	81	82	2				
	92	5	589	45	30	20	20				SILO CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	81	82	2				
	93	5	589	45	30	20	30				TRANSFER OPERATIONS	Db Act	STEP FIXED	CTECH	AM	81	82	2				
	94	5	589	45	30	20	40				WASTE DISPOSAL	Db Act	STEP FIXED	CTECH	AM	81	82	2				
	95	4	589	45	30	30					SILOS 200 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	181	182	2				
	96	4	589	45	30	40					SILOS 300 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	279	280	2				

	LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt	
	97	3	589	45	40						OPERATIONS - REPACKAGING	Db Sm										
	98	4	589	45	40	05					PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)	Db Act	STEP FIXED	CTECH	AM	107	281	13				
	99	5	589	45	40	10	40				COMMON ANCILLARY FACILITIES (REPLACEMENT)	Db Act	STEP FIXED	CTECH	GA	53	280	9				
	100	6	589	45	40	10	600	30			ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)	Db Act	STEP FIXED	CTECH	GA	109	281	7				
	101	4	589	45	40	40					BASKET TO BASKET 300 YEAR REPACKAGING	Db Sm										
	102	5	589	45	40	40	05				CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
	103	5	589	45	40	40	10				PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)	Db Sm										
	104	6	589	45	40	40	10	20			RPBB EQUIP. DESIGN, SUPPLY & INSTALL	Db Sm										
	105	7	589	45	40	40	10	20	10		RECEIPT & TRANSFER (EQUIP)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
	106	7	589	45	40	40	10	20	20		BASKET TO BASKET FUEL TRANSFER	Db Act	STEP FIXED	CTECH	AM	279	280	2				
	107	7	589	45	40	40	10	20	30		BASKET DECONTAMINATION	Db Act	STEP FIXED	CTECH	AM	279	280	2				
	108	6	589	45	40	40	10	30			RPBB BUILDING DESIGN AND CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	279	280	2				
	109	6	589	45	40	40	10	60			BUILDING SERVICES (RPB)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
	110	6	589	45	40	40	10	70			COMMISSIONING (RPB)	Db Act	STEP FIXED	CTECH	AM	279	279	1				
	111	6	589	45	40	40	10	80			CONST'N INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
	112	5	589	45	40	40	400				CONSTRUCTION MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
	113	5	589	45	40	40	500				COMMISSIONING MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM	279	279	1				
	114	5	589	45	40	40	600				REPACKAGING OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM	281	281	1				
	115	5	589	45	40	40	700				OPERATION INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM	281	281	1				
	116	5	589	45	40	40	800				STORAGE OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM	281	281	1				
	117																					
	118	2	589	55							**ENVIRONMENTAL MANAGEMENT SYSTEM**	Db Sm										
	119	3	589	55	10						EA & MONITORING PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH	4	281	278				
	120	3	589	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT	Db Act	FIXED	OPG	RJH	75	77	3				
	121	3	589	55	40						GROUNDWATER MONITORING	Db Act	FIXED	OPG	RJH	13	281	269				
	122	3	589	55	50						RADIOLOGICAL BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH	13	281	269				
	123	3	589	55	60						NON-RAD BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH	13	281	269				
	124	3	589	55	80						HUMAN HEALTH MONITORING	Db Act	FIXED	OPG	RJH	13	281	269				
	125																					
	126	2	589	90							**PROGRAM MANAGEMENT (Yrs 01 to 03)**	Db Act	STEP FIXED	CTECH	AM	1	3	3				

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt
1	1	590								**SILOS IN STORAGE BUILDINGS (SSB) - AECL WHITESHELL**										
2	2	590	15							**SITING**	Db Sm									
3	3	590	15	10						TECHNICAL SITING MANAGEMENT	Db Act	FIXED	OPG	RJH	1	9	7			
4	3	590	15	70						PREFERRED SITE	Db Sm									
5	4	590	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING	Db Act	FIXED	OPG	RJH	6	6	1			
6	4	590	15	70	30					PREFERRED SITE - CHARACTERIZATION	Db Act	FIXED	OPG	RJH	6	6	1			
7																				
8	2	590	20							**SYSTEM DEVELOPMENT**	Db Sm									
9	3	590	20	02						SYSTEM DEVELOPMENT MANAGEMENT	Db Act	FIXED	CTECH	AM	274	280	7			
10	3	590	20	05						SYSTEM OPTIMIZATION	Db Act	FIXED	CTECH	AM	274	277	4			
11	3	590	20	20						PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)	Db Act	FIXED	CTECH	AM	274	280	7			
12	3	590	20	30						STORAGE SYSTEM ENG'NG	Db Act	FIXED	CTECH	AM	274	280	7			
13	3	590	20	40						SECURITY & SAFEGUARD ENG'NG	Db Act	FIXED	CTECH	AM	276	276	1			
14																				
15	2	590	25							**SAFETY ASSESSMENT**	Db Sm									
16	3	590	25	10						SAFETY ASSESSMENT MANAGEMENT	Db Act	FIXED	OPG	RJH	1	12	10			
17	3	590	25	30						SA - SITING	Db Act	FIXED	OPG	RJH	5	6	2			
18	3	590	25	40						SA - OPERATING LICENSE	Db Act	FIXED	OPG	RJH	10	11	2			
19	3	590	25	50						SA - FACILITY OPERATIONS	Db Act	FIXED	OPG	RJH	13	281	28			
20	3	590	25	70						SA - DECOMMISSIONING (Processing Facilities)	Db Act	FIXED	OPG	RJH	280	281	2			
21																				
22	2	590	30							**LICENSING & APPROVALS**	Db Sm									
23	3	590	30	30						LIAISON WITH CNSC	Db Act	FIXED	CTECH	RJH	3	6	4			
24	3	590	30	50						CNSC CONSTRUCTION LICENCE	Db Act	FIXED	CTECH	RJH	7	12	6			
25	3	590	30	60						OTHER GOVN'MT APPROVALS	Db Act	FIXED	CTECH	RJH						
26	4	590	30	60	10					APPROVAL REQUIREMENTS	Db Act	FIXED	CTECH	RJH	3	6	4			
27	4	590	30	60	30					FEDERAL APPROVALS	Db Act	FIXED	CTECH	RJH	7	12	6			
28	4	590	30	60	40					PROVINCIAL APPROVALS	Db Act	FIXED	CTECH	RJH	7	12	6			
29	4	590	30	60	50					MUNICIPAL APPROVALS	Db Act	FIXED	CTECH	RJH	7	12	6			
30	3	590	30	65						CNSC OPERATING LICENCE (initial application)	Db Act	FIXED	CTECH	RJH	11	12	2			
31	3	590	30	70						CNSC OPERATING LICENCE (maintenance and renewal)	Db Act	FIXED	CTECH	RJH	13	281	269			
32																				
33	2	590	35							**PUBLIC AFFAIRS**	Db Sm									
34	3	590	35	45						PUBLIC AFFAIRS - PREFERRED SITE	Db Act	FIXED	OPG	RJH	6	6	1			
35	3	590	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL	Db Act	FIXED	OPG	RJH	7	9	3			
36	3	590	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION	Db Act	FIXED	OPG	RJH	10	12	3			
37	3	590	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH	1	12	10			
38	3	590	35	120						COMMUNITY OFFSETS AND BENEFITS	Db Act	FIXED	OPG	RJH	10	12	3			
39																				
40	2	590	40							**FACILITY DESIGN AND CONSTRUCTION**	Db Sm									
41	3	590	40	10						SITE & IMPROVEMENTS	Db Act	STEP FIXED	CTECH	AM	10	10	1			
42	3	590	40	30						COMMON ANCILLARY FACILITIES	Db Sm									
43	4	590	40	30	10					ADMIN AND SUPPORT FACILITIES	Db Sm									
44	5	590	40	30	10	01				ADMIN AND VISITOR RECEPT'N BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt	
45	5	590	40	30	10	02				OPS SUPPT & HEALTH PHYSICS BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
46	5	590	40	30	10	03				EQUIP STORAGE AND MAINT'CE BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
47	5	590	40	30	10	05				ACTIVE SOLID WASTE HDLG BLDG	Db Act	STEP FIXED	CTECH	AM	279	280	2				
48	5	590	40	30	10	06				SOLID WASTE STORAGE AREA	Db Act	STEP FIXED	CTECH	AM	279	280	2				
49	5	590	40	30	10	07				ACTIVE LIQ/W TRT'MT BLDG	Db Act	STEP FIXED	CTECH	AM	279	280	2				
50	5	590	40	30	10	08				LOW LVL LIQ/W STRG BLDG	Db Act	STEP FIXED	CTECH	AM	279	280	2				
51	5	590	40	30	10	09				WAREHOUSE BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
52	5	590	40	30	10	10				GUARDHOUSE AND SECURITY FENCE	Db Act	STEP FIXED	CTECH	AM	*	*	*				
53	5	590	40	30	10	11				TRUCK INSP'N / WASH STATION	Db Act	STEP FIXED	CTECH	AM	Not required for RES						
54	5	590	40	30	10	12				UTILITY BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
55	5	590	40	30	10	13				TEST FACILITY CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	53	54	2				
56	4	590	40	30	20					OTHER SITE SYSTEMS	Db Sm										
57	5	590	40	30	20	01				FIRE PROTECTION SYSTEMS	Db Act	STEP FIXED	CTECH	AM	*	*	*				
58	5	590	40	30	20	02				SECURITY AND COMMUNICATION SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
59	5	590	40	30	20	03				ELECTRICAL AND EMERGENCY POWER	Db Act	STEP FIXED	CTECH	AM	*	*	*				
60	5	590	40	30	20	04				SANITARY SEWER SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
61	5	590	40	30	20	05				POTABLE WATER SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
62	5	590	40	30	20	06				RETENTION/SEDIMENTATION POND	Db Act	STEP FIXED	CTECH	AM	*	*	*				
63	5	590	40	30	20	07				STORM WATER DETENTION POND	Db Act	STEP FIXED	CTECH	AM	*	*	*				
64	5	590	40	30	20	08				CONST'N MAT'L STOCKPILE AREA	Db Act	STEP FIXED	CTECH	AM	*	*	*				
65	5	590	40	30	20	09				SITE MATERIALS STORAGE AREA	Db Act	STEP FIXED	CTECH	AM	*	*	*				
66	5	590	40	30	20	10				ACCESS ROADS AND VEHICLE COMPOUNDS	Db Act	STEP FIXED	CTECH	AM	*	*	*				
67	4	590	40	30	30					CONST'N INDIRECTS ANCILLARY FACILITIES	Db Act	STEP FIXED	CTECH	AM	53	54	2				
68	3	590	40	40						STORAGE DESIGN & CONSTRUCTION (BUILDING)											
69	4	590	40	40	10					STORAGE BUILDING DESIGN & CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	12	12	1				
70	4	590	40	40	20					STORAGE BUILDING SERVICES DESIGN & INSTALLATION	Db Act	STEP FIXED	CTECH	AM	12	12	1				
71	4	590	40	40	30					STORAGE BUILDING CONSTRUCTION INDIRECTS	Db Act	STEP FIXED	CTECH	AM	12	12	1				
72	3	590	40	650						ENERGY CONSUMPTION	Db Act	STEP FIXED	CTECH	AM	54	54	1				
73										*** Existing buildings and services adopted by RES facility.**												
74	2	590	45							**FACILITY OPERATION**	Db Sm										
75	3	590	45	20						OPERATIONS - EXTENDED MONITORING	Db Sm										
76	4	590	45	20	05					PROGRAM MANAGEMENT	Db Act	STEP FIXED	CTECH	AM	13	281	269				
77	4	590	45	20	40					MONITORING AND SURVEILLANCE	Db Act	STEP FIXED	CTECH	AM	13	281	269				
78	4	590	45	20	50					OPERATION INDIRECTS (MONITORING)	Db Act	STEP FIXED	CTECH	AM	13	281	269				
79	4	590	45	20	60					COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)	Db Act	STEP FIXED	CTECH	AM	55	281	227				
80	4	590	45	20	70					FUEL INTEGRITY MONITORING (25 YEARLY)	Db Act	STEP FIXED	CTECH	AM	6	281	276				
81	3	590	45	30						OPERATIONS - FACILITY REPEATS	Db Sm										
82	4	590	45	30	20					SILOS 100 YEAR REPLACEMENT											
83	4	590	45	30	20	10				DEMOLISH EXISTING STORAGE SILOS	Db Act	STEP FIXED	CTECH	AM	111	112	2				
84	5	590	45	30	20	20				SILO CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	111	112	2				
85	5	590	45	30	20	30				TRANSFER OPERATIONS	Db Act	STEP FIXED	CTECH	AM	111	112	2				
86	5	590	45	30	20	40				WASTE DISPOSAL	Db Act	STEP FIXED	CTECH	AM	111	112	2				

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt	
87	4	590	45	30	30					SILOS 200 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	211	212	2				
88	4	590	45	30	40					SILOS 300 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	279	280	2				
89	4	590	45	30	50					STORAGE BUILDINGS 100 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	111	112	2				
90	4	590	45	30	60					STORAGE BUILDINGS 200 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	211	212	2				
91	4	590	45	30	70					STORAGE BUILDINGS 300 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	211	212	2				
92	3	590	45	40						OPERATIONS - REPACKAGING	Db Sm				279	280	2				
93	4	590	45	40	05					PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)	Db Act	STEP FIXED	CTECH	AM	109	281	13				
94	5	590	45	40	10	40				COMMON ANCILLARY FACILITIES (REPLACEMENT)	Db Act	STEP FIXED	CTECH	GA	53	280	9				
95	6	590	45	40	10	600	30			ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)	Db Act	STEP FIXED	CTECH	GA	111	281	7				
96	4	590	45	40	40					BASKET TO BASKET 300 YEAR REPACKAGING	Db Sm										
97	5	590	45	40	40	05				CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
98	5	590	45	40	40	10				PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)	Db Sm										
99	6	590	45	40	40	10	20			RPBB EQUIP. DESIGN, SUPPLY & INSTALL	Db Sm										
100	7	590	45	40	40	10	20	10		RECEIPT & TRANSFER (EQUIP)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
101	7	590	45	40	40	10	20	20		BASKET TO BASKET FUEL TRANSFER	Db Act	STEP FIXED	CTECH	AM	279	280	2				
102	7	590	45	40	40	10	20	30		BASKET DECONTAMINATION	Db Act	STEP FIXED	CTECH	AM	279	280	2				
103	6	590	45	40	40	10	30			RPBB BUILDING DESIGN AND CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	279	280	2				
104	6	590	45	40	40	10	60			BUILDING SERVICES (RPB)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
105	6	590	45	40	40	10	70			COMMISSIONING (RPB)	Db Act	STEP FIXED	CTECH	AM	279	279	1				
106	6	590	45	40	40	10	80			CONST'N INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
107	5	590	45	40	40	400				CONSTRUCTION MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
108	5	590	45	40	40	500				COMMISSIONING MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM	279	279	1				
109	5	590	45	40	40	600				REPACKAGING OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM	281	281	1				
110	5	590	45	40	40	700				OPERATION INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM	281	281	1				
111	5	590	45	40	40	800				STORAGE OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM	281	281	1				
112																					
113	2	590	55							**ENVIRONMENTAL MANAGEMENT SYSTEM**	Db Sm										
114	3	590	55	10						EA & MONITORING PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH	6	281	276				
115	3	590	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT	Db Act	FIXED	OPG	RJH	5	7	3				
116	3	590	55	40						GROUNDWATER MONITORING	Db Act	FIXED	OPG	RJH	13	281	269				
117	3	590	55	50						RADIOLOGICAL BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH	13	281	269				
118	3	590	55	60						NON-RAD BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH	13	281	269				
119	3	590	55	80						HUMAN HEALTH MONITORING	Db Act	FIXED	OPG	RJH	13	281	269				
120																					
121	2	590	90							**PROGRAM MANAGEMENT (Yrs 01 to 12)**	Db Act	STEP FIXED	CTECH	AM	1	12	12				

LINE No	Level sp sht	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt
1	1	591								**SILOS IN SHALLOW TRENCHES (SST) WHITESHELL**										
2	2	591	15							**SITING**	Db Sm									
3	3	591	15	10						TECHNICAL SITING MANAGEMENT	Db Act	FIXED	OPG	RJH	1	9	7			
4	3	591	15	70						PREFERRED SITE	Db Sm									
5	4	591	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING	Db Act	FIXED	OPG	RJH	6	6	1			
6	4	591	15	70	30					PREFERRED SITE - CHARACTERIZATION	Db Act	FIXED	OPG	RJH	6	6	1			
7																				
8	2	591	20							**SYSTEM DEVELOPMENT**	Db Sm									
9	3	591	20	02						SYSTEM DEVELOPMENT MANAGEMENT	Db Act	FIXED	CTECH	AM	274	280	7			
10	3	591	20	05						SYSTEM OPTIMIZATION	Db Act	FIXED	CTECH	AM	274	277	4			
11	3	591	20	20						PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)	Db Act	FIXED	CTECH	AM	274	280	7			
12	3	591	20	30						STORAGE SYSTEM ENG'NG	Db Act	FIXED	CTECH	AM	274	280	7			
13	3	591	20	40						SECURITY & SAFEGUARD ENG'NG	Db Act	FIXED	CTECH	AM	276	276	1			
14																				
15	2	591	25							**SAFETY ASSESSMENT**	Db Sm									
16	3	591	25	10						SAFETY ASSESSMENT MANAGEMENT	Db Act	FIXED	OPG	RJH	1	12	10			
17	3	591	25	30						SA - SITING	Db Act	FIXED	OPG	RJH	5	6	2			
18	3	591	25	40						SA - OPERATING LICENSE	Db Act	FIXED	OPG	RJH	10	11	2			
19	3	591	25	50						SA - FACILITY OPERATIONS	Db Act	FIXED	OPG	RJH	13	281	28			
20	3	591	25	70						SA - DECOMMISSIONING (Processing Facilities)	Db Act	FIXED	OPG	RJH	280	281	2			
21																				
22	2	591	30							**LICENSING & APPROVALS**	Db Sm									
23	3	591	30	30						LIAISON WITH CNSC	Db Act	FIXED	CTECH	RJH	3	6	4			
24	3	591	30	50						CNSC CONSTRUCTION LICENCE	Db Act	FIXED	CTECH	RJH	7	12	6			
25	3	591	30	60						OTHER GOVN'MT APPROVALS	Db Act	FIXED	CTECH	RJH						
26	4	591	30	60	10					APPROVAL REQUIREMENTS	Db Act	FIXED	CTECH	RJH	3	6	4			
27	4	591	30	60	30					FEDERAL APPROVALS	Db Act	FIXED	CTECH	RJH	7	12	6			
28	4	591	30	60	40					PROVINCIAL APPROVALS	Db Act	FIXED	CTECH	RJH	7	12	6			
29	4	591	30	60	50					MUNICIPAL APPROVALS	Db Act	FIXED	CTECH	RJH	7	12	6			
30	3	591	30	65						CNSC OPERATING LICENCE (initial application)	Db Act	FIXED	CTECH	RJH	11	12	2			
31	3	591	30	70						CNSC OPERATING LICENCE (maintenance and renewal)	Db Act	FIXED	CTECH	RJH	13	281	269			
32																				
33	2	591	35							**PUBLIC AFFAIRS**	Db Sm									
34	3	591	35	45						PUBLIC AFFAIRS - PREFERRED SITE	Db Act	FIXED	OPG	RJH	6	6	1			
35	3	591	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL	Db Act	FIXED	OPG	RJH	7	9	3			
36	3	591	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION	Db Act	FIXED	OPG	RJH	10	12	3			
37	3	591	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH	1	12	10			
38	3	591	35	120						COMMUNITY offsets and benefits	Db Act	FIXED	OPG	RJH	10	12	3			
39																				
40	2	591	40							**FACILITY DESIGN AND CONSTRUCTION**	Db Sm									
41	3	591	40	10						SITE & IMPROVEMENTS	Db Act	STEP FIXED	CTECH	AM	10	10	1			
42	3	591	40	30						COMMON ANCILLARY FACILITIES	Db Sm									
43	4	591	40	30	10					ADMIN AND SUPPORT FACILITIES	Db Sm									
44	5	591	40	30	10	01				ADMIN AND VISITOR RECEPT'N BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			
45	5	591	40	30	10	02				OPS SUPPT & HEALTH PHYSICS BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			
46	5	591	40	30	10	03				EQUIP STORAGE AND MAINT'CE BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*			

LINE No	sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt	
47		5	591	40	30	10	05				ACTIVE SOLID WASTE HDLG BLDG	Db Act	STEP FIXED	CTECH	AM	279	280	2				
48		5	591	40	30	10	06				SOLID WASTE STORAGE AREA	Db Act	STEP FIXED	CTECH	AM	279	280	2				
49		5	591	40	30	10	07				ACTIVE LIQ/W TRT'MT BLDG	Db Act	STEP FIXED	CTECH	AM	279	280	2				
50		5	591	40	30	10	08				LOW LVL LIQ/W STRG BLDG	Db Act	STEP FIXED	CTECH	AM	279	280	2				
51		5	591	40	30	10	09				WAREHOUSE BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
52		5	591	40	30	10	10				GUARDHOUSE AND SECURITY FENCE	Db Act	STEP FIXED	CTECH	AM	*	*	*				
53		5	591	40	30	10	11				TRUCK INSP'N / WASH STATION	Db Act	STEP FIXED	CTECH	AM	Not required for RES						
54		5	591	40	30	10	12				UTILITY BLDG	Db Act	STEP FIXED	CTECH	AM	*	*	*				
55		5	591	40	30	10	13				TEST FACILITY CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	53	54	2				
56		4	591	40	30	20					OTHER SITE SYSTEMS	Db Sm										
57		5	591	40	30	20	01				FIRE PROTECTION SYSTEMS	Db Act	STEP FIXED	CTECH	AM	*	*	*				
58		5	591	40	30	20	02				SECURITY AND COMMUNICATION SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
59		5	591	40	30	20	03				ELECTRICAL AND EMERGENCY POWER	Db Act	STEP FIXED	CTECH	AM	*	*	*				
60		5	591	40	30	20	04				SANITARY SEWER SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
61		5	591	40	30	20	05				POTABLE WATER SYSTEM	Db Act	STEP FIXED	CTECH	AM	*	*	*				
62		5	591	40	30	20	06				RETENTION/SEDIMENTATION POND	Db Act	STEP FIXED	CTECH	AM	*	*	*				
63		5	591	40	30	20	07				STORM WATER DETENTION POND	Db Act	STEP FIXED	CTECH	AM	*	*	*				
64		5	591	40	30	20	08				CONST'N MAT'L STOCKPILE AREA	Db Act	STEP FIXED	CTECH	AM	*	*	*				
65		5	591	40	30	20	09				SITE MATERIALS STORAGE AREA	Db Act	STEP FIXED	CTECH	AM	*	*	*				
66		5	591	40	30	20	10				ACCESS ROADS AND VEHICLE COMPOUNDS	Db Act	STEP FIXED	CTECH	AM	*	*	*				
67		4	591	40	30	30					CONST'N INDIRECTS ANCILLARY FACILITIES	Db Act	STEP FIXED	CTECH	AM	53	54	2				
68		3	591	40	40						STORAGE DESIGN & CONSTRUCTION (CHAMBERS)	Db Act	STEP FIXED	CTECH	AM	11	11	1				
69		3	591	40	50						STORAGE DESIGN & CONSTRUCTION (SILOS)	Db Act	STEP FIXED	CTECH	AM	12	12	1				
70		3	591	40	650						ENERGY CONSUMPTION	Db Act	STEP FIXED	CTECH	AM	54	54	1				
71											*** Existing buildings and services adopted by RES facility.**											
72		2	591	45							**FACILITY OPERATION**	Db Sm										
73		3	591	45	10						OPERATIONS FUEL TRANSFER	Db Sm										
74		4	591	45	10	05					PROGRAM MANAGEMENT	Db Act	STEP FIXED	CTECH	AM	11	13	3				
75		4	591	45	10	25					MONITORING AND SURVEILLANCE (FUEL TRANSFER)	Db Act	STEP FIXED	CTECH	AM	13	13	1				
76		4	591	45	10	30					OPERATION INDIRECTS (FUEL TRANSFER)	Db Act	STEP FIXED	CTECH	AM	13	13	1				
77		4	591	45	10	40					STORAGE OPERATIONS	Db Act	STEP FIXED	CTECH	AM	13	13	1				
78		3	591	45	20						OPERATIONS - EXTENDED MONITORING	Db Sm										
79		4	591	45	20	05					PROGRAM MANAGEMENT	Db Act	STEP FIXED	CTECH	AM	14	281	268				
80		4	591	45	20	40					MONITORING AND SURVEILLANCE	Db Act	STEP FIXED	CTECH	AM	14	281	268				
81		4	591	45	20	50					OPERATION INDIRECTS (MONITORING)	Db Act	STEP FIXED	CTECH	AM	14	281	268				
82		4	591	45	20	60					COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)	Db Act	STEP FIXED	CTECH	AM	55	281	227				
83		4	591	45	20	70					FUEL INTEGRITY MONITORING (25 YEARLY)	Db Act	STEP FIXED	CTECH	AM	6	281	276				
84		3	591	45	30						OPERATIONS - FACILITY REPEATS	Db Sm										
85		4	591	45	30	20					SILOS 100 YEAR REPLACEMENT											
86		4	591	45	30	20	10				DEMOLISH EXISTING STORAGE SILOS	Db Act	STEP FIXED	CTECH	AM	111	112	2				

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt	
87	5	591	45	30	20	20				SILO CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	111	112	2				
88	5	591	45	30	20	30				TRANSFER OPERATIONS	Db Act	STEP FIXED	CTECH	AM	111	112	2				
89	5	591	45	30	20	40				WASTE DISPOSAL	Db Act	STEP FIXED	CTECH	AM	111	112	2				
90	4	591	45	30	30					SILOS 200 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	211	212	2				
91	4	591	45	30	40					SILOS 300 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	279	280	2				
92	4	591	45	30	50					STORAGE CHAMBER 200 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	AM	211	212	2				
93	3	591	45	40						OPERATIONS - REPACKAGING	Db Sm										
94	4	591	45	40	05					PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)	Db Act	STEP FIXED	CTECH	AM	109	281	13				
95	5	591	45	40	10	40				COMMON ANCILLARY FACILITIES (REPLACEMENT)	Db Act	STEP FIXED	CTECH	GA	53	280	9				
98	6	591	45	40	10	600	30			ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)	Db Act	STEP FIXED	CTECH	GA	111	281	7				
111	4	591	45	40	40					BASKET TO BASKET 300 YEAR REPACKAGING	Db Sm										
112	5	591	45	40	40	05				CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
113	5	591	45	40	40	10				PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)	Db Sm										
114	6	591	45	40	40	10	20			RPBB EQUIP. DESIGN, SUPPLY & INSTALL	Db Sm										
115	7	591	45	40	40	10	20	10		RECEIPT & TRANSFER (EQUIP)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
116	7	591	45	40	40	10	20	20		BASKET TO BASKET FUEL TRANSFER	Db Act	STEP FIXED	CTECH	AM	279	280	2				
117	7	591	45	40	40	10	20	30		BASKET DECONTAMINATION	Db Act	STEP FIXED	CTECH	AM	279	280	2				
118	6	591	45	40	40	10	30			RPBB BUILDING DESIGN AND CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM	279	280	2				
119	6	591	45	40	40	10	60			BUILDING SERVICES (RPB)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
120	6	591	45	40	40	10	70			COMMISSIONING (RPB)	Db Act	STEP FIXED	CTECH	AM	279	279	1				
121	6	591	45	40	40	10	80			CONST'N INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
122	5	591	45	40	40	400				CONSTRUCTION MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM	279	280	2				
123	5	591	45	40	40	500				COMMISSIONING MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM	279	279	1				
124	5	591	45	40	40	600				REPACKAGING OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM	281	281	1				
125	5	591	45	40	40	700				OPERATION INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM	281	281	1				
126	5	591	45	40	40	800				STORAGE OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM	281	281	1				
127																					
128	2	591	55							**ENVIRONMENTAL MANAGEMENT SYSTEM**	Db Sm										
129	3	591	55	10						EA & MONITORING PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH	6	281	276				
130	3	591	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT	Db Act	FIXED	OPG	RJH	5	7	3				
131	3	591	55	40						GROUNDWATER MONITORING	Db Act	FIXED	OPG	RJH	13	281	269				
132	3	591	55	50						RADIOLOGICAL BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH	13	281	269				
133	3	591	55	60						NON-RAD BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH	13	281	269				
134	3	591	55	80						HUMAN HEALTH MONITORING	Db Act	FIXED	OPG	RJH	13	281	269				
135																					
137																					
138	2	591	90							**PROGRAM MANAGEMENT (Yrs 01 to 12)**	Db Act	STEP FIXED	CTECH	AM	1	12	12				

APPENDIX D

D1 COST ESTIMATE DATABASE CD

The contents of the attached CD comprise six folders. Each folder, identified by a WBS number, represents an estimate for each alternative.

Each WBS folder contains an Estimating Workbook and Detail Work Breakdown Structure Schedule for the specific site alternative.

Folder No.	Alternative	Site
586	Silos	Chalk River
587	SSB	Chalk River
588	SST	Chalk River
589	Silos	Whiteshell
590	SSB	Whiteshell
591	SST	Whiteshell