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TECH
Radioactive Materials Management

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

Alternatives for Hydro-Québec's Gentilly Reactor Site

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 Gentilly site. Implementation of a RES alternative would provide an extended dry storage facility on a reactor 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 Gentilly site 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 Atomic Energy of Canada Ltd's Chalk River and Whiteshell sites [3].

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

The three alternatives considered for the Gentilly site are:

- Vaults
- Surface Modular Vault (SMV)
- Vaults in Shallow Trenches (VST)

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 reactor 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 136,051 fuel bundles (this inventory includes AECL fuel currently stored at Gentilly 1) at the Gentilly site (at 2002 constant dollar prices) are:

- Vaults $0.97 B
- SMV $1.90 B
- VST $1.26 B

Contents

Tables

Figures

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 Gentilly site.

The estimates are based on RES conceptual designs that only receive CANDU used fuel bundles, generated or resident on the reactor site, which are detailed in Ref. 6. The RES facilities have been developed to store 136,051 fuel bundles.

The fuel at the RES facilities would be in AECL-design fuel basket format.
The three alternatives costed for each site are:

- Vaults
- Surface Modular Vault (SMV)
- Vaults in Shallow Trenches (VST)

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 SMV and VST alternatives, the cost estimate excludes all costs related to the vault-based dry storage facilities existing on the Gentilly site. However in the case of the Vaults alternative it is assumed that the existing interim facilities are "inherited" and the estimates include all costs for monitoring, maintaining and replacing storage facilities and repackaging fuel following transfer of the last fuel from wet bays into dry storage on the reactor 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.

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 Gentilly site.

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 HQ has responsibility is currently stored either in water-filled pools (wet storage), or concrete structures (dry storage). The specific storage location is shown in Figure 1 (location 6). Assumed total fuel inventory is presented in Section 2.2 of this report.

Figure 1: Existing Fuel Storage Locations in Canada

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 Gentilly site. 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. 6.

2 Descriptions of RES Facility Alternatives

2.1 GENERAL

The RES facility is envisaged as a self-contained, standalone facility, located at the existing reactor site. The RES facility has to accept fuel received in basket format from the existing wet bay or existing storage structures. 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 reactor site. Each of the RES facility alternatives comprises a used fuel receipt and processing facility, and a fuel container storage complex. The Gentilly site inventory comprises fuel from both Gentilly 1 and Gentilly 2, belonging to AECL and Hydro-Québec respectively. For the purposes of this study, it is assumed that the Gentilly 1 fuel will remain on this site and will be integrated into whichever RES alternative is selected for implementation. Should it be decided to implement RES on the Gentilly site, then AECL will provide the funding for their share of the fuel to be stored.

Table 1 summarises the assumed used fuel bundle inventory that the Gentilly reactor site will maintain in storage.

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

Location	Used Fuel Bundles	Percentage of Total (%)
Gentilly 1*	3,213	2.36
Gentilly 2	132,838	97.64
Total	**136,051**	**100**

* comprises AECL fuel presently stored in concrete canisters (silos) in the Gentilly 1 turbine hall.

2.3 VAULTS FACILITY ALTERNATIVE

The Vaults alternative comprises the storage of fuel bundles in stainless steel baskets within self-shielded vaults. The concrete vaults are arranged in an array on a concrete pad and do not have any weather protection. HQ is currently using vaults for the dry storage of their used fuel. The Vaults alternative is identified as the 'indigenous' fuel storage alternative for the Gentilly site.

2.4 SMV FACILITY ALTERNATIVE

The Surface Modular Vault (SMV) alternative comprises the storage of fuel bundles confined in baskets and placed into an array of tubes in a series of engineered vaults within the storage buildings. The fuel baskets are placed in a series of vertical storage tubes within the vault, which ensures that they are correctly aligned and remain in place. The upper end of each storage tube is closed off with a closure shield plug unit. The fuel within the storage tubes is cooled by natural ventilation flow around and through the storage tube array. Fuel is transferred to the SMV facility in the basket transfer flask, which is winched into the building from a road transporter. The modular vaults within a storage building are serviced by a basket handling crane, which provides coverage to each array of storage tubes across a shielded charge hall floor. The basket handling crane can engage with each tube in the array, remove the closure plug (using a gamma gate), position the basket transfer flask and lower fuel baskets into the storage tube.

2.5 VST FACILITY ALTERNATIVE

The Vaults in Shallow Trenches (VST) alternative comprises the storage of fuel baskets confined in concrete vaults. The vaults will be housed in a series of parallel, modular chambers with concrete walls, floors and roofs. The vaults will be constructed and mounded over with an earthen cover. The vaults within each storage chamber can be accessed by a basket handling crane, which provides coverage to the storage tubes in each vault. The basket handling crane can engage with each storage tube, remove the closure plug (using a gamma gate), position the basket transfer flask and lower fuel baskets into the storage tube. The complex will be accessible at ground level. The earthen cover applied over the roof is 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.

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 Gentilly site. 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 nuclear station is fully decommissioned and the RES facility is transitioning to a standalone operation. The fundamental assumption is that the reactor site will be active and will have a large work force on site until the station is 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 reactor site 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 processing building or existing buildings and new buildings not required. The test facility building will be constructed at either the HQ or NBP reactor site.
Equipment Storage and Maintenance Building	Building exists on the reactor site and new building not required. Allowance for refurbishment.
Store for Empty Baskets	Building exists on the reactor site 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. A building will be constructed to serve this reactor site.

Active-Liquid Waste Storage Building	Building not required until first repackaging event.
General Warehouse	Building exists on the reactor site and new building not required. Allowance for refurbishment.
Guardhouse and Perimeter Security System	Building and security system exist on the reactor site and new building and system not required. Allowance for refurbishment.
Truck Inspection/Wash Facility	Not required since no fuel is being transported off-site.
Utility Building	Building exists on the reactor site 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 the reactor 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 C.

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 vaults-based dry storage facilities would continue to operate and to receive fuel (Vaults alternative). New storage structures would be built as per the CNSC Construction Licences already held by HQ. Following the transfer of the last fuel from wet bays into dry storage, the facility would enter into a period of extended monitoring. Around this time it is assumed that the nearby nuclear station will be fully decommissioned and the RES facility would need to become a standalone facility. During the period of extended monitoring the storage facilities and fuel would be monitored, and the buildings and services would be maintained and refurbished as necessary. This regime of extended monitoring would continue until the vaults reach the end of their 100-year service life.

A new Environmental Assessment (EA) and Construction Licence approval would be sought for the transfer of the fuel when the existing vaults-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 vaults. After all fuel bundles have been transferred into new storage vaults, 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 Vaults alternative will be completed during the following time periods Y1 to Y3 and Y84 to Y86. The EA process and Construction Licensing process is assumed to occur from Y84 to Y86.

The second scenario, implementation of new SMV or VST technologies, would require an additional 7 years following December 2008 (Y3) to transition to the new dry storage systems. Therefore the earliest in-service date for a new system is assumed to be January 2020 (Y15) on the Gentilly site. 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 and would take one year to complete. When complete, letters of intent are sent to CNSC to prepare sites and to construct new storage facilities.
2. The federal EA process takes 3 years and involves a comprehensive study. HQ would be the proponent in this EA process.

3. Six months to finalise a site preparation and construction licence application 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 with Gentilly coming into service in 2020 (Y15).

In summary the siting work for the SMV and VST alternatives will be completed during the period Y1 to Y11. The EA process and Construction Licensing process is scheduled from Y8 to Y11 prior to construction of the new dry storage facilities.

Although it has been assumed for the purposes of this cost estimate that the SMV and VST technologies would be implemented as soon as practical, it might also be reasonable to assume a later implementation of the technology. More specifically one could assume that the SMV and VST technologies would be implemented when the existing CANSTOR vaults reach the end of their design life.

It is assumed that when the SMV or VST technologies are implemented on the site, the vaults-based interim dry storage facilities would continue to operate in parallel until all fuel stored in vaults has been transferred to the new storage facilities. In the SMV scenario the last dry storage vault would be emptied and fuel placed in new modular vault storage facilities in Y26. In the VST scenario the last basket would be transferred from interim storage to the VST storage chambers in Y26. After all fuel has been transferred the interim storage facilities would be decommissioned. At that time the SMV and VST facilities would enter into a period of extended monitoring. During this period the SMV facility would undergo periodic facility refurbishment events occurring every 100 years, and repackaging events every 300 years. Similarly the VST facility would undergo periodic facility refurbishment events (vault replacement every 100 years storage chamber replacement occurring every 200 years), and basket repackaging events every 300 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 station is decommissioned. After the dates when the station is fully decommissioned it is assumed that the RES facility will not have access to some resources provided by the station and will need to become a stand-alone facility. At that time additional buildings and services would be acquired or existing building refurbished, and additional staff would be retained.

Table 2: Key Assumed Dates for Implementation at the HQ site

Milestone	Gentilly	
	Nominal	Calendar
Government decision about preferred option and selection of the RES alternative	1	01Jul06
Review of RES alternatives for Gentilly and selection of preferred alternative	3	31Dec08
Implementation of RES Alternative		
First basket loaded (Actual Date)		1995
RES based on new dry technology becomes operational	15	1Jan20
Station/Site Decommissioning		
Last unit shutdown and the complete reactor site enters into safe-store mode. Some station staff remains on site until station completely dismantled.	8	31Dec13
Last fuel removed from wet bay and all fuel now in dry storage	17	31Dec22 (1)
Reactors and buildings dismantled, site decommissioned, and station staff is no longer present on the reactor site. RES facility becomes a stand-alone operation on the reactor site.	48	31Dec51

Notes:
1. Date when last fuel removed from the G2 wet bay in Y17. These dates are based, in part, on the requirement that fuel remains in the wet bay for a minimum of 7 years. In the Vaults alternative, 3,213 bundles of G1 fuel are transferred from silos to new vaults storage structures in Y18. In the SMV and VST alternatives, this AECL fuel is transferred in Y26.

3.3 VAULT OPERATIONS

The Vaults 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 repeats and repackaging events, when baskets will be removed from time served storage vaults. Fuel in basket format will be transferred to new storage vaults. Periodically, as baskets reach the end of the service lives, fuel will be transferred into replacement baskets, before being returned to replacement storage vaults.

The dates for major events during Gentilly Vaults operations are as follows:

Start of extended monitoring	Y19
Replace storage vaults*	Y87 to 89
Build repackaging facility**	Y288 to Y289
Repackaging event**	Y290 to Y294

* Repeated every 100 years
** Repeated every 300 years

3.4 SMV OPERATIONS

The SMV alternative schedule and cost estimate assume the fuel inventory is transferred to surface modular vault storage at an early date, followed by extended monitoring of the stored fuel. This period includes the intermediate facility repeat events, when baskets will be removed from time served modular vault buildings. Baskets will be transferred to new modular vault buildings. Periodically, as baskets reach the end of their service lives, fuel will be transferred into new baskets, before being returned to replacement modular vault buildings within the complex.

The dates for major events during Gentilly SMV operations are as follows:

Initial fuel receipts	Y15 to Y26
Start of extended monitoring	Y27
Replace storage vaults*	Y113 to Y121
Build repackaging facility**	Y288 to Y289
Repackaging event**	Y290 to Y294

* Repeated every 100 years
** Repeated every 300 years

3.5 VST OPERATIONS

The VST 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 vaults are replaced within the storage chambers. Fuel in basket format will be transferred to new storage vaults. Periodically, as baskets reach the end of the service lives, fuel will be transferred into replacement baskets, before being returned to replacement vaults within the storage chambers.

The dates for major events during Gentilly VST operations are as follows:

Initial fuel receipts	Y15 to Y26
Start of extended monitoring	Y27
Replace storage vaults*	Y113 to Y121
Replace storage chambers**	Y213 to 215
Build repackaging facility***	Y288 to Y289
Repackaging event***	Y290 to Y294

* Repeated every 100 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 Gentilly site.
Each of the three conceptual designs is required to store used fuel arising at the Gentilly site. A separate cost estimate has therefore been established for each of the three RES alternatives, (Vaults, SMV, and VST), giving 3 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 one repackaging event as necessary. This 300-year cycle is defined by the service life of the fuel container (the basket). 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:

583 Gentilly Vaults
584 Gentilly Surface Modular Vaults (SMV)
585 Gentilly Vaults in Shallow Trenches (VST)

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 HQ and NBP 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 the SMV and VST alternatives and the 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 5, 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 Appendix B and electronic versions of the cost estimating data are presented on the CD in Appendix C.

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.

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

- The system development costs (5xx-20) have been divided between the HQ and NBP sites for those alternatives which are common (SMV and VST), since the development activities are considered to be identical, and largely independent of site considerations.
- The costs associated with detail design (within 5xx-40) of particular alternatives have been divided between the fuel owners adopting that particular RES alternative. For example, those fuel owners adopting the SMV alternative will contribute to the detail design costs for that alternative.
- The costs associated with the construction and maintenance of the 25-year fuel monitoring facility (5xx-45-20-70) has have been shared between the NBP and HQ 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 reactor 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 RES facility operations will commence following the construction of the Process Building, ancillary facilities, initial storage complex capacity. Further stages of capacity will be constructed during the facility operations, if required.
- The estimate is based on RES designs that only receive CANDU used fuel bundles from HQ. AECL fuel from Gentilly 1 has a slightly different design when compared to Gentilly 2. But it

is assumed that the design differences are minor in the context of this study. The design capacity of the RES storage facilities is matched to the fuel inventories of the reactor site.

- 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 Gentilly site and the cost of decommissioning of the interim storage facilities (except in Vaults alternative estimate) are excluded from this cost estimate report. More specifically this report excludes the following:

1. The cost of operating and maintaining the station wet bays before and after station shutdown.

2. The cost of retrieving the fuel from wet bays and the preparation of the fuel for transfer to the basket welding facility. Preparation of baskets, which includes the draining of wet bay waters from the basket, drying the contents and welding the basket lid to the base.

3. The cost of operating and maintaining existing interim dry storage facilities, and the cost of constructing new interim dry storage facilities on the Gentilly site, as necessary, until the RES facilities become operational.

4. The cost of Environmental Assessments and any other related work required for the expansion of existing interim storage facilities on the Gentilly site.

5. 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 the Vaults alternative estimate).

6. *Vaults Alternative:* the cost of interim dry storage facility operations up to the point in time when the last fuel bundle has been retrieved from wet bays and placed into dry storage. In other words the Vaults cost estimate starts (with extended monitoring) in Y19 for the Gentilly site. This estimate includes the cost of decommissioning the interim storage facilities (vaults), but not the cost of decommissioning AECL's silos.

7. The cost of infrastructure support up to the point in time when the station are fully decommissioned. It is assumed that the Gentilly station will be fully decommissioned in Y48. Before the station is fully decommissioned, the RES facilities would have access to station 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 station decommissioning, it is assumed that the RES facility would inherit many of these infrastructure support and services in order to be stand-alone facility.

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.

For Gentilly, the total cost total cost of each facility alternative than can accept 136,051 fuel bundles is approximately:
Vaults $0.97 B
SMV $1.90 B
VST $1.26 B

Figures 2 to 4 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 Appendix. B.

Figure 2: Annual Cash flow projection and cumulative costs for Gentilly Vaults Facility

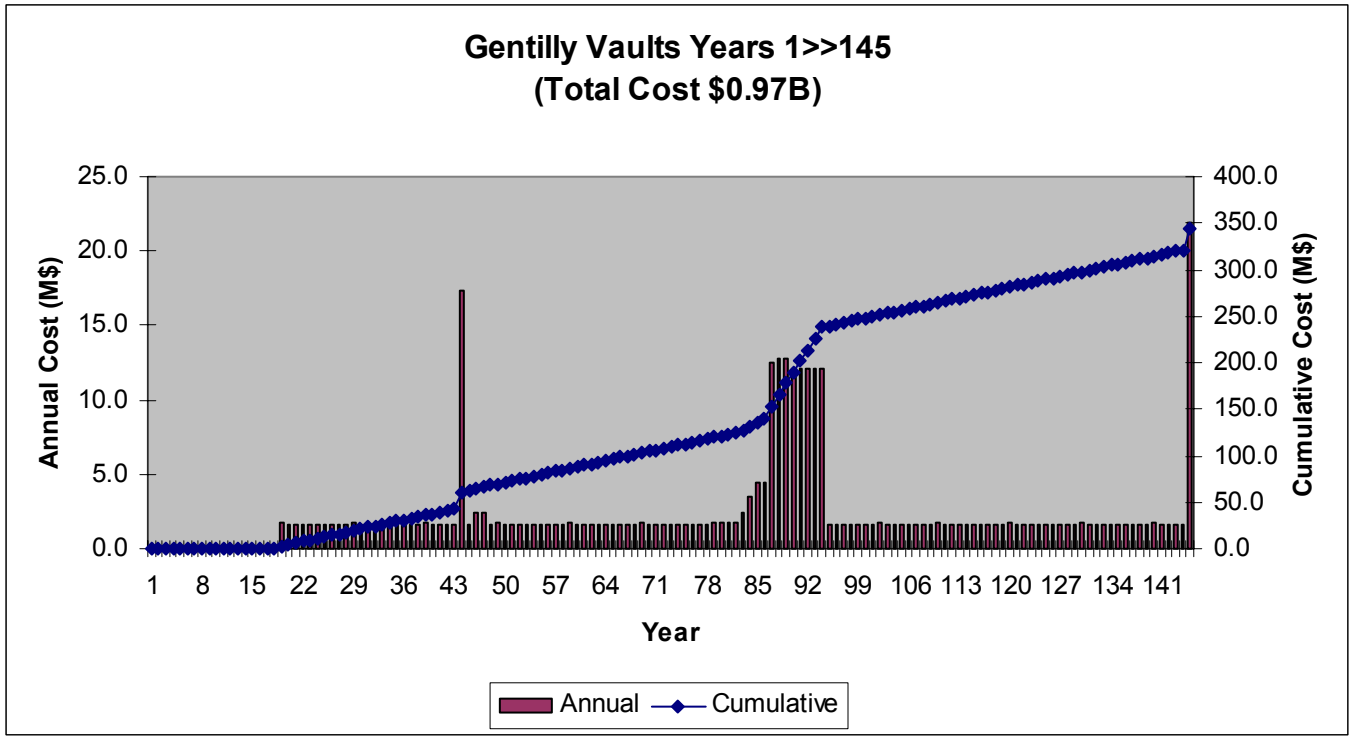


Figure 3: Annual Cash flow projection and cumulative costs for Gentilly SMV Facility

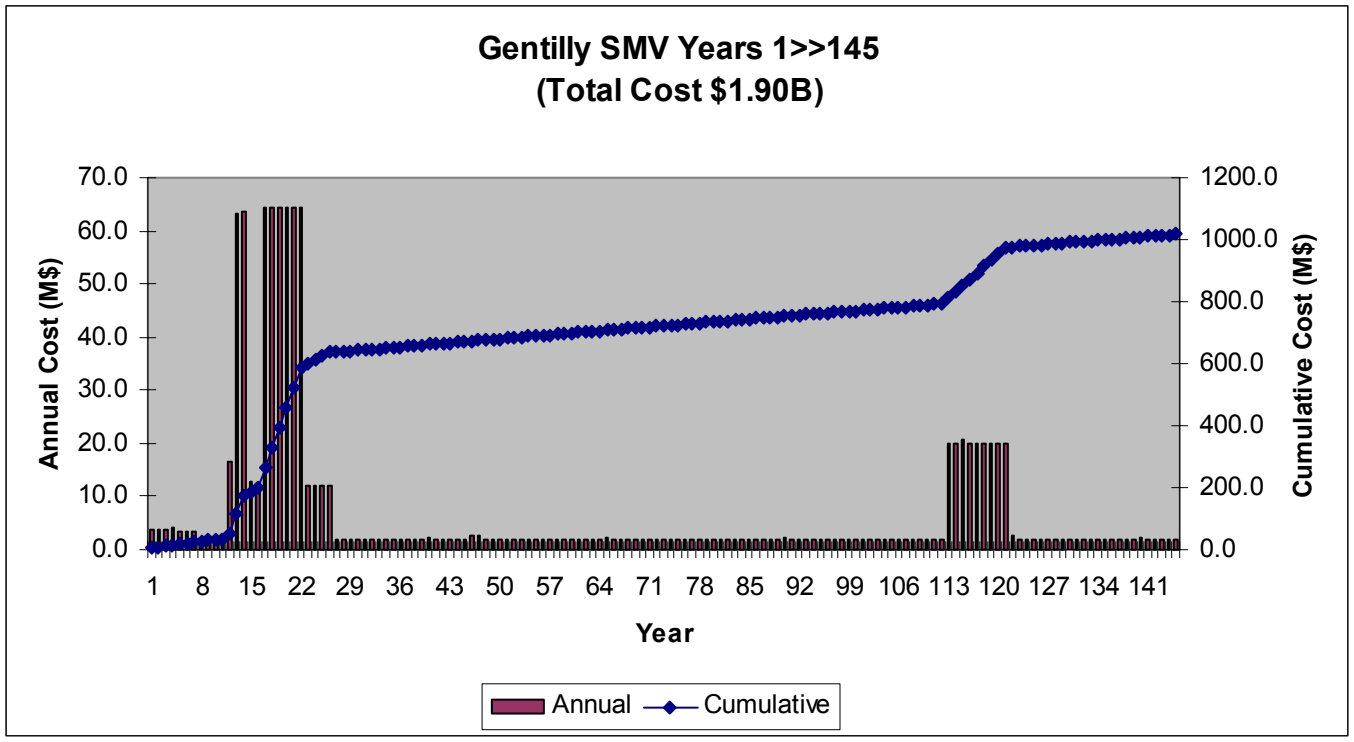


Figure 4: Annual Cash flow projection and cumulatative costs for Gentilly VST Facility

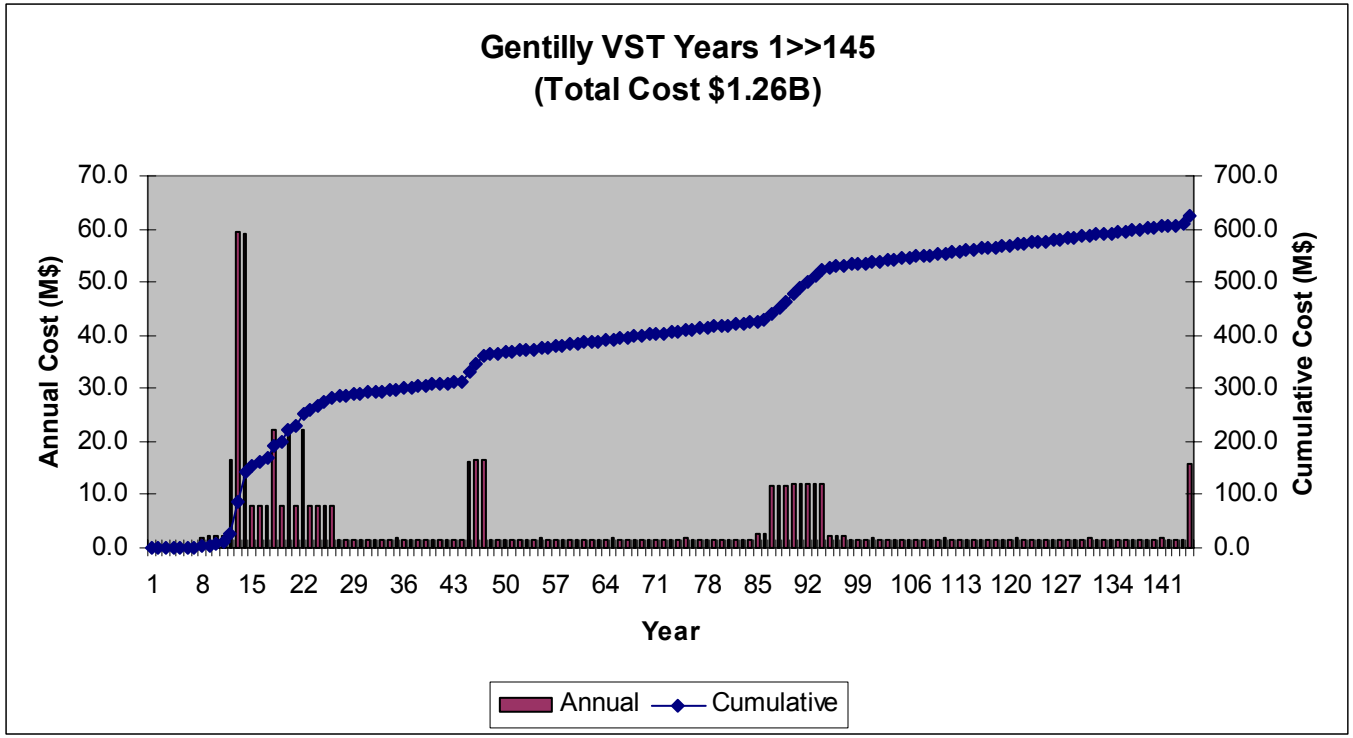


Figure 5: Typical Level 2 Work Breakdown Structure (5xx)

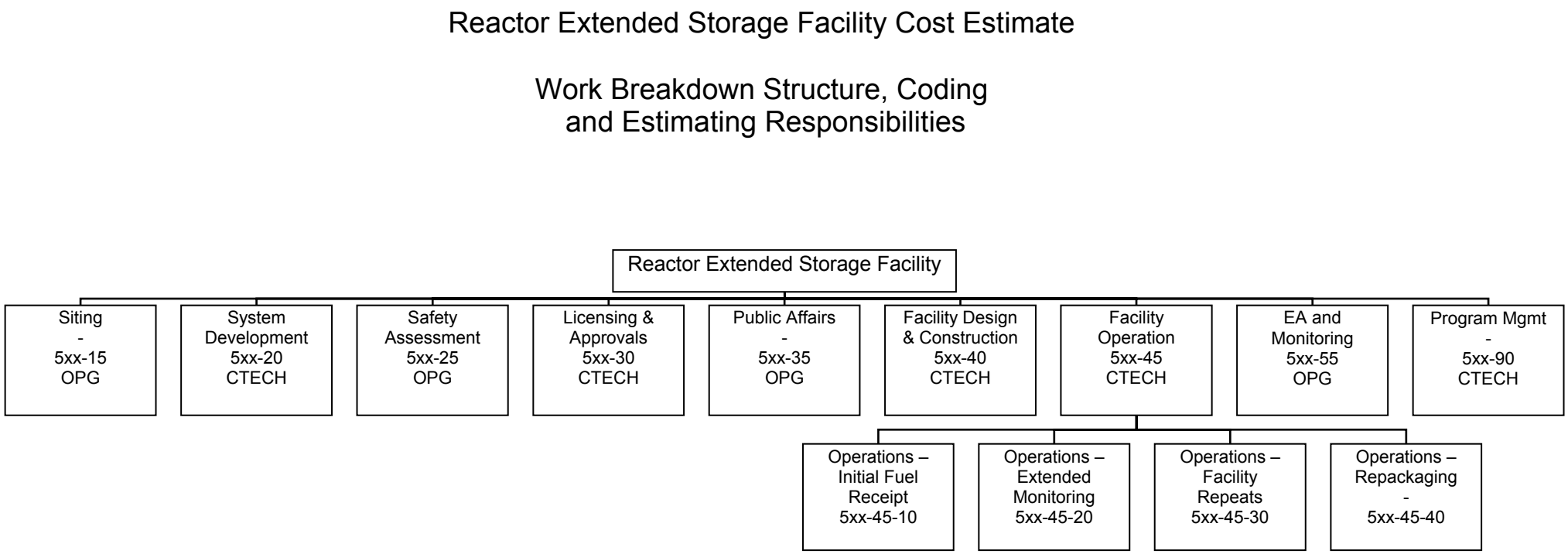


Table 3: Cost Estimates for Reactor Extended Storage Facilities by Level 2 Work Element

		Cost (2002K$)		
		Gentilly		
		583	584	585
WBS	**Description**	**Vaults**	**SMV**	**VST**
5xx.15	Siting	824	824	1,003
5xx.20	System Development	6,548	24,012	11,937
5xx.25	Safety Assessment	2,336	3,022	3,022
5xx.30	Licensing and Approvals	23,248	24,214	24,214
5xx.35	Public Affairs	1,718	1,718	1,718
5xx.40	Facility Design and Construction	19,594	144,618	136,290
5xx.45	Facility Operation	886,693	1,669,049	1,054,081
5xx.55	Environmental Assessment and Monitoring	25,745	26,940	26,940
5xx.90	Program Management	573	1,401	1,326
	Total Cost (K$)	967,281	1,895,797	1,260,531

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 5 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 583, 584 and 585.

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 the reactor site. 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 reactor site.

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. HQ sends letter of intent to CNSC to construct a new vault-based facility for storage of fuel baskets and to transfer fuel baskets from old vaults into new storage vaults (i.e. first 100-year transfer event in the Vaults alternative)
2. HQ sends letter of intent to CNSC to construct new storage structures and to transfer baskets into new structures for non indigenous alternatives (i.e. SMV and VST alternatives).

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 Vaults alternatives it assumed that the cost of Program Management is incurred during the nominal 18-year period (Y1 to Y18) leading to the start of extended monitoring on the reactor site. 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 SMV and VST alternatives it is assumed that the cost of Program Management is incurred over a 14-year period starting in Y1 and until the first storage facility is completed on the Gentilly site in Y14.

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$)		
	Gentilly		
	583	584	585
	Vaults	**SMV**	**VST**
Labour	419,809	531,160	575,888
Material and Equipment	223,779	658,238	280,180
Other	115,461	303,629	134,968
Contingency	208,232	402,771	269,496
Total Cost (K$)	967,281	1,895,797	1,260,531

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 reactor site.

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

Work Element	Description	Gentilly
Siting	All costs captured under 583-15	824
EA& Construction Licence	Costs captured under 583-55-20	2,501
System Development	All costs captured under 583-20. 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
Safety Assessment	All costs captured under 583-25 except costs related SA work during Operations (583-25-50) and SA to support decommissioning activities (583-25-70)	682
Licensing and Approvals	All costs captured under 583-30 except costs related L&A work for renewal and maintenance of Operating Licence (583-30-70).	2,910
Public Affairs	All costs captured under 583-35.	1,718
Program Management	All costs captured under 583-90. Program management costs are incurred during years prior to start of extended monitoring;	573
Total (K$)		15,758

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

Work Element	Description	Gentilly
Siting	All costs captured under 584-15	824
EA& Construction Licence	All costs captured under 584-55-20	3,127
System Development	All costs captured under 584-20	24,012
Safety Assessment	All costs captured under 584-25 except costs related SA work during Operations (584-25-50) and SA to support decommissioning activities (584-25-70)	1,365
Licensing and Approvals	All costs captured under 584-30 except costs related L&A work for renewal and maintenance of	3,580

	Operating Licence (584-30-70)	
Public Affairs	All costs captured under 584-35	1,718
Program Management	All costs captured under 584-90. Program management costs are incurred during years prior to start of SMV operations.	1,401
Total		36,027

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

Work Element	Description	Gentilly
Siting	All costs captured under 585-15	1,003
EA& Construction Licence	All costs captured under 585-55-20	3,127
System Development	All costs captured under 585-20	11,937
Safety Assessment	All costs captured under 585-25 except costs related SA work during Operations (585-25-50) and SA to support decommissioning activities (585-25-70)	1,365
Licensing and Approvals	All costs captured under 585-30 except costs related L&A work for renewal and maintenance of Operating Licence (585-30-70)	3,580
Public Affairs	All costs captured under 585-35	1,718
Program Management	All costs captured under 585-90. Program management costs are incurred during years prior to start of VST operations.	1,326
Total (K$)		24,056

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 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 Appendix B.

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

Work Element	Description	Gentilly
Transition to standalone RES facility	All site improvement and facility construction/refurbishment costs incurred at the time when the station is fully decommissioned and the RES must become a standalone operation	17,107
Prior to start of 300-year repackaging event	Construction of new waste management facilities specifically required to support the first operations during the first repackaging event. The cost of new processing building for 300-year repackaging event is captured under Operation costs	2,487
Total (K$)		19,594

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

Work Element	Description	Gentilly
Initial construction	Initial construction of all facilities and services required for SMV operations.	140,666
Transition to standalone RES facility	All site improvement and facility construction/refurbishment costs incurred at the time when the station is fully decommissioned and the RES facility must become a standalone operation	3,952
Total (K$)		144,618

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

Work Element	Description	Gentilly
Initial construction	Initial construction of all facilities and services required for VST operations.	132,338
Transition to standalone RES facility	All site improvement and facility construction/refurbishment costs incurred at the time when the station is fully decommissioned and the RES facility must become a standalone operation	3,952
Total (K$)		136,290

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 storage structures will be replaced every 100 years in all alternatives. Once every 300 years there would be a major repackaging event were the fuel would be transferred to new baskets and then placed into new storage structures.

The estimates for 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.

The Vaults estimate does 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 Appendix B.

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 Vaults alternative, the fuel is already in an

appropriate storage complex at the reactor site and therefore the Vaults estimate exclude any costs for initial fuel receipt. For the SMV and VST alternatives, the fuel baskets will be transferred from the wet bay and the existing vaults into the SMV storage structure or into vaults within concrete storage chambers (VST), respectively. During the initial fuel receipt phase, additional fuel storage capacity will be constructed, expanding the storage complex capacity in a staged manner.

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 into 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 fuel bundles from the baskets. The fuel bundles are transferred to 'fresh' baskets.

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

Work Element	Description	Gentilly
Storage structure (vaults) repeats – 100 yrs	All costs captured under 583-45-30-20. Includes the cost of demolition of old storage structures, disposal of waste materials and construction of new structures.	72,030
Storage structure (vaults) repeats – 200 yrs	All costs captured under 583-45-30-50	70,730
Storage structure (vaults) repeats – 300 yrs	All costs captured under 583-45-30-70	70,405
Repackaging basket to basket – 300 yrs	All costs captured under 583-45-40-10. Includes construction of new processing building, repackaging operations, acquisition of new baskets and disposal old baskets.	231,712
Program Management in support of periodic facility repeats and repackaging events	All costs captured under 583-45-40-05. These costs are incremental to ongoing Program management costs captured under Program Management during extended monitoring (583-45-20-05)	27,839
Total (K$)		472,716

Table 12: Operations - Initial Fuel Receipts, Facility Repeat and Repackaging Costs for SMV Alternative (2002 K$)

Work Element	Description	Gentilly
Initial Fuel Receipts	All costs captured under 584-45-10. Includes operations to package fuel and place into storage, and to construct additional storage structures. Includes cost of Program Management to support these operations.	456,482
Storage building (SMV) repeats – 100 yrs	All costs captured under 584-45-30-20. Includes the cost of demolition of old storage structures, disposal of waste materials and construction of new structures.	157,845
Storage building (SMV) repeats – 200 yrs	All costs captured under 584-45-30-30	157,845
Storage building (SMV) repeats – 300 yrs	All costs captured under 584-45-30-40	157,545
Repackaging basket to basket – 300 yrs	All costs captured under 584-45-40-10. Includes the cost demolition of old processing building, disposal of waste material, construction of new processing building, repackaging operations, acquisition of baskets and disposal old baskets.	275,593
Program Management in support of periodic facility repeats and repackaging event	All costs captured under 584-45-40-05. These costs are incremental to ongoing Program management costs captured under Program Management during extended monitoring (584-45-20-05) but do not include the Program Management costs included under 584-45-10.	22,741
Total		1,228,050

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

Work Element	Description	Gentilly
Initial Fuel Receipts	All costs captured under 585-45-10. Includes operations to package fuel and place into storage, and to construct additional storage structures. Includes cost of Program Management to support these operations.	136,705
Storage structure (vaults) repeats – 100 yrs	All costs captured under 585-45-30-20. Includes the cost of demolition of old storage structures, disposal of waste materials and construction of new structures.	72,030
Storage structure (vaults) repeats – 200 yrs	All costs captured under 585-45-30-30	72,030
Storage structure (vaults) repeats – 300 yrs	All costs captured under 585-45-30-40	71,705
Storage chamber repeats – 200 yrs	All costs captured under 585-45-30-50. Includes the cost of demolition of old storage structures, disposal of waste materials and construction of	40,365

	new structures.	
Repackaging basket to basket – 300 yrs	All costs captured under 585-45-40-40. In addition repackaging operations described above includes transfer of fuel to new modules and disposal old modules.	231,712
Program management during repackaging events	All costs captured under 585-45-40-05. These costs are incremental to ongoing Program management costs captured under Program Management during extended monitoring (585-45-20-05) but do not include the Program Management costs included under 585-45-10.	27,839
Total (K$)		652,387

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:

Vaults	276 years
SMV	268 years
VST	268 years

Tables 14 to 16 summarize the extended monitoring costs for each alternative on the Gentilly site for each alternative. 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. 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 Vaults Alternative (2002 K$)

Work Element	Description	Gentilly
Program Management	All costs captured under 583-45-20-05	111,426
Monitoring & Surveillance	All costs captured under 583-45-20-40	3,758
Operation Indirects	All costs captured under 583-45-20-50	262,112
Common Ancillary Services Operations	All costs captured under 583-45-20-60	34,162
Fuel Integrity Monitoring	All costs captured under 583-45-20-70	2,520
Safety Assessment – Facility Operation & Decommissioning	All costs captured under 583-25-50 & -70	1,654
Operating Licence Renewal	All costs captured under 583-30-70	20,338
Environmental Monitoring	All costs captured under 583-55 except the costs associated with Environmental Assessment and Construction Licensing work (583-55-20)	23,244
Total (K$)		459,213
Annual Cost	Total cost of extended monitoring divided by duration of 276 years	$1.66M/a

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

Work Element	Description	Gentilly
Program Management	All costs captured under 584-45-20-05	125,931
Monitoring & Surveillance	All costs captured under 584-45-20-40	3,919
Operation Indirects	All costs captured under 584-45-20-50	262,277
Common Ancillary Services Operations	All costs captured under 584-45-20-60	42,083
Fuel Integrity Monitoring	All costs captured under 584-45-20-70	6,788
Safety Assessment – Facility Operation & Decommissioning	All costs captured under 584-25-50 & -70	1,657
Operating Licence Renewal	All costs captured under 584-30-70	20,634
Environmental Monitoring	All costs captured under 584-55 except the costs associated with Environmental Assessment and Construction Licensing work (584-55-20)	23,813
Total (K$)		487,102
Annual Cost	Total cost of extended monitoring divided by duration of 268 years	$1.82M/a

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

Work Element	Description	Gentilly
Program Management	All costs captured under 585-45-20-05	107,913
Monitoring & Surveillance	All costs captured under 585-45-20-40	3,649
Operation Indirects	All costs captured under 585-45-20-50	254,514
Common Ancillary Services Operations	All costs captured under 585-45-20-60	33,171
Fuel Integrity	All costs captured under 585-45-20-70	2,447

Monitoring		
Safety Assessment – Facility Operation & Decommissioning	All costs captured under 585-25-50 & -70	1,657
Operating Licence Renewal	All costs captured under 585-30-70	20,634
Environmental Monitoring	All costs captured under 585-55 except the costs associated with Environmental Assessment and Construction Licensing work (585-55-20)	23,813
Total (K$)		447,798
Annual Cost	Total cost of extended monitoring divided by duration of 268 years	$1.67M/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 Gentilly RES facilities. The WMO is assumed to have 11 full-time staff and 0.8 of these staff are dedicated to servicing the HQ RES facilities. The remainder of the staff will service the RES facilities on the other 6 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, including overheads, insurance, community offsets and benefits, legal fees, and sales tax. For the purposes of this cost estimate it is assumed that a RES facility on the Gentilly site will not be subject to property tax payments. In addition it is assumed that the cost of public affairs will be absorbed by the overall HQ public affairs program. 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 Gentilly RES facilities. Material and equipment costs are assumed to be $1K/a.

5xx-45-20-50 Operations Indirects
Operation indirects covers all activities and costs to maintain storage buildings, processing or 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.

For Gentilly, other costs are included for material and equipment during refurbishment and replacement work programs for the ancillary facilities ($75K/a), for armed response capability ($50K/a) and energy consumption ($5K/a).

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 the Vaults, SMV and VST alternatives, there is no processing building shielded cell, so an additional allowance (relative to CES) is included for a cell on the reactor site.

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 Gentilly RES facilities will be $50K/a (about 0.17 fte/a of CNSC staff time).

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 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 Y300 then the costs for this 300-year period can simple be repeated as required to generate costs, say, for 600, 900 years and so on.

This approach to estimating long-term costs should only be used in the context of this study. In reality there would be considerable optimization of the storage technology during facility repeat and repackaging events to reflect radioactive decay and reduction in heat load over time.

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 AECL's Chalk River and Whiteshell Reactor Sites. CTECH Report No: 1105/MD18084/REP/19 - 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 Hydro-Québec's Gentilly Reactor Site. CTECH Report No: 1105/MD18084/REP/14 - 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 Gentilly Site

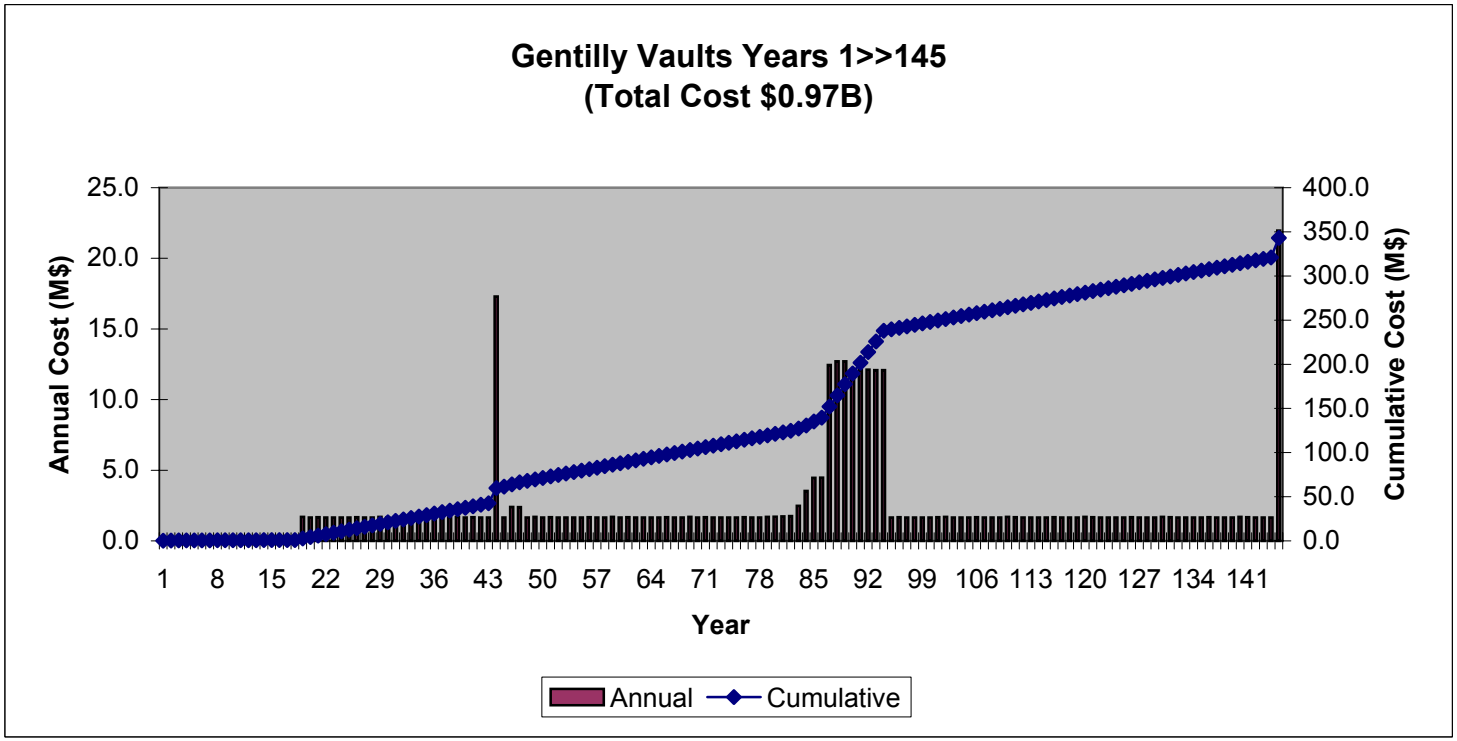
WBS No 583 – Vaults
WBS No 584 – SMV
WBS No 585 - VST

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

RES ALTERNATIVE **FUEL OWNER** **HQ**
WBS No 583
Gentilly
VAULTS

Lev 2	WBS Name	Sheet Totals ($k)
15	Siting	824
20	System Development	6,548
25	Safety Assessment	2,336
30	Licensing & Approvals	23,248
35	Public Affairs	1,718
40	Facility Design & Construction	19,594
45	Facility Operation	886,693
55	Environmental Assessment and Monitoring	25,745
90	Program Management	573
	Total Cost ($k)	**967,281**

Gentilly Vaults Alternative	**967,281**
Siting Phase	**15,758**
Siting	824
EA	2,501
System Development	6,548
SA	682
L&A	2,910
Public Affairs	1,718
Program Mgmt	573
Construction Phase	**19,594**
Transition to Standalone	17,107
Before 300-yr Repackaging	2,487
Operations Phase	**931,929**
Repeat & Repackaging	*472,716*
Vaults - 100 yrs	72,030
Vaults - 200 yrs	70,730
Vaults - 300 yrs	70,405
Repackaging B to B - 300 yrs	231,712
PM for Repeats & Repackaging	27,839
Extended Monitoring	*459,213*
Program Mgmt	111,426
Monitoring Survelliance	3,758
Operation Indirects	262,112
Common Ancillary Services Ops	34,162
Fuel Integrity Monitoring	2,520
SA - Ops & Decommissioning	1,654
L&A - Ops Licence Renewal	20,338
Environmental Monitoring	23,244


Gentilly Vaults Years 1>>145
(Total Cost $0.97B)
Annual Cost (M$)
Cumulative Cost (M$)
25.0
20.0
15.0
10.0
5.0
0.0
400.0
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

VAULTS
Gentilly

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
583	15	0	0	0	0	0	0	Siting	Labour	STEP	OPG	RJH	1	86	7	0	0	NO DATA TO FILL	452.2
583	15	0	0	0	0	0	0	Siting	Materials and Equipment	STEP	OPG	RJH	1	86	7	0	0		0.0
583	15	0	0	0	0	0	0	Siting	Other	STEP	OPG	RJH	1	86	7	0	0		97.0
583	15	0	0	0	0	0	0	Siting	Contingency	STEP	OPG	RJH	1	86	7	0	0		274.6

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 %
			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

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
											Labour			Materials and other Equipment			Other			Contingency				
1	2	3	4	5	6	7	8				CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
583	15							**Siting**																
583	15	10						SITING MANAGEMENT																
								RES is 7 yrs vs 13 yrs for CES and shared amongst 7 sites or a factor of 0.08. However 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	
583	15	70						PREFERRED SITE																
583	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	
583	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

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

VAULTS
Gentilly

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
583	20	0	0	0	0	0	0	System Development	Labour	STEP	CTECH	AM	283	289	7	0	0	NO DATA TO FILL	4156.3
583	20	0	0	0	0	0	0	System Development	Materials and Equipment	STEP	CTECH	AM	283	289	7	0	0		430.0
583	20	0	0	0	0	0	0	System Development	Other	STEP	CTECH	AM	283	289	7	0	0		147.7
583	20	0	0	0	0	0	0	System Development	Contingency	STEP	CTECH	AM	283	289	7	0	0		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
		0%	
Labour	4141	0.0	4156.3
Materials and Equipment	430	0.0	430.0
Other	163	0.0	147.7
Contingency	1814.2	0.0	1814.2
Total	6548	0.0	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																		
583	20							**System Development**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
583	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. 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	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. 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
583	20	5						SYSTEM OPTIMIZATION																

			Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documentation 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	0				0.00	0.00	0.00								0
			Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documentation 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
583	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. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documentation 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 large reduction due to no cask related feasibilty studies and no fuel container dismantling techniques carried out in this RES alternative . 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. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documentation 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
583	20	30	STORAGE SYSTEM ENG'NG																

			Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documentation 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	0				0.00	0.00	0.00									0
			Assume system development shared between 2 sites (NBP & HQ) Therefore factor = 1/2. Also for resident storage option selected as future storage method an additional 50% is deducted. Assume additional documentation 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						200.00	0.08	15.75							16
			Percentage for contingency assumed same as for CES	Contingency	25%									25%	1.00	164.26				164
583	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	4,141	Total	430	Total	163	Total	1,814.2							
						Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0							

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

BASIS OF ESTIMATE NOTES - Insert references and notes

1
2
3
4

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

VAULTS
Gentilly

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
583	25	0	0	0	0	0	0	Safety Assessment	Labour	STEP	OPG	RJH	1	289	41	0	0	NO DATA TO FILL	1428.3
583	25	0	0	0	0	0	0	Safety Assessment	Materials and Equipment	STEP	OPG	RJH	1	289	41	0	0		0.0
583	25	0	0	0	0	0	0	Safety Assessment	Other	STEP	OPG	RJH	1	289	41	0	0		240.5
583	25	0	0	0	0	0	0	Safety Assessment	Contingency	STEP	OPG	RJH	1	289	41	0	0		667.5

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	1428		0.0	1428.3	
Materials and Equipment	0		0.0	0.0	
Other	241		0.0	240.5	
Contingency	667.5		0.0	667.5	
Total	2336		0.0	2336	

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																	
583	25							**Safety Assessment**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
583	25	10						SAFETY ASSESSMENT MANAGEMENT																
								RES = 11 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	0.05	0							0	1
									Other	0.05							850	0.05	42.5				43	
									Contingency	40%										40%	1.0	121.4	121	
583	25	30						SA - SITING																
								Very limited siting activities leads to no SA costs	Labour	0	2287.5	0	0										0	2
									Materials and Equipment	0				0	0	0							0	
									Other	0							3,850	0	0				0	
									Contingency	40%										40%	1.0	0.0	0	
583	25	40						SA - OPERATING LICENSE																
									Labour	0.1	1540.5	0.1	154.05										154	3
									Materials and Equipment	0.1				0	0.1	0							0	
									Other	0.1							300	0.1	30				30	
									Contingency	40%										40%	1.0	73.6	74	
583	25	50						SA - FACILITY OPERATIONS																
								RES has 30 renewal events vs 45 in CES giving a factor of 0.67. However renewal costs can be shared between 5 sites with same technology; thus reduce factor to 0.08	Labour	0.08	9604.8	0.08	768.384										768	

				Materials and Equipment	0				0	0	0							0
			Expenses at $0.5K/a x 276 yrs	Other	1							138	1	138				138
				Contingency	40%										40%	1.0	362.6	363
583	25	70	SA - DECOMMISSIONING (Processing Facilities)															
				Labour	0.1	2449.9	0.1	244.99										245
			RES has 1 decommissioning events - while CES has 3. Costs can be shared between sites with similar technology; thus factor to 0.1															
				Materials and Equipment	0.1				0	0.1	0							0
				Other	0.1							300	0.1	30				30
				Contingency	40%										40%	1.0	110.0	110

Total	**2,336**
Check: Should = 0	**0**

Total	1,428	Total	0	Total	241	Total	667.5
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

VAULTS
Gentilly

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
583	30	0	0	0	0	0	0	Licensing & Approvals	Labour	STEP	OPG	RJH	19	294	276	0	0	NO DATA TO FILL	3081.5
583	30	0	0	0	0	0	0	Licensing & Approvals	Materials and Equipment	STEP	OPG	RJH	19	294	276	0	0		0.0
583	30	0	0	0	0	0	0	Licensing & Approvals	Other	STEP	OPG	RJH	19	294	276	0	0		15517.2
583	30	0	0	0	0	0	0	Licensing & Approvals	Contingency	STEP	OPG	RJH	19	294	276	0	0		4649.7

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
				0%	
Labour	3082			0.0	3081.5
Materials and Equipment	0			0.0	0.0
Other	15517			0.0	15517.2
Contingency	4649.7			0.0	4649.7
Total	23248			0.0	23248

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																	
								In general L&A costs are assumed to be less than for a CES facility since dealing with well developed technology on an existing site. In some cases the costs are shared between the seven sites															
583	30							**Licensing & Approvals**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
583	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	1
									Other	0.2							40	0.2	8				8	
									Contingency	0.25										25%	1.0	29.8	30	
583	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	0.2	0							0	
									Other	0.2							6,264	0.2	1252.8				1,253	
									Contingency	0.25										25%	1.0	444.8	445	
583	30	60						OTHER GOVN'MT APPROVALS																
583	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
583	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
583	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
583	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
583	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
583	30	70		CNSC OPERATING LICENCE (Maintenance & Renewal)																			
				CES duration is 330 years. Costs incurred in RES during period Y19 to Y294 or 276 years. RES is assumed to have 0.8 staff vs 1 staff in CES. Thus factor is 276/330 x 0.8/1 = 0.067	Labour	0.067	32754	0.067	2194.518														2,195
					Materials and Equipment	1				0	1	0											0
				Expenses at $51K/a x 276 yrs	Other	1							14,076	1	14076								14,076
					Contingency	0.25										25%	1.0	4,067.6					4,068

																					Total	**23,248**
																					Check: Should = 0	**0**
						Total		3,082	Total		0	Total		15,517	Total			4,649.7				
						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

VAULTS

Gentilly

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
583	35	0	0	0	0	0	0	Public Affairs	Labour	STEP	OPG	RJH	1	89	10	0	0	NO DATA TO FILL	683.8
583	35	0	0	0	0	0	0	Public Affairs	Materials and Equipment	STEP	OPG	RJH	1	89	10	0	0		0.0
583	35	0	0	0	0	0	0	Public Affairs	Other	STEP	OPG	RJH	1	89	10	0	0		461.8
583	35	0	0	0	0	0	0	Public Affairs	Contingency	STEP	OPG	RJH	1	89	10	0	0		572.8

INSTRUCTIONS

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

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
Labour	684	*0.0*	683.8
Materials and Equipment	0	*0.0*	0.0
Other	462	*0.0*	461.8
Contingency	572.8	*0.0*	572.8
Total	1718	*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																	
583	35							**Public Affairs**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
583	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	
583	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	
583	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	
583	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
583	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

VAULTS

Gentilly

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
583	40	0	0	0	0	0	0	Facility Design & Construction	Labour	STEP	CTECH	AM	44	289	5	0	0	NO DATA TO FILL	5472.0
583	40	0	0	0	0	0	0	Facility Design & Construction	Materials and Equipment	STEP	CTECH	AM	44	289	5	0	0		8090.2
583	40	0	0	0	0	0	0	Facility Design & Construction	Other	STEP	CTECH	AM	44	289	5	0	0		0.0
583	40	0	0	0	0	0	0	Facility Design & Construction	Contingency	STEP	CTECH	AM	44	289	5	0	0		6032.2

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	5472		*0.0*	5472.0	
Materials and Equipment	8090		*0.0*	8090.2	
Other	0		*0.0*	0.0	
Contingency	6032.2		*0.0*	6032.2	
Total	19594		*0.0*	19594	

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 is calculated	Add Basis of estimate Note Ref Number
												Labour			Materials and other Equipment			Other			Contingency			TOTAL	
																							Cost $k	
583	40							**Facility Design & Construction**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
583	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 additional land acquisition costs neccesary	Other	0.0							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
583	40	30						COMMON ANCILLARY FACILITIES																
583	40	30	10					ADMIN AND SUPPORT FACILITIES																
583	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
583	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

					/45/20/50	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
583	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
583	40	30	10	5	ACTIVE SOLID WASTE HDLG BLDG															
					A 30% allowance of the 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
583	40	30	10	6	SOLID WASTE STORAGE AREA															
					A 30% allowance of the 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
583	40	30	10	7	ACTIVE LIQ/W TRT'MT BLDG															
					A 30% allowance of the 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
583	40	30	10	8	LOW LVL LIQ/W STRG BLDG															
					A 30% allowance of the 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
583	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
583	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
583	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
583	40	30	10	12	UTILITY BLDG														
					Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour	0.0	1,023.2	0.0	0.0						comment 7			0
						Materials and Equipment	0.0				1,257.0	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	30%									30%	1.0	0.0	0
583	40	30	10	13	TEST FACILITY CONSTRUCTION														
					Taken as being independent of fuel inventory stored. Same size bldg as CES, facilty will be shared between NBP and HQ therefore costs 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
583	40	30	20		OTHER SITE SYSTEMS														
583	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
583	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
583																			
583	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
583	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
583	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 CES	Contingency	25%										25%	1.0	0.0			0
583	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
583	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	Contingency	30%										30%	1.0	0.0			0
583	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
583	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
583	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
583	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

transition	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

Total	**19,594**
Check: Should = 0	**0**

Total	5,472	Total	8,090	Total	0	Total	6,032.2
Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0

BASIS OF ESTIMATE NOTES - Insert references and notes

1

2

3

4

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

VAULTS
Gentilly

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
583	45	0	0	0	0	0	0	Facility Operation	Labour	STEP	CTECH	AM	19	294	276	0	0	NO DATA TO FILL	390234.0
583	45	0	0	0	0	0	0	Facility Operation	Materials and Equipment	STEP	CTECH	AM	19	294	276	0	0		211118.6
583	45	0	0	0	0	0	0	Facility Operation	Other	STEP	CTECH	AM	19	294	276	0	0		97156.5
583	45	0	0	0	0	0	0	Facility Operation	Contingency	STEP	CTECH	AM	19	294	276	0	0		188183.9

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	390234	0.0	390234.0
Materials and Equipment	211119	0.0	211118.6
Other	97156	0.0	97156.5
Contingency	188184	0.0	188183.9
Total	886,693	0.0	886693

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				**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
583	45							**Facility Operation**																
583	45	20						OPERATIONS - EXTENDED MONITORING																
583	45	20	5					PROGRAM MANAGEMENT																
								Entries in CES DET applicable to RES but duration 276 years RES & 300 years CES therefore276/300 = 0.92. Program management spread over 7 sites with Gentilly assumed to have 0.8 staff vs 9 in CES. Thus combined factor = 0.082	Labour	0.082	312,354.0	0.1	25,543.6											25,544	4
								No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	0.0	0.0								0	
								Annual cost = $243/a x 277 yrs	Other	1.00							67,311.0	1.0	67,311.0					67,311	2,3
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	18,570.9		18,571	
583	45	20	40					MONITORING AND SURVEILLANCE -EXTENDED MONITORING																	
								CES monitoring and surveillance duration was 300 yrs for 4717 baskets, RES is 276 years for 2299 baskets. Gentilly assumed to have 0.5 staff for RES vs 5 in CES. Combined factor based on duration, fuel inventory and staffing levels.	Labour	0.04	49,716.0	0.0	2,229.2											2,229	4
								annual costs = $1k/a x 276 years	Materials and Equipment	1.00				276.0	1.0	276.0								276	5
								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	50%										50%	1.0	1,252.6		1,253	
583	45	20	50					OPERATION INDIRECTS (EXTENDED MONITORING)																	
									Labour	0.19	875,048.0	0.2	165,744.4											165,744	4

				Entries in CES DET applicable to RES but duration 276 years RES & 300 years CES. Staff for RES = 7 vs 34 in CES. Combined factor = 276/300 x 7/34. M&E costs are $75k/a x 276 years	Materials and Equipment	1.00			20,700.0	1.0	20,700.0							20,700	5
				Armed response = $50k/a + energy costs at $5k/a. total = $55k x 276 years	Other	1.00						15,180.0	1.0	15,180.0				15,180	5
				Percentage for contingency assumed same as for CES	Contingency	30%									30%	1.0	60,487.3	60,487	
583	45	20	60	COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)																	
				RES has duration 276 years, CES has 300 years. RES staff is 1 vs 5 in CES. Factor is 276/300 x 1/5	Labour	0.18	148,529.0	0.2	27,329.3									27,329	4
				No entry in CES alternative cost category	Materials and Equipment	0.0			0.0	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	6,832.3	6,832	
583	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	4
				annual M+E costs is $2.5k/a x 277 years	Materials and Equipment	1.0			690.0	1.0	690.0							690	5
				Other costs is $0.5k/a x 277 years	Other	1.0						138.0	1.0	138.0				138	5
				Percentage for contingency assumed same as for CES	Contingency	50%									50%	1.0	840.1	840	
583	45	30		OPERATIONS - FACILITY REPEATS																	
583	45	30	20	VAULTS 100 YEAR REPLACEMENT																	
				replace all 12 vaults. CES has cost for replacing 24 therefore labour cost factor = 12/24	Labour	0.50	43,775.7	0.5	21,887.9									21,888	
				each vault materialscost = $675k therefore from CES materials total cost (which is for 24 vaults) deduct 12x$675k to leave remaining materials costs for 12 vaults and associated equipment	Materials and Equipment	1.00			30,520.000	1.0	30,520.0							30,520	
				eletrical consumption for const'n of vaults and waste didposal is related to quantity of vaults, use factor 12/24. Armed response included at rate of $50k/a based on 5 years duration - see note 8.	Other	0.50						5,500.0	0.5	3,000.0				3,000	6
				Percentage for contingency assumed same as for CES	Contingency	30%									30%	1.0	16,622.4	16,622	
583	45	30	30	VAULTS 200 YEAR REPLACEMENT																	
				assume same costs as for 100 year vault replacement	Labour	0.50	43,775.7	0.5	21,887.9									21,888	
				assume same costs as for 100 year vault replacement	Materials and Equipment	1.00			29,520.000	1.0	29,520.0							29,520	
				assume same costs as for 100 year vault replacement	Other	0.50						5,500.0	0.5	3,000.0				3,000	6
				assume same costs as for 100 year vault replacement	Contingency	30%									30%	1.0	16,322.4	16,322	
583	45	30	40	VAULTS 300 YEAR REPLACEMENT																	
				assume same costs as for 100 year vault replacement	Labour	0.50	43,775.7	0.5	21,887.9									21,888	
				assume same costs as for 100 year vault replacement	Materials and Equipment	1.00			29,520.000	1.0	29,520.0							29,520	
				assume same costs as for 100 year vault replacement	Other	0.50						5,500.0	0.5	2,750.0				2,750	7
				assume same costs as for 100 year vault replacement	Contingency	30%									30%	1.0	16,247.4	16,247	
583	45	40		OPERATIONS - REPACKAGING																	

583	45	40	5			PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)															
							Labour	0.05	440,778.0	0.1	23,198.8								23,199		
						Entries in CES DET applicable to RES but duration 30 years RES = 3x(2yr licensing 1yr demolish prev. bldg, 2yr const'n, 5yr operations) & 114 years CES therefore30/114 = 0.263. A further factor included due to program management shared equally between 7 sites this factor is increased to include inefficiency of single site based program management team (use 20%).												
						No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	0.0	0.0						0	
						see note 2. no property tax assumed this site	Other	0.00							0.0	0.0				0	2
						Percentage for contingency assumed same as for CES	Contingency	20%									20%	1.0	4,639.8	4,640	
583	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	0.00							0.0	0.0	0.0			0	
						Percentage for contingency assumed same as for CES	Contingency	22%									22%	1.0	23,230.6	23,231	
583	45	40	10	600	30	ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)															
						duration 24 years RES compared to 30 years CES. Factor =24/30 = 0.8	Labour	0.8	11,882.0	0.8	9,505.6								9,506		1
						No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	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	2,376.4	2,376	
583	45	40	40			BASKET TO BASKET 300 YEAR REPACKAGING															
583	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	
583	45	40	40	10		PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)															
583	45	40	40	10	20	RPBB EQUIP. DESIGN, SUPPLY & INSTALL															
583	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	
583	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
583	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
583	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
583	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
583	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	0.0					0.0	0.0	0.0				0
							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
583	45	40	40	10	80		CONST'N INDIRECTS (RPB)													
							As for RPM, - assume Design accounts for approx 45% of the total const'n indirect costs (information on ratio obtained from CES SMV Processing building). These costs can be shared between the 2 sites (HQ & NBP) therefore factor = (100-45)+45/2 = 77.5% (or 0.78)	Labour	0.78	6,299.6	0.8	4,882.2										4,882
								Materials and Equipment	0.0					0.0	0.0	0.0				0
								Other	0.78							241.5	0.8	187.2		187
							same contingency as for CES	Contingency	30%									30%	1.0	1,520.8	1,521
583	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	0.0					0.0	0.0	0.0				0
							No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0		0
							same contingency as for CES	Contingency	30%									30%	1.0	1,407.2	1,407
583	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	0.0					0.0	0.0	0.0				0
							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	
583	45	40	40	600	REPACKAGING OPERATIONS (RPB)																					
					Labour for repackaging operations for CES is for a fuel inventory of 4717 baskets. RES has 2299 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 2299/4717 = 0.487	Labour	0.49	3,960.8	0.5	1,930.4														1,930	
					the same factor for labour is used for procurement of new baskets	Materials and Equipment	0.49				23,585.0	0.5	11,495.0												11,495	
					the same factor for labour is used for waste disposal of old baskets	Other	0.49							378.0	0.5	184.2									184	
					same contingency as for CES	Contingency	30%															30%	1.0	4,082.9	4,083	
583	45	40	40	700	OPERATION INDIRECTS (RPB)																					
					operation indirect labour costs for CES are for a duration of 10 yrs RES operations are for 5 yrs therefore a factor of 0.5 is used	Labour	0.5	2,678.3	0.5	1,339.2														1,339	
					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 = 5/10yrs = 0.5. Armed response included at rate of $50k/a based on 5 years duration - see note 8	Other	1.0							1,870.0	1.0	1,870.0								1,870	6
					same contingency as for CES	Contingency	30%															30%	1.0	1,014.6	1,015	
583	45	40	40	800	STORAGE OPERATIONS (RPB)																					
					Labour for storage operations for CES is for a fuel inventory of 4717 baskets. RES has 2299 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 2299/4717 = 0.487	Labour	0.49	990.2	0.5	482.6														483	
					No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	0.0	0.0												0	
					No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0									0	
					same contingency as for CES	Contingency	30%															30%	1.0	144.8	145	

																								Total	**886,693**
																								Check: Should = 0	**0**
								Total	390,234	Total	211,119	Total	97,156	Total	188,183.9										
								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 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

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

3 243k$/a made up of expenses from table 18 in report (118+50+50+25). No property tax or PST included.

4 staffing levels obtained from table 17 in cost estimate report 1105/MD18084/REP/18

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

6 armed response costs during 'fuel handling' based on rate of $100k/a. 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

7 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 VAULTS
ACTIVITY SUMMARY TO DATA TRANSFER Gentilly

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
583	55	0	0	0	0	0	0	Environmental Assessment and Monitoring	Labour	STEP	OPG	RJH	19	294	276	0	0	NO DATA TO FILL	14130.0
583	55	0	0	0	0	0	0	Environmental Assessment and Monitoring	Materials and Equipment	STEP	OPG	RJH	19	294	276	0	0		4140.0
583	55	0	0	0	0	0	0	Environmental Assessment and Monitoring	Other	STEP	OPG	RJH	19	294	276	0	0		1534.0
583	55	0	0	0	0	0	0	Environmental Assessment and Monitoring	Contingency	STEP	OPG	RJH	19	294	276	0	0		5941.2

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
		0%	
Labour	14130	0.0	14130.0
Materials and Equipment	4140	0.0	4140.0
Other	1534	0.0	1534.0
Contingency	5941.2	0.0	5941.2
Total	25745	0.0	25745

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

WBS LEVEL 1	2	3	4	5	6	7	8	WBS Description / Detail	Cost Category	Factor	Labour			Materials and other Equipment			Other			Contingency			TOTAL Cost $k
								Total HQ fuel inventory is about 3% of CES inventory. Therefore it is assumed that the costs of EA & Monitoring program are significantly less than for CES. However there will be a "fixed" cost component to some costs which limit the amount by which costs can be reduced.															
583	55							**Environmental Assessment and Monitoring**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	
583	55	10						EA & MONITORING PROGRAM MANAGEMENT															
								Costs are incurred over the period Y19 to Y294 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				0	1	0							0
								Expenses at $1.5K/a x 276 yrs	Other	1							414	1	414				414
									Contingency	0.3										3226.24	0.3	967.872	968
583	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	0.2	0						0
				Other	0.2							2,150	0.2	430			430
				Contingency	0.3										1924.2	0.3	577.26	577
583	55	40	GROUNDWATER MONITORING															
			Costs span the period Y19 to Y294 or 276 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.6 in CES. Factor is 276/330 x 0.02/0.6 = 0.028.	Labour	0.028	37158	0.028	1040.424									1,040
			M&E at $3K/a x 276 yrs	Materials and Equipment	1				828	1	828						828
			Expenses at $2K/a x 276 yrs	Other	1							552	1	552			552
				Contingency	0.3										2420.424	0.3	726.1272	726
583	55	50	RADIOLOGICAL BIOSPHERE MONITORING															
			Costs span the period Y19 to Y294 or 276 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 276 yrs	Materials and Equipment	1				2484	1	2484						2,484
				Other	1							0	1	0			0
				Contingency	0.3										7916	0.3	2374.8	2,375
583	55	60	NON-RAD BIOSPHERE MONITORING															
			Costs span the period Y19 to Y294 or 276 yrs vs 330 in CES. RES staff is 0.05 staff vs 0.8 staff in CES. Factor is 276/330 x 0.05/0.8 = 0.052	Labour	0.052	53590	0.052	2786.68									2,787
			M&E at $3K/a x 276 yrs	Materials and Equipment	1				828	1	828						828
				Other	1							0	1	0			0
				Contingency	0.3										3614.68	0.3	1084.404	1,084
583	55	80	HUMAN HEALTH MONITORING															
			Costs span the period Y19 to Y294 or 276 yrs vs 330 yrs in CES. RES staff is 0.02 vs 0.17 in CES. Factor is 276/330 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 276 yrs	Other	1							138	1	138			138

	Contingency	0.3				702.48	0.3	210.744	211

Total	**25,745**
Check: Should = 0	**0**

		Total	14,130	Total	4,140	Total	1,534	Total	5,941.2
		Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0

BASIS OF ESTIMATE NOTES - Insert references and notes

1	Note if appropriate,
2	Correspondence description
3	Special request from fuel owner
4	Misc.

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

VAULTS
Gentilly

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
583	90	0	0	0	0	0	0	Program Management	Labour	STEP	CTECH	AM	1	18	18	0	0	NO DATA TO FILL	171.4
583	90	0	0	0	0	0	0	Program Management	Materials and Equipment	STEP	CTECH	AM	1	18	18	0	0		0.0
583	90	0	0	0	0	0	0	Program Management	Other	STEP	CTECH	AM	1	18	18	0	0		306.2
583	90	0	0	0	0	0	0	Program Management	Contingency	STEP	CTECH	AM	1	18	18	0	0		95.5

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
		0%	
Labour	171	*0.0*	171.4
Materials and Equipment	0	*0.0*	0.0
Other	306	*0.0*	306.2
Contingency	95.5	*0.0*	95.5
Total	573	*0.0*	573

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																	
583	90							**Program Management**																
								Program management shared between 7 reactor sites at percentages based on table 18 in cost estimate report. 7% for Gentilly			**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 18year duration	Labour	0.07	2448.8436	0.07	171.419052										171	
								no entry	Materials and Equipment	0				0	0	0								0	
								the following expenses: Overheads, insurance, community compensation & legal fees as table 18	Other	0.07							4374	0.07	306.18					306	
								Contingency as CES value	Contingency	20%										20%	1.0	95.5		96	
											Total		171	Total		0	Total		306	Total		95.5		
											Check: Should = 0		0	Check: Should = 0		0	Check: Should = 0		0	Check: Should = 0		0		

Total	**573**
Check: Should = 0	**0**

BASIS OF ESTIMATE NOTES - Insert references and notes

1	Note if appropriate,
2	Correspondence description
3	Special request from fuel owner
4	Misc.

RES ALTERNATIVE
WBS No 583
VAULTS
Gentilly

Cost Category	Total K$
Labour	419,809
Materials and Equipment	223,779
Other	115,461
Contingency	208,232
Total Cost	**967,281**

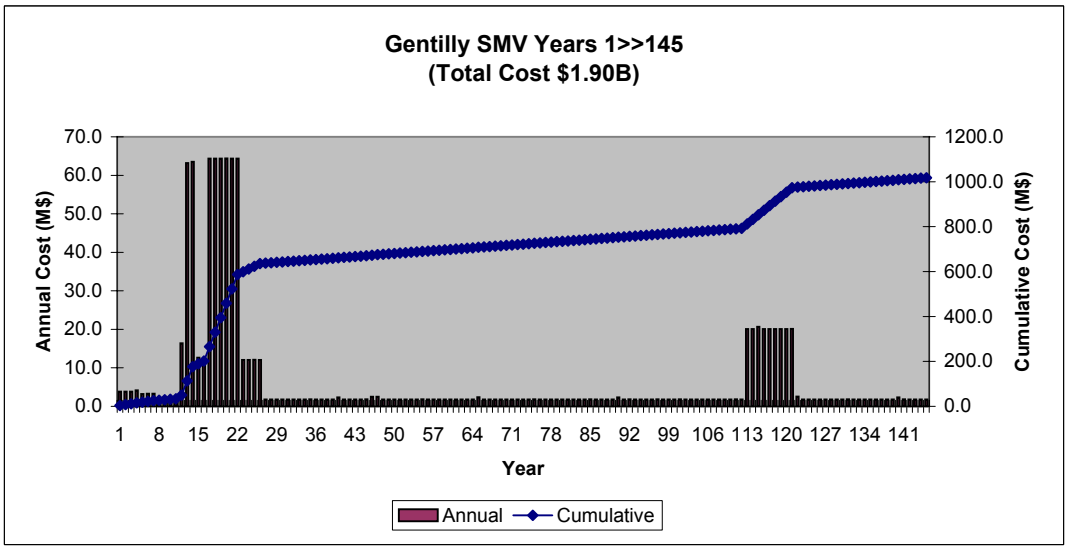
967,281

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$
583	15	0	0	0	0	0	0	RJH	Labour	STEP	1	86	7	0	452
583	15	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	86	7	0	0
583	15	0	0	0	0	0	0	RJH	Other	STEP	1	86	7	0	97
583	15	0	0	0	0	0	0	RJH	Contingency	STEP	1	86	7	0	275
583	20	0	0	0	0	0	0	AM	Labour	STEP	283	289	7	0	4,156
583	20	0	0	0	0	0	0	AM	Materials and Equipment	STEP	283	289	7	0	430
583	20	0	0	0	0	0	0	AM	Other	STEP	283	289	7	0	148
583	20	0	0	0	0	0	0	AM	Contingency	STEP	283	289	7	0	1,814
583	25	0	0	0	0	0	0	RJH	Labour	STEP	1	289	41	0	1,428
583	25	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	289	41	0	0
583	25	0	0	0	0	0	0	RJH	Other	STEP	1	289	41	0	241
583	25	0	0	0	0	0	0	RJH	Contingency	STEP	1	289	41	0	668
583	30	0	0	0	0	0	0	RJH	Labour	STEP	19	294	276	0	3,082
583	30	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	19	294	276	0	0
583	30	0	0	0	0	0	0	RJH	Other	STEP	19	294	276	0	15,517
583	30	0	0	0	0	0	0	RJH	Contingency	STEP	19	294	276	0	4,650
583	35	0	0	0	0	0	0	RJH	Labour	STEP	1	89	10	0	684
583	35	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	89	10	0	0
583	35	0	0	0	0	0	0	RJH	Other	STEP	1	89	10	0	462
583	35	0	0	0	0	0	0	RJH	Contingency	STEP	1	89	10	0	573
583	40	0	0	0	0	0	0	AM	Labour	STEP	44	289	5	0	5471.98
583	40	0	0	0	0	0	0	AM	Materials and Equipment	STEP	44	289	5	0	8090.15
583	40	0	0	0	0	0	0	AM	Other	STEP	44	289	5	0	0
583	40	0	0	0	0	0	0	AM	Contingency	STEP	44	289	5	0	6032.157
583	45	0	0	0	0	0	0	AM	Labour	STEP	19	294	276	0	390,234
583	45	0	0	0	0	0	0	AM	Materials and Equipment	STEP	19	294	276	0	211,119
583	45	0	0	0	0	0	0	AM	Other	STEP	19	294	276	0	97,156
583	45	0	0	0	0	0	0	AM	Contingency	STEP	19	294	276	0	188,184
583	55	0	0	0	0	0	0	RJH	Labour	STEP	19	294	276	0	14,130
583	55	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	19	294	276	0	4,140
583	55	0	0	0	0	0	0	RJH	Other	STEP	19	294	276	0	1,534
583	55	0	0	0	0	0	0	RJH	Contingency	STEP	19	294	276	0	5,941
583	90	0	0	0	0	0	0	AM	Labour	STEP	1	18	18	0	171
583	90	0	0	0	0	0	0	AM	Materials and Equipment	STEP	1	18	18	0	0
583	90	0	0	0	0	0	0	AM	Other	STEP	1	18	18	0	306
583	90	0	0	0	0	0	0	AM	Contingency	STEP	1	18	18	0	96

RES ALTERNATIVE **FUEL OWNER** **HYDRO QUÉBEC**
WBS No 584
GENTILLY
SURFACE MODULAR VAULTS **(SMV)**

Lev 2	WBS Name	Sheet Totals ($k)
15	Siting	824
20	System Development	24,012
25	Safety Assessment	3,022
30	Licensing & Approvals	24,214
35	Public Affairs	1,718
40	Facility Design & Construction	144,618
45	Facility Operation	1,669,049
55	Environmental Assessment and Monitoring	26,940
90	Program Management	1,401
	Total Cost ($k)	**1,895,797**

Gentilly SMV Alternative	**1,895,797**
Siting Phase	**36,027**
Siting	824
EA	3,127
System Development	24,012
SA	1,365
L&A	3,580
Public Affairs	1,718
Program Mgmt	1,401
Construction Phase	**144,618**
Initial construction	140,666
Transition to Standalone	3,952
Operations Phase	**1,715,152**
Repeat & Repackaging	*1,228,050*
Initial Fuel receipts	456,482
SMV - 100 yrs	157,845
SMV - 200 yrs	157,845
SMV - 300 yrs	157,545
Repackaging B to B - 300 yrs	275,593
PM for Repeats & Repackaging	22,741
Extended Monitoring	*487,102*
Program Mgmt	125,931
Monitoring Survelliance	3,919
Operation Indirects	262,277
Common Ancillary Services Ops	42,083
Fuel Integrity Monitoring	6,788
SA - Ops & Decommissioning	1,657
L&A - Ops Licence Renewal	20,634
Environmental Monitoring	23,813


Gentilly SMV Years 1>>145
(Total Cost $1.90B)
Annual Cost (M$)
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
Cumulative Cost (M$)
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

SURFACE MODULAR VAULTS (SMV)
GENTILLY

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
584	15	0	0	0	0	0	0	Siting	Labour	STEP	OPG	RJH	1	11	7	0	0	NO DATA TO FILL	452.2
584	15	0	0	0	0	0	0	Siting	Materials and Equipment	STEP	OPG	RJH	1	11	7	0	0		0.0
584	15	0	0	0	0	0	0	Siting	Other	STEP	OPG	RJH	1	11	7	0	0		97.0
584	15	0	0	0	0	0	0	Siting	Contingency	STEP	OPG	RJH	1	11	7	0	0		274.6

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
		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

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			Total Cost is calculated	Add Basis of estimate Note Ref Number
584	15							**Siting**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	Cost $k	
584	15	10						SITING MANAGEMENT																
								RES is 7 yrs vs 13 yrs for CES and shared amongst 7 sites or a factor of 0.08. However 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
									Other	0.05							1,300	0.05	65				65
									Contingency	50%										50%	1.0	154.9	155
584	15	70						PREFERRED SITE																
584	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	0.1	0							0
									Other	0.1							120	0.1	12				12
									Contingency	50%										50%	1.0	35.4	35
584	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	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

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SURFACE MODULAR VAULTS (SMV)
GENTILLY

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
584	20	0	0	0	0	0	0	System Development	Labour	STEP	CTECH	AM	1	7	7	0	0	NO DATA TO FILL	16121.9
584	20	0	0	0	0	0	0	System Development	Materials and Equipment	STEP	CTECH	AM	1	7	7	0	0		430.0
584	20	0	0	0	0	0	0	System Development	Other	STEP	CTECH	AM	1	7	7	0	0		1422.0
584	20	0	0	0	0	0	0	System Development	Contingency	STEP	CTECH	AM	1	7	7	0	0		6038.6

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost
Labour	16122
Materials and Equipment	430
Other	1422
Contingency	6038.6
Total	24012

Check: Total minus budget Should = 0

Budget costs to Years by %

Check total	Total Cost $k
0%	
0.0	16121.9
0.0	430.0
0.0	1422.0
0.0	6038.6
0.0	24012

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	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
584	20							**System Development**			**Labour**			**Materials and other Equipment**			**Other**			**Contingency**			Cost $k	
											CES	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
584	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 customization to both sites.	Labour	0.26	7980.70	0.26	2094.93										2,095
								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 customization to 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	652.1		652
584	20	5						SYSTEM OPTIMIZATION																
								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. No cask/module related work required therefore a further reduction of 50%	Labour	0.26	5011.20	0.26	1315.44										1,315
								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. No cask/module related work required therefore a further reduction of 50%	Other	0.26						120.00	0.26	31.50					32
			Percentage for contingency assumed same as for CES	Contingency	30%									30%	1.00	404.08		404
584	20	20	PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)																
			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. No cask/module related work required and no processing bldg (except repackaging) therefore a further reduction of 70%	Labour	0.16	30642.60	0.16	4826.21										4,826
			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
			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. No cask/module related work required and no processing bldg (except repackaging) 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	2698.59		2,699
584	20	30	STORAGE SYSTEM 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. No additional factors as new technology at this site	Labour	0.53	14295.80	0.53	7505.30										7,505
			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. No additional factors as new technology at this site	Other	0.53						2200.00	0.53	1155.00					1,155
			Percentage for contingency assumed same as for CES	Contingency	25%									25%	1.00	2165.07		2,165
584	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	**24,012**
												Check: Should = 0	**0**
			Total	16,122	Total	430	Total	1,422	Total		6,038.6		
			Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0		0		

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SURFACE MODULAR VAULTS (SMV)
GENTILLY

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
584	25							Safety Assessment	Labour	STEP	OPG	RJH	1	290	41			1843.3
584	25							Safety Assessment	Materials and Equipment	STEP	OPG	RJH	1	290	41			
584	25							Safety Assessment	Other	STEP	OPG	RJH	1	290	41			315.0
584	25							Safety Assessment	Contingency	STEP	OPG	RJH	1	290	41			863.3

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	1843	*0.0*	1843.3
Materials and Equipment			
Other	315		315.0
Contingency	863.3	*0.0*	863.3
Total	3022	*0.0*	3022

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																	
584	25							**Safety Assessment**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
584	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	0.1	5218.2	0.1	521.82											522
									Materials and Equipment	0.1					0.1									
									Other	0.1							850	0.1	85					85
									Contingency	40%										40%	1.0	242.7		243
584	25	30						SA - SITING																
								Very limited siting activities leads to no SA work	Labour		2287.5													
									Materials and Equipment															
									Other								3,850							
									Contingency	40%										40%	1.0			
584	25	40						SA - OPERATING LICENSE																
									Labour	0.2	1540.5	0.2	308.1											308
									Materials and Equipment	0.2					0.2									
									Other	0.2							300	0.2	60					60
									Contingency	40%										40%	1.0	147.2		147

584	25	50	SA - FACILITY OPERATIONS																	
			RES has 30 renewal events vs 45 in CES giving a factor of 0.67. However renewal costs can be shared between 5 sites with same technoilogy; thus reduce factor to 0.4	Labour	0.08	9604.8	0.08	768.384											768
				Materials and Equipment	1					1										
			Expenses at $0.5K/a x 280	Other	1						140	1	140							140
				Contingency	40%									40%	1.0	363.4				363
584	25	70	SA - DECOMMISSIONING (Processing Facilities)																	
			RES has 1 decommissioning events - while CES has 3. Costs can be shared between sites with same 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		1,843	Total			Total		315	Total			863.3		
						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

SURFACE MODULAR VAULTS (SMV)
GENTILLY

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
584	30							Licensing & Approvals	Labour	STEP	OPG	RJH	6	294	289			3291.4
584	30							Licensing & Approvals	Materials and Equipment	STEP	OPG	RJH	6	294	289			
584	30							Licensing & Approvals	Other	STEP	OPG	RJH	6	294	289			16079.5
584	30							Licensing & Approvals	Contingency	STEP	OPG	RJH	6	294	289			4842.7

NO DATA TO FILL

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost
Labour	3291
Materials and Equipment	
Other	16080
Contingency	4842.7
Total	24214

Check: Total minus budget Should = 0

Budget costs to Years by %

Check total	Total Cost $k
0.0	3291.4
	16079.5
0.0	4842.7
	24214

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																	

In general L&A costs are assumed to be less than for a CES facility. In some cases the costs are shared between the seven sites

					CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	
584	30			**Licensing & Approvals**													
584	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
584	30	50		CNSC CONSTRUCTION LICENCE														
					Labour	0.25	2631	0.25	657.75									658
				Some inefficiencies gained due to multiple sites	Materials and Equipment	0.25				0.25								
					Other	0.25						6,264	0.25	1566				1,566
					Contingency	0.25									25%	1.0	555.9	556
584	30	60		OTHER GOVN'MT APPROVALS														
584	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
584	30	60	30	FEDERAL APPROVALS														
					Labour	0.25	133	0.25	33.25									33
					Materials and Equipment	0.25				0.25								
					Other	0.25						0.25						
					Contingency	0.25									25%	1.0	8.3	8
584	30	60	40	PROVINCIAL APPROVALS														
					Labour	0.25	133	0.25	33.25									33
					Materials and Equipment	0.25				0.25								
					Other	0.25						0.25						
					Contingency	0.25									25%	1.0	8.3	8
584	30	60	50	MUNICIPAL APPROVALS														
					Labour	0.25	133	0.25	33.25									33
					Materials and Equipment	0.25				0.25								
					Other	0.25						0.25						
					Contingency	0.25									25%	1.0	8.3	8
584	30	65		CNSC OPERATING LICENCE (Initial Application)														
					Labour	0.25	513	0.25	128.25									128
					Materials and Equipment	0.25				0.25								
					Other	0.25					902	0.25	225.5					226
					Contingency	0.25									25%	1.0	88.4	88
584	30	70		CNSC OPERATING LICENCE (Maintenance & Renewal)														
				CES duration is 330 years. Costs incurred in RES during period Y15 to Y294 or 280 years. RES has 0.08 staff vs 1 staff in CES. 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	**24,214**
																	Check: Should = 0	
						Total		3,291	Total			Total		16,080	Total		4,842.7	
						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

SURFACE MODULAR VAULTS (SMV)
GENTILLY

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
584	35							Public Affairs	Labour	STEP	OPG	RJH	1	14	10			683.8
584	35							Public Affairs	Materials and Equipment	STEP	OPG	RJH	1	14	10			
584	35							Public Affairs	Other	STEP	OPG	RJH	1	14	10			461.8
584	35							Public Affairs	Contingency	STEP	OPG	RJH	1	14	10			572.8

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	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

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
584	35							**Public Affairs**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	Cost $k	
584	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
584	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
584	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
584	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

584 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		**6,873**
												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

1

2

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SURFACE MODULAR VAULTS (SMV)
GENTILLY

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
584	40	0	0	0	0	0	0	0 Facility Design & Construction	Labour	STEP	CTECH	AM	11	286	276	0	0	NO DATA TO FILL	21621.4
584	40	0	0	0	0	0	0	0 Facility Design & Construction	Materials and Equipment	STEP	CTECH	AM	11	47	37	0	0		66843.7
584	40	0	0	0	0	0	0	0 Facility Design & Construction	Other	STEP	CTECH	AM	11	47	37	0	0		28630.3
584	40	0	0	0	0	0	0	0 Facility Design & Construction	Contingency	STEP	CTECH	AM	11	47	37	0	0		27522.5

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 %
Labour	21621		*0.0*	21621.4	
Materials and Equipment	66844		*0.0*	66843.7	
Other	28630		*0.0*	28630.3	
Contingency	27522.5		*0.0*	27522.5	
Total	144618		*0.0*	144618	

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																	
584	40							**Facility Design & Construction**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
584	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 additional land acquisition costs neccesary	Other	0.0							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	
584	40	30						COMMON ANCILLARY FACILITIES																
584	40	30	10					ADMIN AND SUPPORT FACILITIES																
584	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	
584	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	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
584	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	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
584	40	30	10	5	ACTIVE SOLID WASTE HDLG BLDG														
				A 30% allowance of the 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
584	40	30	10	6	SOLID WASTE STORAGE AREA														
				A 30% allowance of the 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
584	40	30	10	7	ACTIVE LIQ/W TRT'MT BLDG														
				A 30% allowance of the 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
584	40	30	10	8	LOW LVL LIQ/W STRG BLDG														
				A 30% allowance of the 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
584	40	30	10	9	WAREHOUSE BLDG														
				Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in	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
584	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
584	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
584	40	30	10	12	UTILITY BLDG															
				Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in	Labour	0.0	1,023.2	0.0	0.0								comment 7		0
					Materials and Equipment	0.0				1,257.0	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	30%										30%	1.0	0.0	0
584	40	30	10	13	TEST FACILITY															
				Taken as being independent of fuel inventory stored. Same size bldg as CES, facilty will be shared between NBP and HQ therefore costs 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
584	40	30	20		OTHER SITE SYSTEMS															
584	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
584	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
584	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
584	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
584	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 CES	Contingency	25%										25%	1.0	0.0	0
584	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

584 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
584 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
584 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
584 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
584 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
584 40 40	STORAGE CONSTRUCTION (Stage 1)																				
584 40 40 10 5	CONSTRUCTIION FACILITIES																				
	Construction of RES SMV facility, total capacity 240 tubes. CES stage 4 construction is 600 tubes.	Labour	0.58	469.5	0.58	270.9															271
		Materials and Equipment	0.58				312.0	0.58	180.0												180
		Other	0.58							112.0	0.58	64.6									65
	Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	154.7						155
584 40 40 10 10	STORES ENGINEERING																				
	factor for services taken as same as for construction	Labour	1.00	6,841.7	1.00	6,841.7															6,842
	factor for services taken as same as for construction	Materials and Equipment	0.00				0.0	0.00	0.0												0
	factor for services taken as same as for construction	Other	0.00							0.0	0.00	0.0									0
	Percentage for contingency averaged from figures used in CES	Contingency	30%										30%	1.0	2,052.5						2,053
584 40 40 10 20	STORES EQUIPMENT DESIGN, SUPPLY AND INSTALL'N																				
	Factor for equipment taken from CES with reduction for loss of CHM	Labour	0.40	5,476.2	0.40	2,190.5															2,190

					Factor for equipment taken from CES with reduction for loss of CHM	Materials and Equipment	0.40					12,131.7	0.40	4,852.7								4,853
					Factor for equipment taken from CES with reduction for loss of CHM	Other	0.40									0.0	0.40	0.0				0
					Percentage for contingency averaged from figures used in CES	Contingency	13%												13%	1.0	880.4	880
584	40	40	10	30	SURFACE MODULAR VAULT DESIGN AND CONSTRUCTION																	
					Construction of RES SMV facility, total capacity 240 tubes. CES stage 4 construction is 600 tubes. Price based pro rata on CES stage 4 with module and CHM prices subtracted	Labour	0.60	2,940.3	0.60	1,764.2												1,764
						Materials and Equipment	0.60					89,285.0	0.60	53,571.0								53,571
						Other	0.60									47,112.2	0.60	28,267.3				28,267
					Percentage for contingency averaged from figures used in CES	Contingency	20%												20%	1.0	16,720.5	16,721
584	40	40	10	40	COMMISSIONING																	
					Factor applied to CES	Labour	0.60	164.7	0.60	98.8												99
					Same allowance applied as CES	Materials and Equipment	0.00					12,131.7	0.00	0.0								0
					Same allowance applied as CES	Other	0.00									0.0	0.00	0.0				0
					Price based pro rata on CES stage 4 with module and CHM prices subtracted	Contingency	40%												40%	1.0	39.5	40
584	40	40	10	50	CONST'N INDIRECTS																	
					Factor applied to CES, but design element shared between sites, (deduct 22.5%)	Labour	1.00	4,882.2	1.0	4,882.2												4,882
					Factor applied to CES	Materials and Equipment	0.70					0.0	0.7	0.0								0
					Factor applied to CES	Other	1.00									241.5	1.0	241.5				242
					Percentage for contingency assumed same as for CES	Contingency	30%												30%	1.0	1,537.1	1,537
571	40	500			COMMISSIONING MANAGEMENT																	
					Factor applied to CES	Labour	0.7	144.5	0.7	101.2												101
					Factor applied to CES	Materials and Equipment	0.0					0.0	0.0	0.0								0
					Factor applied to CES	Other	0.7									28.9	0.7	20.2				20
					Percentage for contingency assumed same as for CES	Contingency	50%												50%	1.0	60.7	61
571	40	600			EQUIPMENT, SPARES and CONSUMABLES.																	
					No entry into cost category	Labour	0.0	0.0	0.0	0.0												0
					Factor applied to CES	Materials and Equipment	0.7					214.1	0.7	149.9								150
					consumption for construction of 1 storage bldg and :	Other	0.00									0.0	0.0	0.0				0
					Contingency included in cost (built into power consumption calculation)	Contingency	30%												30%	1.0	45.0	45
571	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 construction of storage facility and	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	**144,618**
																				Check: Should = 0	**0**
						Total		21,621				Total		66,844		Total		28,630		Total	27,522.5
						Check: Should = 0		0				Check: Should = 0		0		Check: Should = 0		0		Check: Should = 0	0

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SURFACE MODULAR VAULTS (SMV)
GENTILLY

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
584	45	0	0	0	0	0	0	Facility Operation	Labour	STEP	CTECH	AM	15	294	280	0	0	NO DATA TO FILL	471360.0
584	45	0	0	0	0	0	0	Facility Operation	Materials and Equipment	STEP	CTECH	AM	15	294	280	0	0		586764.0
584	45	0	0	0	0	0	0	Facility Operation	Other	STEP	CTECH	AM	15	294	280	0	0		254718.8
584	45	0	0	0	0	0	0	Facility Operation	Contingency	STEP	CTECH	AM	15	294	280	0	0		356205.6

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	471360	*0.0*	471360.0
Materials and Equipment	586764	*0.0*	586764.0
Other	254719	*0.0*	254718.8
Contingency	356206	*0.0*	356205.6
Total	1669049	*0.0*	1669049

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																	
584	45							**Facility Operation**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
584	45	10						OPERATIONS FUEL TRANSFER																
584	45	10	5					PROGRAM MANAGEMENT - INITIAL FUEL TRANSFER																
								CES duration reduced, hence factor 12/30, and Program management spread over 7 sites, recognising inefficiency use 20 %	Labour	0.08	118,334.0	0.1	9,466.7										9,467	
								No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	0.0	0.0							0	
								Annual cost = $243/a x 12 yrs	Other	1.00							2,916	1.0	2,916.0				2,916	2
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	2,476.5	2,477	
584	45	10	10					PROCESS BUILDING OPERATIONS																
								Fuel inventory 2299 baskets, (CES 4717). Throughput rate 0.5 of CES.	Labour	0.24	78,324.0	0.24	19,087.0										19,087	
								No module canister (or baskets) to be procured	Materials and Equipment	0.00				255,840.0	0.00	0.0							0	
								No provision in CES	Other	0.00							131,349.0	0.0	0.0				0	
								Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	9,543.5	9,544	
584	45	10	20					COMMON ANCILLARY FACILITIES OPERATIONS (INITIAL FUEL RECEIPT)																
								Independent of fuel inventory RES duration 12 years compared to 30 year CES.	Labour	0.40	32,676.3	0.40	13,070.5										13,071	
								No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	0.0	0.0							0	
								No entry in CES alternative cost category	Other	0.00							131,349.0	0.0	0.0				0	

					Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	3,267.6	3,268
584	45	10	25		MONITORING AND SURVEILLANCE (INITIAL FUEL RECEIPT)															
					Fuel inventory 2299 baskets, (CES 4717). RES duration 12 years compared to 30 year CES.	Labour	0.19	3,900.0	0.19	760.3										760
					No relevant entry in CES alternative cost category	Materials and Equipment	0.00				53.0	0.00	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	50%										50%	1.0	380.2	380
584	45	10	30		OPERATION INDIRECTS (FUEL TRANSFER)															
					Factor due to reduced admin & maintenance. Security and site infrastructure similar to CES, CES additional fuel receipt security/armed response omitted. Duration 12 years (CES 30), but using 90% utilisation. Other category is for energy consumption only.	Labour	0.360	115,547.0	0.36	41,596.9										41,597
						Materials and Equipment	0.360				1,284.0	0.4	462.2							462
						Other	0.360							16,380.0	0.4	5,896.8				5,897
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	14,386.8	14,387
584	45	10	40		STORAGE OPERATIONS															
					Fuel inventory 2299 baskets, (CES 4717). RES duration 12 years	Labour	0.49	30,696.0	0.49	14,960.8										14,961
					Fuel inventory 2299 baskets, (CES 4717). RES duration 12 years	Materials and Equipment	0.49				200.0	0.5	97.5							97
					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	4,517.5	4,517
584	45	10	50		ADDITIONAL STORAGE CONSTRUCTION															
584	45	10	50	10	STORAGE CONSTRUCTION STAGE 2															
					factor for storage const'n stage 2 taken pro rata from RES stage 1	Labour	0.58	2,940.3	0.58	1,696.8										1,697
					factor for storage const'n stage 2 taken pro rata from RES stage 1	Materials and Equipment	0.58				89,285.0	0.58	51,524.6							51,525
					factor for storage const'n stage 2 taken pro rata from RES stage 1	Other	0.58							47,112.2	0.58	27,187.5				27,188
					Percentage for contingency averaged from CES	Contingency	30%										30%	1.0	24,122.7	24,123
584	45	10	50	20	STORAGE CONSTRUCTION STAGE 3															
					factor for storage const'n stage 3 taken pro rata from RES stage 1	Labour	0.58	2,940.3	0.58	1,696.8										1,697
					factor for storage const'n stage 3 taken pro rata from RES stage 1	Materials and Equipment	0.58				89,285.0	0.58	51,524.6							51,525
					factor for storage const'n stage 3 taken pro rata from RES stage 1	Other	0.58							47,112.2	0.58	27,187.5				27,188
					Percentage for contingency averaged from CES	Contingency	30%										30%	1.0	24,122.7	24,123
584	45	10	50	30	STORAGE CONSTRUCTION STAGE 4															
					factor for storage const'n stage 4 taken pro rata from RES stage 1	Labour	0.58	2,940.3	0.58	1,696.8										1,697
					factor for storage const'n stage 4 taken pro rata from RES stage 1	Materials and Equipment	0.58				89,285.0	0.58	51,524.6							51,525
					factor for storage const'n stage 4 taken pro rata from RES stage 1	Other	0.58							47,112.2	0.58	27,187.5				27,188

				Percentage for contingency averaged from CES	Contingency	30%										30%	1.0	24,122.7	24,123		
584	45	20		OPERATIONS - EXTENDED MONITORING																	
584	45	20	5	PROGRAM MANAGEMENT																	
				Entries in CES DET applicable to RES but duration 268 years RES & 300 years CES therefore 268/300 = 0.893. Program management spread over 7 sites with Gentilly assumed to have 0.8 staff vs 9 in CES. Thus combined factor = 0.079	Labour	0.079	312,652.0	0.08	24,826.9									24,827	3
				No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	0.0	0.0						0			
				Annual cost = $243/a x 268 yrs	Other	1.00							65,124.0	1.0	65,124.0			65,124	1,2		
				Percentage for contingency assumed same as for CES	Contingency	40%										40%	1.0	35,980.4	35,980		
584	45	20	40	MONITORING AND SURVEILLANCE - EXTENDED MONITORING																	
				CES monitoring and surveillance duration was 300 yrs for 4717 baskets, RES is 268 years for 2299 baskets. Gentilly assumed to have 0.5 staff for RES vs 5 in CES. Combined factor based on duration, fuel inventory and staffing levels.	Labour	0.04	53,849.0	0.0	2,344.6									2,345	3		
				annual costs = $1k/a x 268 years	Materials and Equipment	1.00				268.0	1.00	268.0						268	4		
				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	50%										50%	1.0	1,306.3	1,306		
584	45	20	50	OPERATION INDIRECTS (EXTENDED MONITORING)																	
					Labour	0.18	907,516.0	0.18	166,911.8									166,912	3		
				Entries in CES DET applicable to RES but duration 268 years 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	1.00	20,100.0						20,100	4		
				Armed response = $50k/a + energy costs at $5k/a. total = $55k x 268 years	Other	1.00							14,740.0	1.0	14,740.0			14,740	4		
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	60,525.5	60,526		
584	45	20	60	COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)																	
				RES has duration 268 years, CES has 300 years. RES staff is 1 vs 5 in CES. Factor is 268/300 x 1/5	Labour	0.18	148,529.0	0.18	33,666.4									33,666	3		
				No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	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	8,416.6	8,417		
584	45	20	70	FUEL INTEGRITY MONITORING (25 YEARLY)																	
				RES has duration 268 years, CES has 300 years. RES staff is 0.1 vs 0.5 in CES. Factor is 268/300 x 0.1/0.5	Labour	0.2	24,724.0	0.2	4,417.4									4,417	3		
				annual M+E costs is $2.5k/a x 277 years	Materials and Equipment	1.0				670.0	1.0	670.0						670	4		

				Other costs is $0.5k/a x 268 years	Other	1.0								134.0	1.0	134.0					134	4
				Percentage for contingency averaged form CES	Contingency	30%											30%	1.0	1,566.4	1,566		
584	45	30		OPERATIONS - FACILITY REPEATS																		
584	45	30	20	STORAGE VAULT 100 YEAR REPLACEMENT																		
				Labour for demolition of previous vaults and construction of new = factor 240/4400 tube qty, labour for fuel transfer = 9/30 (years for transfer)	Labour	0.05	154,896.8	0.1	8,448.9											8,449		
				const'n materials = building to house 240 tubes RES, 4400 tubes CES	Materials and Equipment	0.17				563,645.8	0.2	98,415.0								98,415		
				waste disposal =vaults for 240 tubes RES, 4400 tubes CES Includes Armed response included at rate of $50k/a based on 5 years duration - see note 5.	Other	0.05								447,765.3	0.1	24,673.6				24,674	5	
				Percentage for contingency assumed same as for CES	Contingency	20%											20%	1.0	26,307.5	26,308		
584	45	30	50	STORAGE VAULTS 200 YEAR REPLACEMENT																		
				assumed same as 100 yr replacement	Labour	0.05	154,896.8	0.1	8,448.9											8,449		
				assumed same as 100 yr replacement	Materials and Equipment	0.17				563,645.8	0.2	98,415.0								98,415		
				assumed same as 100 yr replacement	Other	0.05								447,765.3	0.1	24,673.6				24,674	5	
				Percentage for contingency assumed same as for CES	Contingency	20%											20%	1.0	26,307.5	26,308		
584	45	30	70	STORAGE VAULTS 300 YEAR REPLACEMENT																		
				assumed same as 100 yr replacement	Labour	0.05	154,896.8	0.1	8,448.9											8,449		
				assumed same as 100 yr replacement	Materials and Equipment	0.17				563,645.8	0.2	98,415.0								98,415		
				assumed same as 100 yr replacement	Other	0.05								447,765.3	0.1	24,423.6				24,424	6	
				Percentage for contingency assumed same as for CES	Contingency	20%											20%	1.0	26,257.5	26,258		
584	45	40		OPERATIONS - REPACKAGING																		
584	45	40	5	PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)																		
				Entries in CES applicable to RES but duration 30 years RES & 114 years CES therefore30/114, program management spread over 7 sites, recognising inefficiency use 20 %	Labour	0.05	360,064.0	0.1	18,950.7											18,951		
				No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	0.0	0.0								0		
				see note 1. no property tax assumed this site	Other	0.00								130,095.5	0.0	0.0				0	1	
				Percentage for contingency assumed same as for CES	Contingency	20%											20%	1.0	3,790.1	3,790		
584	45	40	10	BASKET TO BASKET 300 YEAR REPACKAGING																		
584	45	40	10	20 CONSTRUCTION FACILITIES - REPACK'NG PLANT BASKET (RPB)																		
				RPB Repackaging plant similar to CES facility, but for baskets therefore factor = 0.8	Labour	0.8	476.1	0.8	380.9											381		
				RPB Repackaging plant similar to CES facility, but for baskets therefore factor = 0.8	Materials and Equipment	0.8				354.6	0.8	283.7								284		
				RPB Repackaging plant similar to CES facility, but for baskets therefore factor = 0.8	Other	0.8								228.4	0.8	182.7				183		
				Percentage for contingency assumed same as for CES	Contingency	30%											30%	1.0	254.2	254		

584	45	40	10	30			PROCESSING BUILDING - REPACK'NG PLANT BASKET (RPB)														
584	45	40	10	30	20		RPB EQUIP. DESIGN, SUPPLY & INSTALL														
584	45	40	10	30	20	10	RECEIPT & TRANSFER (EQUIP)														
							RPB Repackaging plant similar to CES facility	Labour	1.0	106.6	1.0	106.6									107
							RPB Repackaging plant similar to CES facility	Materials and Equipment	1.0				2,132.0	1.0	2,132.0						2,132
							RPB Repackaging plant similar to CES facility	Other	1.0							111.9	1.0	111.9			112
							Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	705.2	705
584	45	40	10	30	20	20	BASKET TO BASKET FUEL TRANSFER (EQUIP)														
							Equipment similar to CES facility	Labour	1.0	3,721.1	1.0	3,721.1									3,721
							Equipment similar to CES facility	Materials and Equipment	1.0				18,605.6	1.0	18,605.6						18,606
							Equipment similar to CES facility	Other	1.0							1,116.3	1.0	1,116.3			1,116
							Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	7,032.9	7,033
584	45	40	10	30	20	30	BASKET DECONTAMINATION (EQUIP)														
							Equipment similar to CES facility	Labour	1.0	961.0	1.0	961.0									961
							Equipment similar to CES facility	Materials and Equipment	1.0				4,805.0	1.0	4,805.0						4,805
							Equipment similar to CES facility	Other	1.0							288.3	1.0	288.3			288
							Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	1,816.3	1,816
584	45	40	10	30	30		RPB, BUILDING DESIGN & CONST'N														
							RPB Repackaging plant similar to CES facility	Labour	1.00	8,000.0	1.0	8,000.0									8,000
							RPB Repackaging plant similar to CES facility	Materials and Equipment	1.00				7,768.3	1.0	7,768.3						7,768
							RPB Repackaging plant similar to CES facility	Other	1.00							1,600.0	1.0	1,600.0			1,600
							Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	5,210.5	5,210
584	45	40	10	30	60		BUILDING SERVICES (RPB)														
							RPB Repackaging plant similar to CES facility	Labour	1.00	9,120.0	1.0	9,120.0									9,120
							RPB Repackaging plant similar to CES facility	Materials and Equipment	1.00				7,199.9	1.0	7,199.9						7,200
							RPB Repackaging plant similar to CES facility	Other	1.00							2,527.2	1.0	2,527.2			2,527
							Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	4,711.8	4,712
584	45	40	10	30	70		COMMISSIONING (RPB)														
							RPB Repackaging plant similar to CES facility	Labour	1.00	1,169.3	1.0	1,169.3									1,169
							RPB Repackaging plant similar to CES facility	Materials and Equipment	0.0				0.0	0.0	0.0						0
							RPB Repackaging plant similar to CES facility	Other	1.00							218.3	1.0	218.3			218
							Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	693.8	694

584	45	40	10	30	80	CONST'N INDIRECTS (RPB)																
						RPB plant similar to CES facility, butdesign element shared between NPB and HQ, reduction of 22.5%	Labour	1.00	4,882.2	1.0	4,882.2										4,882	
						No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	0.0	0.0							0	
						RPB Repackaging plant similar to CES facility	Other	1.00							241.5	1.0	241.5				242	
						Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	1,537.1	1,537	
584	45	40	10	40		COMMON ANCILLARY FACILITIES (REPLACEMENT)			comment 7													
						reduced ancillary facilities at 100 and 200 year events support stand-alone RES facility as CES therefore factor = (7/12+7/12 +1)	Labour	2.2	21,056.2	2.2	45,621.8										45,622	
							Materials and Equipment	2.2				29,785.1	2.2	64,534.4							64,534	
						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	27,539.0	27,539	
584	45	40	10	500		COMMISSIONING MANAGEMENT (RPB)																
						RPB Repackaging plant similar to CES facility	Labour	1.0	219.0	1.0	219.0										219	
						No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	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	50%										50%	1.0	109.5	110	
584	45	40	10	600		REPACKAGING OPERATIONS (RPM)																
						repackaging of 1992 baskets	Labour	0.10	118,823.0	0.10	11,882.3										11,882	
						procurement of 1992 RES baskets compared to 8528 CES module canisters	Materials and Equipment	0.04				255,840.0	0.04	9,960.0							9,960	
						disposal of 1992 RES baskets compared to 8528 CES modules canister and 34112 modules	Other	0.03							43,594.8	0.03	1,338.6				1,339	
						Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	6,954.3	6,954	
584	45	40	10	600	30	ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)																
						duration 5 years RES compared to 30 years CES. Factor =9/30 = 0.3	Labour	0.17	11,882.0	0.17	1,980.3										1,980	
						No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	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	495.1	495	
584	45	40	10	700		OPERATION INDIRECTS (RPM)																
						duration 5 years RES compared to 30 years CES. Factor =5/30 = 0.17	Labour	0.17	13,976.2	0.17	2,329.4										2,329	
						duration 5 years RES compared to 30 years CES. Factor =5/30 = 0.18	Materials and Equipment	0.17				351.6	0.2	58.6							59	
						duration 5 years RES compared to 30 years CES. Factor =5/30 = 0.17. Armed response included at rate of $50k/a based on 5 years duration - see note 5.	Other	0.17							16,200.0	0.2	2,950.0				2,950	5
						Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	1,601.4	1,601	
584	45	40	10	800		STORAGE OPERATIONS (RPM)																

transfer of 1992 baskets, RES compared to 8528 canisters CES	Labour	0.23	2,093.9	0.23	489.1											489
No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	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	30%										30%	1.0	146.7		147

Total	**1,669,049**
Check: Should = 0	**0**

	Total	471,360	Total	586,764	Total	254,719	Total	356,205.6
	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	It is assumed that there is no property tax on facilities located on the Point Lepreau site. Reference note 5 on table 18 - Cost Estimate Report 1105/MD18084/REP/18
2	243k$/a made up of expenses from table 18 in report (118+50+50+25). No property tax or PST included.
3	staffing levels obtained from table 17 in cost estimate report 1105/MD18084/REP/18
4	annual cost obtained from table 18 in cost estimate report 1105/MD18084/REP/18
5	armed response costs during 'fuel handling' based on rate of $100k/a. 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
6	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

SURFACE MODULAR VAULTS (SMV)
GENTILLY

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
584	55	0	0	0	0	0	0	0 Environmental Assessment and Monitoring	Labour	STEP	OPG	RJH	8	294	287	0	0	NO DATA TO FILL	14856.3
584	55	0	0	0	0	0	0	0 Environmental Assessment and Monitoring	Materials and Equipment	STEP	OPG	RJH	8	294	287	0	0		4200.0
584	55	0	0	0	0	0	0	0 Environmental Assessment and Monitoring	Other	STEP	OPG	RJH	8	294	287	0	0		1666.5
584	55	0	0	0	0	0	0	0 Environmental Assessment and Monitoring	Contingency	STEP	OPG	RJH	8	294	287	0	0		6216.8

INSTRUCTIONS

Check: Total minus budget Should = 0

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check total	Total Cost $k
		0%	
Labour	14856	*0.0*	14856.3
Materials and Equipment	4200	*0.0*	4200.0
Other	1667	*0.0*	1666.5
Contingency	6216.8	*0.0*	6216.8
Total	26940	*0.0*	26940

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
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																
								Total HQ fuel inventory is about 3% of CES inventory. Therefore it is assumed that the costs of EA & Monitoring program are significantly less than for CES. However there will be a "fixed" cost component to some costs which limit the amount by which costs can be reduced.															
584	55							**Environmental Assessment and Monitoring**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	
584	55	10						EA & MONITORING PROGRAM MANAGEMENT															
								Costs are incurred over the period Y8 to Y294 (when repackaging ends) or 286 yrs vs CES at 347 yrs. RES has 0.1 staff vs 2 staff in CES. Fcator is 286/347 x 0.1/2 = 0.041	Labour	0.041	70306	0.041	2882.546									2,883
									Materials and Equipment	1				0	1	0							0
								Expenses at $1.5K/a x 286 yrs	Other	1							429	1	429				429
									Contingency	0.3										3311.546	0.3	993.4638	993
584	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT															
								Assume C/L & EA process spans 3 years (Y9 to Y11) with some preparation work in Y8; ie total of 4 years. Due to multiple sites with same technology can share costs	Labour	0.25	7471	0.25	1867.75									1,868
									Materials and Equipment	0.25				0	0.25	0							0

				Other	0.25				2,150	0.25	537.5				538
				Contingency	0.3							2405.25	0.3	721.575	722
584	55	40	GROUNDWATER MONITORING												
			Costs span the period Y15 to Y294 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
584	55	50	RADIOLOGICAL BIOSPHERE MONITORING												
			Costs span the period Y15 to Y294 or 280 yrs vs 330 ys for CES. RES staff is 0.1 vs 3.3 staff in CES. Factor is 0.026	Labour	0.026	217280	0.026	5649.28							5,649
			M&E at $9K/a x 280 yrs	Materials and Equipment	1				2520	1	2520				2,520
				Other	1				0	1	0				0
				Contingency	0.3							8169.28	0.3	2450.784	2,451
584	55	60	NON-RAD BIOSPHERE MONITORING												
			Costs span the period Y15 to Y294 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	0.053	53590	0.053	2840.27							2,840
			M&E at $3K/a x 280 yrs	Materials and Equipment	1				840	1	840				840
				Other	1				0	1	0				0
				Contingency	0.3							3680.27	0.3	1104.081	1,104
584	55	80	HUMAN HEALTH MONITORING												
			Costs span the period Y15 to Y294 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	0.1	5760	0.1	576							576
				Materials and Equipment	1				0	1	0				0
			Expenses at 0.5K/a x 280 yrs	Other	1				140	1	140				140
				Contingency	0.3							716	0.3	214.8	215
					Total		14,856	Total		4,200	Total		1,667	Total	26,939.6
					Check: Should = 0		0	Check: Should = 0		0	Check: Should = 0		0	Check: Should = 0	0

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

SURFACE MODULAR VAULTS (SMV)
GENTILLY

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
584	90	0	0	0	0	0	0	Program Management	Labour	STEP	CTECH	AM	1	14	14	0	0	NO DATA TO FILL	929.6
584	90	0	0	0	0	0	0	Program Management	Materials and Equipment	STEP	CTECH	AM	1	14	14	0	0		0.0
584	90	0	0	0	0	0	0	Program Management	Other	STEP	CTECH	AM	1	14	14	0	0		238.1
584	90	0	0	0	0	0	0	Program Management	Contingency	STEP	CTECH	AM	1	14	14	0	0		233.6

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
		0%	
Labour	930	*0.0*	929.6
Materials and Equipment	0	*0.0*	0.0
Other	238	*0.0*	238.1
Contingency	233.6	*0.0*	233.6
Total	1401	*0.0*	1401

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																	
584	90							**Program Management**																
								Program management shared between 7 reactor sites at percentages based on table 18 in cost estimate report. 7% for Gentilly			**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 14 year duration	Labour	0.07	13280.686	0.07	929.647992										930	
								no entry	Materials and Equipment	0				0	0	0							0	
								the following expenses: Overheads, insurance, community compensation & legal fees as table 18 in cost estimate report.	Other	0.07							3402	0.07	238.14				238	
								Contingency as CES value	Contingency	20%										20%	1.0	233.6	234	

Total	930	Total	0	Total	238	Total	233.6
Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0

Total	**1,401**
Check: Should = 0	**0**

BASIS OF ESTIMATE NOTES - Insert references and notes

RES ALTERNATIVE
WBS No 584
SURFACE MODULAR VAULTS (SMV)
GENTILLY

Cost Category	Total K$
Labour	531,160
Materials and Equipment	658,238
Other	303,629
Contingency	402,771
Total Cost	**1,895,797**

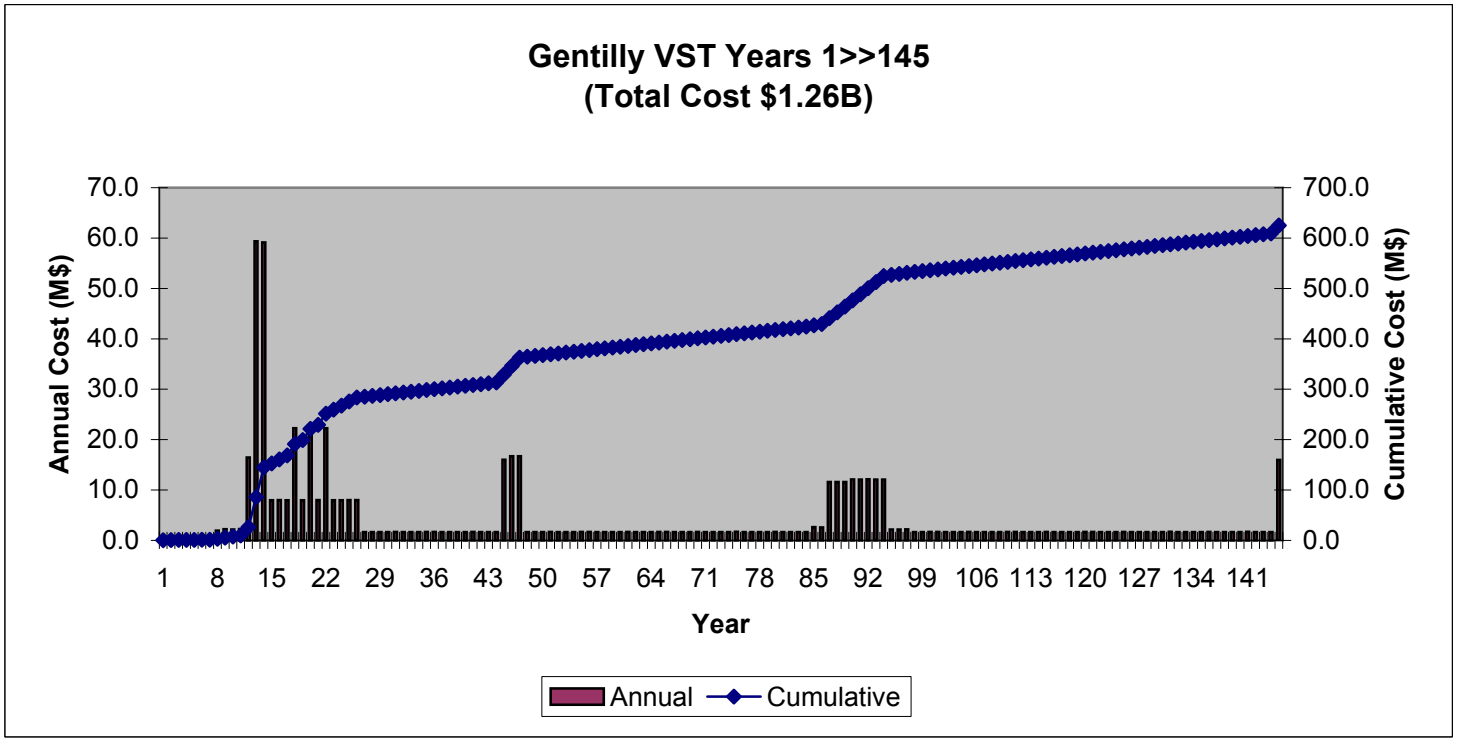
1,895,797

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$
584	15	0	0	0	0	0	0	RJH	Labour	STEP	1	11	7	0	452
584	15	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	11	7	0	0
584	15	0	0	0	0	0	0	RJH	Other	STEP	1	11	7	0	97
584	15	0	0	0	0	0	0	RJH	Contingency	STEP	1	11	7	0	275
584	20	0	0	0	0	0	0	AM	Labour	STEP	1	7	7	0	16,122
584	20	0	0	0	0	0	0	AM	Materials and Equipment	STEP	1	7	7	0	430
584	20	0	0	0	0	0	0	AM	Other	STEP	1	7	7	0	1,422
584	20	0	0	0	0	0	0	AM	Contingency	STEP	1	7	7	0	6,039
584	25	0	0	0	0	0	0	RJH	Labour	STEP	1	290	41	0	1,843
584	25	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	290	41	0	0
584	25	0	0	0	0	0	0	RJH	Other	STEP	1	290	41	0	315
584	25	0	0	0	0	0	0	RJH	Contingency	STEP	1	290	41	0	863
584	30	0	0	0	0	0	0	RJH	Labour	STEP	6	294	289	0	3,291
584	30	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	6	294	289	0	0
584	30	0	0	0	0	0	0	RJH	Other	STEP	6	294	289	0	16,080
584	30	0	0	0	0	0	0	RJH	Contingency	STEP	6	294	289	0	4,843
584	35	0	0	0	0	0	0	RJH	Labour	STEP	1	14	10	0	684
584	35	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	14	10	0	0
584	35	0	0	0	0	0	0	RJH	Other	STEP	1	14	10	0	462
584	35	0	0	0	0	0	0	RJH	Contingency	STEP	1	14	10	0	573
584	40	0	0	0	0	0	0	AM	Labour	STEP	11	286	276	0	21621.439
584	40	0	0	0	0	0	0	AM	Materials and Equipment	STEP	11	47	37	0	66843.7489
584	40	0	0	0	0	0	0	AM	Other	STEP	11	47	37	0	28630.313
584	40	0	0	0	0	0	0	AM	Contingency	STEP	11	47	37	0	27522.5343
584	45	0	0	0	0	0	0	AM	Labour	STEP	15	294	280	0	471,360
584	45	0	0	0	0	0	0	AM	Materials and Equipment	STEP	15	294	280	0	586,764
584	45	0	0	0	0	0	0	AM	Other	STEP	15	294	280	0	254,719
584	45	0	0	0	0	0	0	AM	Contingency	STEP	15	294	280	0	356,206
584	55	0	0	0	0	0	0	RJH	Labour	STEP	8	294	287	0	14,856
584	55	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	8	294	287	0	4,200
584	55	0	0	0	0	0	0	RJH	Other	STEP	8	294	287	0	1,667
584	55	0	0	0	0	0	0	RJH	Contingency	STEP	8	294	287	0	6,217
584	90	0	0	0	0	0	0	AM	Labour	STEP	1	14	14	0	930
584	90	0	0	0	0	0	0	AM	Materials and Equipment	STEP	1	14	14	0	0
584	90	0	0	0	0	0	0	AM	Other	STEP	1	14	14	0	238
584	90	0	0	0	0	0	0	AM	Contingency	STEP	1	14	14	0	234

RES ALTERNATIVE **FUEL OWNER** **HQ**
WBS No 585
Gentilly
VAULTS IN SHALLOW TRENCHES **(VST)**

Lev 2	WBS Name	Sheet Totals ($k)
15	Siting	1,003
20	System Development	11,937
25	Safety Assessment	3,022
30	Licensing & Approvals	24,214
35	Public Affairs	1,718
40	Facility Design & Construction	136,290
45	Facility Operation	1,054,081
55	Environmental Assessment and Monitoring	26,940
90	Program Management	1,326
	Total Cost ($k)	**1,260,531**

Gentilly VST Alternative	**1,260,531**
Siting Phase	**24,056**
Siting	1003
EA	3,127
System Development	11,937
SA	1,365
L&A	3,580
Public Affairs	1,718
Program Mgmt	1,326
Construction Phase	**136,290**
Initial construction	132,338
Transition to Standalone	3,952
Operations Phase	**1,100,185**
Repeat & Repackaging	*652,387*
Initial Fuel Receipts	136,705
Vaults - 100 yrs	72,030
Vaults - 200 yrs	72,030
Vaults - 300 yrs	71,705
Storage chamber replacement - 200 yrs	40,365
Repackaging B to B - 300 yrs	231,712
PM for Repeats & Repackaging	27,839
Extended Monitoring	*447,798*
Program Mgmt	107,913
Monitoring Surveliance	3,649
Operation Indirects	254,514
Common Ancillary Services Ops	33,171
Fuel Integrity Monitoring	2,447
SA - Ops & Decommissioning	1,657
L&A - Ops Licence Renewal	20,634
Environmental Monitoring	23,813


Gentilly VST Years 1>>145
(Total Cost $1.26B)
Annual Cost (M$)
Cumulative Cost (M$)
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
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

VAULTS IN SHALLOW TRENCHES (VST)
Gentilly

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
585	15	0	0	0	0	0	0	Siting	Labour	STEP	OPG	RJH	1	11	7	0	0	NO DATA TO FILL	555.9
585	15	0	0	0	0	0	0	Siting	Materials and Equipment	STEP	OPG	RJH	1	11	7	0	0		0.0
585	15	0	0	0	0	0	0	Siting	Other	STEP	OPG	RJH	1	11	7	0	0		113.0
585	15	0	0	0	0	0	0	Siting	Contingency	STEP	OPG	RJH	1	11	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

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	
585	15							**Siting**			CES	Factor	RES	CES	Factor	RES	CES	Factor	RES	CES	Factor	RES		
585	15	10						SITING MANAGEMENT																
								RES is 7 yrs vs 13 yrs for CES and shared amongst 7 sites due to inefficencies of multiple sites assume a factor of 0.2	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	
585	15	70						PREFERRED SITE																
585	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING																
								Assume cost is 20% of a CES greenfield site	Labour	0.15	588.3	0.15	88.245									88	2
									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	
585	15	70	30					PREFERRED SITE - CHARACTERISATION																
								Assume cost is 20% of a CES greenfield site	Labour	0.15	1484.8	0.15	222.72									223	3
									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**

Total	556	Total	0	Total	113	Total	334.4
Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

VAULTS IN SHALLOW TRENCHES (VST)
Gentilly

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
585	20	0	0	0	0	0	0	System Development	Labour	STEP	CTECH	AM	283	289	7	0	0	NO DATA TO FILL	7932.6
585	20	0	0	0	0	0	0	System Development	Materials and Equipment	STEP	CTECH	AM	283	289	7	0	0		430.0
585	20	0	0	0	0	0	0	System Development	Other	STEP	CTECH	AM	283	289	7	0	0		279.6
585	20	0	0	0	0	0	0	System Development	Contingency	STEP	CTECH	AM	283	289	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		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																	
585	20							**System Development**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
585	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 customization to 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 customization to 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
585	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
585	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
585	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 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							200.00	0.16	31.50			32

			Percentage for contingency assumed same as for CES	Contingency	25%											25%	1.00	328.51	329
585	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

BASIS OF ESTIMATE NOTES - Insert references and notes

1
2
3
4

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

VAULTS IN SHALLOW TRENCHES (VST)
Gentilly

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
585	25	0	0	0	0	0	0	Safety Assessment	Labour	STEP	OPG	RJH	1	294	40	0	0	NO DATA TO FILL	1843.3
585	25	0	0	0	0	0	0	Safety Assessment	Materials and Equipment	STEP	OPG	RJH	1	294	40	0	0		0.0
585	25	0	0	0	0	0	0	Safety Assessment	Other	STEP	OPG	RJH	1	294	40	0	0		315.0
585	25	0	0	0	0	0	0	Safety Assessment	Contingency	STEP	OPG	RJH	1	294	40	0	0		863.3

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE SUMMARY

Cost Category	Total Cost	Check: Total minus budget Should = 0	Check total	Budget costs to Years by %	Total Cost $k
			0%		
Labour	1843		*0.0*		1843.3
Materials and Equipment	0		*0.0*		0.0
Other	315		*0.0*		315.0
Contingency	863.3		*0.0*		863.3
Total	3022		*0.0*		3022

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																	
585	25							**Safety Assessment**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
585	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	0.1	5218.2	0.1	521.82									522	
									Materials and Equipment	0.1				0	0.1	0							0	1
									Other	0.1							850	0.1	85				85	
									Contingency	40%										40%	1.0	242.7	243	
585	25	30						SA - SITING																
									Labour	0	2287.5	0	0										0	2
									Materials and Equipment	0				0	0	0							0	
									Other	0							3,850	0	0				0	
									Contingency	40%										40%	1.0	0.0	0	
585	25	40						SA - OPERATING LICENSE																
									Labour	0.2	1540.5	0.2	308.1										308	3
									Materials and Equipment	0.2				0	0.2	0							0	
									Other	0.2							300	0.2	60				60	
									Contingency	40%										40%	1.0	147.2	147	
585	25	50						SA - FACILITY OPERATIONS																
								RES has 30 renewal events vs 45 in CES giving a factor of 0.67. However renewal costs can be shared between 5 sites with same technoilogy; thus reduce factor to 0.08	Labour	0.08	9604.8	0.08	768.384									768	
									Materials and Equipment	1				0	1	0							0	
								$0.5K/a x 280 yrs	Other	1							140	1	140				140	

				Contingency	40%									40%	1.0	363.4		363
585	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	0.1	0							0
				Other	0.1							300	0.1	30				30
				Contingency	40%										40%	1.0	110.0	110
																	Total	**3,022**
																	Check: Should = 0	**0**
						Total		1,843	Total		0	Total		315	Total		863.3	
						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

VAULTS IN SHALLOW TRENCHES (VST)
Gentilly

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
585	30	0	0	0	0	0	0	0 Licensing & Approvals	Labour	STEP	OPG	RJH	6	294	289	0	0	NO DATA TO FILL	3291.4
585	30	0	0	0	0	0	0	0 Licensing & Approvals	Materials and Equipment	STEP	OPG	RJH	6	294	289	0	0		0.0
585	30	0	0	0	0	0	0	0 Licensing & Approvals	Other	STEP	OPG	RJH	6	294	289	0	0		16079.5
585	30	0	0	0	0	0	0	0 Licensing & Approvals	Contingency	STEP	OPG	RJH	6	294	289	0	0		4842.7

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	3291	*0.0*	3291.4
Materials and Equipment	0	*0.0*	0.0
Other	16080	*0.0*	16079.5
Contingency	4842.7	*0.0*	4842.7
Total	24214	*0.0*	24214

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														
								In general L&A costs are assumed to be less than for a CES facility. In some cases the costs are shared between the seven sites													
585	30							**Licensing & Approvals**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
585	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	1
									Other	0.2							40	0.2	8				8	
									Contingency	0.25										25%	1.0	29.8	30	
585	30	50						CNSC CONSTRUCTION LICENCE																
									Labour	0.25	2631	0.25	657.75										658	2
								Some efficiencies gained due to multiple sites	Materials and Equipment	0.25				0	0.25	0							0	
									Other	0.25							6,264	0.25	1566				1,566	
									Contingency	0.25										25%	1.0	555.9	556	
585	30	60						OTHER GOVN'MT APPROVALS																
585	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
585	30	60	30	FEDERAL APPROVALS															
					Labour	0.25	133	0.25	33.25										33
					Materials and Equipment	0.25				0	0.25	0							0
					Other	0.25							0	0.25	0				0
					Contingency	0.25										25%	1.0	8.3	8
585	30	60	40	PROVINCIAL APPROVALS															
					Labour	0.25	133	0.25	33.25										33
					Materials and Equipment	0.25				0	0.25	0							0
					Other	0.25							0	0.25	0				0
					Contingency	0.25										25%	1.0	8.3	8
585	30	60	50	MUNICIPAL APPROVALS															
					Labour	0.25	133	0.25	33.25										33
					Materials and Equipment	0.25				0	0.25	0							0
					Other	0.25							0	0.25	0				0
					Contingency	0.25										25%	1.0	8.3	8
585	30	65		CNSC OPERATING LICENCE (Initial Application)															
					Labour	0.25	513	0.25	128.25										128
					Materials and Equipment	0.25				0	0.25	0							0
					Other	0.25							902	0.25	225.5				226
					Contingency	0.25										25%	1.0	88.4	88
585	30	70		CNSC OPERATING LICENCE (Maintenance & Renewal)															
				CES duration is 330 years. Costs incurred in RES during period Y15 to Y294 or 280 years. RES has 0.08 staff vs 1 staff in CES. Factor is 280/330 x 0.08/1 = 0.068	Labour	0.068	32754	0.068	2227.272										2,227
					Materials and Equipment	1				0	1	0							0
				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	**24,214**
Check: Should = 0	**0**

Total	3,291	Total	0	Total	16,080	Total	4,842.7
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

VAULTS IN SHALLOW TRENCHES (VST)
Gentilly

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
585	35							Public Affairs	Labour	STEP	OPG	RJH	1	14	10			NO DATA TO FILL	683.8
585	35							Public Affairs	Materials and Equipment	STEP	OPG	RJH	1	14	10				
585	35							Public Affairs	Other	STEP	OPG	RJH	1	14	10				461.8
585	35							Public Affairs	Contingency	STEP	OPG	RJH	1	14	10				572.8

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	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																
585	35							**Public Affairs**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
585	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
585	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
585	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
585	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

585	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

VAULTS IN SHALLOW TRENCHES (VST)
Gentilly

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
585	40	0	0	0	0	0	0	Facility Design & Construction	Labour	STEP	CTECH	AM	8	289	7	0	0	NO DATA TO FILL	52067.9
585	40	0	0	0	0	0	0	Facility Design & Construction	Materials and Equipment	STEP	CTECH	AM	8	289	7	0	0		48600.5
585	40	0	0	0	0	0	0	Facility Design & Construction	Other	STEP	CTECH	AM	8	289	7	0	0		6257.7
585	40	0	0	0	0	0	0	Facility Design & Construction	Contingency	STEP	CTECH	AM	8	289	7	0	0		29364.0

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	52068			*0.0*	52067.9
Materials and Equipment	48600			*0.0*	48600.5
Other	6258			*0.0*	6257.7
Contingency	29364.0			*0.0*	29364.0
Total	136290			*0.0*	136290

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
585	40							**Facility Design & Construction**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
											Labour			**Materials and other Equipment**			**Other**			**Contingency**				
585	40	10						SITE & IMPROVEMENTS																
								a 10% allowance of the CES costs, applied to the site improvements	Labour	0.1	45,930.4	0.1	4,593.0										4,593	
									Materials and Equipment	0.1				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	
585	40	30						COMMON ANCILLARY FACILITIES																
585	40	30	10					ADMIN AND SUPPORT FACILITIES																
585	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	
585	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	

585	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
585	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
585	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
585	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
585	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
585	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
585	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
585	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
585	40	30	10	12	UTILITY BLDG																
					Building exists therefore new building not required until 100 year replacement. Therefore allowance for refurbishment covered in ***/45/20/50	Labour	0.0	1,023.2	0.0	0.0									comment 7		0
						Materials and Equipment	0.0						1,257.0	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	30%										30%	1.0	0.0		0
585	40	30	10	13	TEST FACILITY CONSTRUCTION																
					Taken as being independent of fuel inventory stored. Same size bldg as CES, facilty will be shared between NBP and HQ therefore costs 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
585	40	30	20		OTHER SITE SYSTEMS																
585	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
585	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
585																					
585	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
585	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
585	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 CES	Contingency	25%										25%	1.0	0.0		0

585	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
585	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	Contingency	30%										30%	1.0	0.0				0
585	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
585	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
585	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
585	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
					STORAGE CONSTRUCTION STAGE 1																		
585	40	40			STORAGE CHAMBERS DESIGN & CONST'N																		
					Construction of the storage chambers complex. 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. 2 chambers length approx 124m for RES as opposed to 4 CES chambers at length 160m. Therefore factor due to length & quantity & use 6/10 rule.The CES design content for stages 2,3&4 has been omitted. The remaining stage 1 design content of the labour cost is split 50/50 between 2 sites (HQ&NBP)	Labour	0.57	72,832.7	0.57	41,237.2													41,237
						Materials and Equipment	0.57				59,932.2	0.57	33,933.1										33,933

			travel expenses for contactors same factor as labour and materials	Other	0.57							7,290.0	0.57	4,127.5					4,128
			Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	19,824.5		19,824
585	40	50	STORAGE VAULTS DESIGN & CONST'N																
			Costs taken from CVST CES storage const'n stage 3 costs. Factor dictated by quantity of vaults constructed, RES = 3 initially built, CES cost was for 24. Includes crane, trolley, & gamma gate	Labour	0.29	16,320.0	0.29	5,358.7											5,359
				Materials and Equipment	0.29					16,200.0	0.29	6,577.2							6,577
			travel expenses for contactors same factor as labour and materials	Other	0.29							7,290.0	0.29	2,093.5					2,094
			Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	3,507.4		3,507
585	40	650	ENERGY CONSUMPTION																
			No entry into cost category	Labour	0.00	0.0	0.00	0.0											0
			No entry into cost category	Materials and Equipment	0.00					0.0	0.00	0.0							0
			consumption for the construction of stage 1 storage chambers and ancillary buildings	Other	0.10							366.3	0.10	36.6					37
			Percentage for contingency assumed same as for CES	Contingency	0%										0%	1.0	0.0		0

Total	**136,290**
Check: Should = 0	**0**

					Total	52,068	Total			48,600	Total			6,258	Total			29,364.0	
					Check: Should = 0	0	Check: Should = 0			0	Check: Should = 0			0	Check: Should = 0			0	

BASIS OF ESTIMATE NOTES - Insert references and notes

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

VAULTS IN SHALLOW TRENCHES (VST)
Gentilly

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
585	45	0	0	0	0	0	0	Facility Operation	Labour	STEP	CTECH	AM	15	294	280	0	0	NO DATA TO FILL	493726.9
585	45	0	0	0	0	0	0	Facility Operation	Materials and Equipment	STEP	CTECH	AM	15	294	280	0	0		226949.3
585	45	0	0	0	0	0	0	Facility Operation	Other	STEP	CTECH	AM	15	294	280	0	0		109618.8
585	45	0	0	0	0	0	0	Facility Operation	Contingency	STEP	CTECH	AM	15	294	280	0	0		223786.1

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
		0%	
Labour	493139	*0.0*	493726.9
Materials and Equipment	226949	*0.0*	226949.3
Other	110207	*0.0*	109618.8
Contingency	223786	*0.0*	223786.1
Total	1054081	*0.0*	1054081

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	Add Basis of estimate Note Ref Number
											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	
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																	
585	45							**Facility Operation**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
585	45	10						OPERATIONS FUEL TRANSFER																
585	45	10	5					PROGRAM MANAGEMENT - INITIAL FUEL TRANSFER																
									Labour	0.08	110,251.0	0.1	8,820.1										8,820	
								Program management runs fromY11to 26. (y10-const'n 11-26 initial fuel transfer ops) therefore factoring labour costs for CES which is 30 years is factored 12/30. A further factor included due to program management shared equally between 7 sites this factor is increased to include inefficiency of single site based program management team (use 20%).																
								No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	0.0	0.0								0	
								Annual cost = $243/a x 12 yrs	Other	1.0							2,916	1.0	2,916.0					2,916	4
								Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	2,347.2	2,347	
585	45	10	25					MONITORING AND SURVEILLANCE (FUEL TRANSFER)																
								RES has a reduced duration (12/30) for monitoring the fuel, also the fuel inventory to bemonitored is lower 2299/4717	Labour	0.19	6,500.0	0.2	1,267.2										1,267	
								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	0.0							0.0	0.0	0.0					0	
								Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	653.5	653	

585	45	10	30		OPERATION INDIRECTS (FUEL TRANSFER)														
					Factor due to reduced admin & maintenance. Security and site infrastructure similar to CES, CES additional fuel receipt security/armed response omitted. Duration 12 years (CES 30), but using 90% utilisation. Other category is for energy consumption only.	Labour	0.4	115,547.0	0.36	41,596.9								41,597	
						Materials and Equipment	0.4				1,284.0	0.4	462.2							462	
						Other	0.4							16,380.0	0.4	5,896.8				5,897	
					Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	14,386.8	14,387	
585	45	10	40		STORAGE OPERATIONS																
					smaller fuel inventory therefore shorter duration for transfer operations 12 yrs for remaining fuel compared to 30 yrs CES	Labour	0.40	29,706.0	0.4	11,882.4										11,882	
					none applicable to basket fuel alternatives	Materials and Equipment	0.0				300.0	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	30%										30%	1.0	3,564.7	3,565	
585	45	10	50		ADDITIONAL STORAGE CONSTRUCTION																
585	45	10	50	10	STORAGE DESIGN & CONST'N STAGE 2 (VAULTS)																
					labour for additional 3 vaults factor = (3/24)^.6 ratio of number of RES vaults to CES with 6/10 rule applied	Labour	0.29	16,320.0	0.29	4,686.7										4,687	1
					labour for additional 3 vaults factor = (3/24)^.6 ratio of number of RES vaults to CES with 6/10 rule applied	Materials and Equipment	0.29				16,200.0	0.29	4,652.2							4,652	1
					labour for additional 3 vaults factor = (3/24)^.6 ratio of number of RES vaults to CES with 6/10 rule applied	Other	0.29							7,290.0	0.29	2,093.5				2,094	1
					Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	2,858.1	2,858	1
585	45	10	50	20	STORAGE DESIGN & CONST'N STAGE 3 (VAULTS)																
					labour for additional 3 vaults factor = (3/24)^.6 ratio of number of RES vaults to CES with 6/10 rule applied	Labour	0.29	16,320.0	0.29	4,686.7										4,687	1
					labour for additional 3 vaults factor = (3/24)^.6 ratio of number of RES vaults to CES with 6/10 rule	Materials and Equipment	0.29				16,200.0	0.29	4,652.2							4,652	1
					labour for additional 3 vaults factor = (3/24)^.6 ratio of number of RES vaults to CES with 6/10 rule applied	Other	0.29							7,290.0	0.29	2,093.5				2,094	1
					Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	2,858.1	2,858	1
585	45	10	50	30	STORAGE DESIGN & CONST'N STAGE 4 (VAULTS)																
					labour for additional 3 vaults factor = (3/24)^.6 ratio of number of RES vaults to CES with 6/10 rule applied	Labour	0.29	16,320.0	0.29	4,686.7										4,687	1
					labour for additional 3 vaults factor = (3/24)^.6 ratio of number of RES vaults to CES with 6/10 rule applied	Materials and Equipment	0.29				16,200.0	0.29	4,652.2							4,652	1
					labour for additional 3 vaults factor = (3/24)^.6 ratio of number of RES vaults to CES with 6/10 rule applied	Other	0.29							7,290.0	0.29	2,093.5				2,094	1
					Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	2,858.1	2,858	1

585	45	20		OPERATIONS - EXTENDED MONITORING																
585	45	20	5	PROGRAM MANAGEMENT																
				Entries in CES DET applicable to RES but duration 268 years RES & 300 years CES therefore268/300 = 0.893. Program management spread over 7 sites with Gentilly assumed to have 0.8 staff vs 9 in CES. Thus combined factor = 0.079	Labour	0.079	312,354.0	0.1	24,803.2									24,803	5
				No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	0.0	0.0							0	
				Annual cost = $243/a x 268 yrs	Other	1.00							65,124.0	1.0	65,124.0				65,124	3,4
				Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	17,985.4	17,985	
585	45	20	40	MONITORING AND SURVEILLANCE - EXTENDED MONITORING																
				CES monitoring and surveillance duration was 300 yrs for 4717 baskets, RES is 268 years for 2299 baskets. Gentilly assumed to have 0.5 staff for RES vs 5 in CES. Combined factor based on duration, fuel inventory and staffing levels.	Labour	0.04	49,716.0	0.0	2,164.6									2,165	5
				annual costs = $1k/a x 268 years	Materials and Equipment	1.00				268.0	1.0	268.0							268	6
				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	50%										50%	1.0	1,216.3	1,216	
585	45	20	50	OPERATION INDIRECTS (EXTENDED MONITORING)																
				Entries in CES DET applicable to RES but duration 268 years 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 Armed response = $50k/a + energy costs at $5k/a. total = $55k x 268 years	Labour	0.18	875,048.0	0.2	160,940.2									160,940	5
					Materials and Equipment	1.00				20,100.0	1.0	20,100.0							20,100	6
					Other	1.00							14,740.0	1.0	14,740.0				14,740	6
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	58,734.1	58,734	
585	45	20	60	COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)																
				RES has duration 268 years, CES has 300 years. RES staff is 1 vs 5 in CES. Factor is 268/300 x 1/5	Labour	0.18	148,529.0	0.2	26,537.2									26,537	5
				No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	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	6,634.3	6,634	
585	45	20	70	FUEL INTEGRITY MONITORING (25 YEARLY)																

				RES has duration 268 years, CES has 300 years. RES staff is 0.1 vs 0.5 in CES. Factor is 268/300 x 0.1/0.5	Labour	0.2	4,631.0	0.2	827.4										827	5
				annual M+E costs is $2.5k/a x 268 years	Materials and Equipment	1.0				670.0	1.0	670.0							670	6
				Other costs is $0.5k/a x 268 years	Other	1.0							134.0	1.0	134.0				134	6
				Percentage for contingency assumed same as for CES	Contingency	50%										50%	1.0	815.7	816	
585	45	30		OPERATIONS - FACILITY REPEATS																	
585	45	30	20	VAULTS 100 YEAR REPLACEMENT																	
				replace all 12 vaults. CES has cost for replacing 24 therefore labour cost factor = 12/24	Labour	0.50	43,775.7	0.5	21,887.9										21,888	
				each vault materialscost = $675k therefore from CES materials total cost (which is for 24 vaults) deduct 12x$675k to leave remaining materials costs for 12 vaults and associated equipment	Materials and Equipment	1.00				30,520.000	1.0	30,520.0							30,520	
				eletrical consumption for const'n of vaults and waste didposal is related to quantity of vaults, use factor 12/24 Includes Armed response included at rate of $50k/a based on 5 years duration - see note 5.	Other	0.50							5,500.0	0.5	3,000.0				3,000	7
				Percentage for contingency assumed same as for CES	Contingency	30%										30%	1.0	16,622.4	16,622	
585	45	30	30	VAULTS 200 YEAR REPLACEMENT																	
				assume same costs as for 100 year vault replacement	Labour	0.50	43,775.7	0.5	21,887.9										21,888	
				assume same costs as for 100 year vault replacement	Materials and Equipment	1.00				30,520.000	1.0	30,520.0							30,520	
				assume same costs as for 100 year vault replacement	Other	0.50							5,500.0	0.5	3,000.0				3,000	7
				assume same costs as for 100 year vault replacement	Contingency	30%										30%	1.0	16,622.4	16,622	
585	45	30	40	VAULTS 300 YEAR REPLACEMENT																	
				assume same costs as for 100 year vault replacement	Labour	0.50	43,775.7	0.5	21,887.9										21,888	
				assume same costs as for 100 year vault replacement	Materials and Equipment	1.00				30,520.000	1.0	30,520.0							30,520	
				assume same costs as for 100 year vault replacement	Other	0.50							5,500.0	0.5	2,750.0				2,750	8
				assume same costs as for 100 year vault replacement	Contingency	30%										30%	1.0	16,547.4	16,547	
585	45	30	50	STORAGE CHAMBERS 200 YEAR REPLACEMENT																	
				CES has 16 chambers, RES has 2 chambers therefore factor = 2/16^0.6	Labour	0.29	110,400.0	0.3	31,704.1										31,704	
				no entry in CES	Materials and Equipment	0.00				0.000	0.0	0.0							0	
				CES has 16 chambers, RES has 2 chambers therefore factor = 2/16^0.6	Labour	0.29							2,048.4	0.3	588.2				588	
				Percentage for contingency assumed same as for CES	Contingency	25%										25%	1.0	8,073.1	8,073	
585	45	40		OPERATIONS - REPACKAGING																	
585	45	40	5	PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)																	

							Entries in CES DET applicable to RES but duration 30 years RES = 3x(2yr licensing 1yr demolish prev. bldg, 2yr const'n, 5yr operations) & 114 years CES therefore 30/114. A further factor included due to program management shared equally between 7 sites this factor is increased to include inefficiency	Labour	0.05	440,778.0	0.1	23,198.8									23,199	
							No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	0.0	0.0						0	
							see note 4. no property tax assumed this site	Other	0.00							463,066.1	0.0	0.0			0	4
							Percentage for contingency assumed same as for CES	Contingency	20%										20%	1.0	4,639.8	4,640	
585	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	0.00							0.0	0.0	0.0			0	
							Percentage for contingency assumed same as for CES	Contingency	22%										22%	1.0	23,230.6	23,231	
585	45	40	10	600	30		ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)																		
							duration 24 years RES compared to 30 years CES. Factor =24/30 = 0.8	Labour	0.8	11,882.0	0.8	9,505.6									9,506	2
							No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	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	2,376.4	2,376	
585	45	40	40				BASKET TO BASKET 300 YEAR REPACKAGING																		
585	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	
585	45	40	40	10			PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)																		
585	45	40	40	10	20		RPBB EQUIP. DESIGN, SUPPLY & INSTALL																		
585	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	
585	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
585	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
585	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
585	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
585	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	0.0					0.0	0.0	0.0							0
							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
585	45	40	40	10	80		CONST'N INDIRECTS (RPB)																
							As for RPM, - assume Design accounts for approx 45% of the total const'n indirect costs (information on ratio obtained from CES SMV Processing building). These costs can be shared between the 2 sites (HQ & NBP) therefore factor = (100-45)+45/2 = 77.5% (or 0.78)	Labour	0.78	6,299.6	0.8	4,882.2											4,882
								Materials and Equipment	0.0					0.0	0.0	0.0							0
								Other	0.78								241.5	0.8	187.2				187
							same contingency as for CES	Contingency	30%											30%	1.0	1,520.8	1,521
585	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	0.0					0.0	0.0	0.0							0
							No entry in CES alternative cost category	Other	0.0								0.0	0.0	0.0				0
							same contingency as for CES	Contingency	30%											30%	1.0	1,407.2	1,407

585	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	0.0				0.0	0.0	0.0							0
					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
585	45	40	40	600	REPACKAGING OPERATIONS (RPB)														
					Labour for repackaging operations for CES is for a fuel inventory of 4717 baskets. RES has 2299 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 2299/4717 = 0.487	Labour	0.49	3,960.8	0.5	1,930.4									1,930
					the same factor for labour is used for procurement of new baskets	Materials and Equipment	0.49				23,585.0	0.5	11,495.0							11,495
					the same factor for labour is used for waste disposal of old baskets	Other	0.49							378.0	0.5	184.2				184
					same contingency as for CES	Contingency	30%										30%	1.0	4,082.9	4,083
585	45	40	40	700	OPERATION INDIRECTS (RPB)														
					operation indirect labour costs for CES are for a duration of 10 yrs RES operations are for 5 yrs therefore a factor of 0.5 is used	Labour	0.5	2,678.3	0.5	1,339.2									1,339
					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 = 5/10yrs = 0.5. Armed response included at rate of $50k/a based on 5 years duration - see note 5	Other	0.5							3,240.0	0.5	1,870.0				1,870	7
					same contingency as for CES	Contingency	30%										30%	1.0	1,014.6	1,015
585	45	40	40	800	STORAGE OPERATIONS (RPB)														
					Labour for storage operations for CES is for a fuel inventory of 4717 baskets. RES has 2299 baskets requiring repackaging. The cost factor is a ratio of the fuel inventory = 2299/4717 = 0.487	Labour	0.49	990.2	0.5	482.6									483
					No entry in CES alternative cost category	Materials and Equipment	0.0				0.0	0.0	0.0							0
					No entry in CES alternative cost category	Other	0.0							0.0	0.0	0.0				0
					same contingency as for CES	Contingency	30%										30%	1.0	144.8	145

Total	**1,054,081**
Check: Should = 0	**0**

	Total	493,139	Total	226,949	Total	110,207	Total	223,786.1
	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 costs for silos demolition and waste diposal based on unit cost factors obtained for demolition of basket storage vaults in CVSB alternative

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

4 243k$/a made up of expenses from table 18 in report (118+50+50+25). No property tax or PST included.

5 staffing levels obtained from table 17 in cost estimate report 1105/MD18084/REP/18

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

7 armed response costs during 'fuel handling' based on rate of $100k/a. 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

8 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

VAULTS IN SHALLOW TRENCHES (VST)

Gentilly

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
585	55	0	0	0	0	0	0	Environmental Assessment and Monitoring	Labour	STEP	OPG	RJH	8	294	287	0	0	NO DATA TO FILL	14856.3
585	55	0	0	0	0	0	0	Environmental Assessment and Monitoring	Materials and Equipment	STEP	OPG	RJH	8	294	287	0	0		4200.0
585	55	0	0	0	0	0	0	Environmental Assessment and Monitoring	Other	STEP	OPG	RJH	8	294	287	0	0		1666.5
585	55	0	0	0	0	0	0	Environmental Assessment and Monitoring	Contingency	STEP	OPG	RJH	8	294	287	0	0		6216.8

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	14856	*0.0*	14856.3
Materials and Equipment	4200	*0.0*	4200.0
Other	1667	*0.0*	1666.5
Contingency	6216.8	*0.0*	6216.8
Total	26940	*0.0*	26940

INSTRUCTIONS

ACTIVITY DETAIL ESTIMATE

WBS LEVEL 1	2	3	4	5	6	7	8	WBS Description / Detail	Cost Category	Factor	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
										Factor	Labour			Materials and other Equipment			Other			Contingency			TOTAL Cost $k	
								Total HQ fuel inventory is about 3% of CES inventory. Therefore it is assumed that the costs of EA & Monitoring program are significantly less than for CES. However there will be a "fixed" cost component to some costs which limit the amount by which costs can be reduced.																
585	55							**Environmental Assessment and Monitoring**			**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**	**CES**	**Factor**	**RES**		
585	55	10						EA & MONITORING PROGRAM MANAGEMENT																
								Costs are incurred over the period Y8 to Y294 (when repackaging ends) or 286 yrs vs CES at 347 yrs. RES has 0.1 staff vs 2 staff in CES. Fcator is 286/347 x 0.1/2 = 0.041	Labour	0.041	70306	0.041	2882.546										2,883	
									Materials and Equipment	1				0	1	0							0	
								Expenses at $1.5K/a x 286 yrs	Other	1							429	1	429				429	
									Contingency	0.3										3311.546	0.3	993.4638	993	
585	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT																
								Assume C/L & EA process spans 3 years (Y9 to Y11) with with some preparation work in Y8; ie total of 4 years. Due to multiple sites with same technology can share costs	Labour	0.25	7471	0.25	1867.75										1,868	

				Materials and Equipment	0.25				0	0.25	0					0
				Other	0.25							2,150	0.25	537.5		538
				Contingency	0.3										2405.25	0.3	721.575	722
585	55	40	GROUNDWATER MONITORING															
			Costs span the period Y15 to Y294 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
585	55	50	RADIOLOGICAL BIOSPHERE MONITORING															
			Costs span the period Y15 to Y294 or 280 yrs vs 330 ys for CES. RES staff is 0.1 vs 3.3 staff in CES. Factor is 0.026	Labour	0.026	217280	0.026	5649.28								5,649
			M&E at $9K/a x 280 yrs	Materials and Equipment	1				2520	1	2520					2,520
				Other	1							0	1	0		0
				Contingency	0.3										8169.28	0.3	2450.784	2,451
585	55	60	NON-RAD BIOSPHERE MONITORING															
			Costs span the period Y15 to Y294 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	0.053	53590	0.053	2840.27								2,840
			M&E at $3K/a x 280 yrs	Materials and Equipment	1				840	1	840					840
				Other	1							0	1	0		0
				Contingency	0.3										3680.27	0.3	1104.081	1,104
585	55	80	HUMAN HEALTH MONITORING															
			Costs span the period Y15 to Y294 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	0.1	5760	0.1	576								576
				Materials and Equipment	1				0	1	0					0
			Expenses at 0.5K/a x 280 yrs	Other	1							140	1	140		140
				Contingency	0.3										716	0.3	214.8	215

Total	**26,940**
Check: Should = 0	**0**

Total	14,856	Total	4,200	Total	1,667	Total	6,216.8
Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0

REACTOR EXTENDED STORE
ACTIVITY SUMMARY TO DATA TRANSFER

VAULTS IN SHALLOW TRENCHES (VST)
Gentilly

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
585	90	0	0	0	0	0	0	Program Management	Labour	STEP	CTECH	AM	1	14	14	0	0	NO DATA TO FILL	929.6
585	90	0	0	0	0	0	0	Program Management	Materials and Equipment	STEP	CTECH	AM	1	14	14	0	0		0.0
585	90	0	0	0	0	0	0	Program Management	Other	STEP	CTECH	AM	1	14	14	0	0		175.7
585	90	0	0	0	0	0	0	Program Management	Contingency	STEP	CTECH	AM	1	14	14	0	0		221.1

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	
		0%		
Labour	930	*0.0*	929.6	
Materials and Equipment	0	*0.0*	0.0	
Other	176	*0.0*	175.7	
Contingency	221.1	*0.0*	221.1	
Total	1326	*0.0*	1326	

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
585	90							**Program Management**															Cost $k	
								Program management shared between 7 reactor sites at percentages based on table 18 in cost estimate report. 7% for Gentilly			**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 14 year duration	Labour	0.07	13280.686	0.07	929.647992										930	
								no entry	Materials and Equipment	0				0	0	0							0	
								the following expenses: Overheads, insurance, community compensation & legal fees as table 18 in cost estimate report.	Other	0.07							2510	0.07	175.7				176	
								Contingency as CES value	Contingency	20%										20%	1.0	221.1	221	
											Total	930	Total	0	Total	176	Total	221.1						
											Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0	Check: Should = 0	0						

Total	**1,326**
Check: Should = 0	**0**

BASIS OF ESTIMATE NOTES - Insert references and notes

1

2

RES ALTERNATIVE
WBS No 585
VAULTS IN SHALLOW TRENCHES (VST)
Gentilly

Cost Category	Total K$
Labour	575,888
Materials and Equipment	280,180
Other	134,968
Contingency	269,496
Total Cost	**1,260,531**

1,260,531

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$
585	15	0	0	0	0	0	0	RJH	Labour	STEP	1	11	7	0	556
585	15	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	11	7	0	0
585	15	0	0	0	0	0	0	RJH	Other	STEP	1	11	7	0	113
585	15	0	0	0	0	0	0	RJH	Contingency	STEP	1	11	7	0	334
585	20	0	0	0	0	0	0	AM	Labour	STEP	283	289	7	0	7,933
585	20	0	0	0	0	0	0	AM	Materials and Equipment	STEP	283	289	7	0	430
585	20	0	0	0	0	0	0	AM	Other	STEP	283	289	7	0	280
585	20	0	0	0	0	0	0	AM	Contingency	STEP	283	289	7	0	3,295
585	25	0	0	0	0	0	0	RJH	Labour	STEP	1	294	40	0	1,843
585	25	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	294	40	0	0
585	25	0	0	0	0	0	0	RJH	Other	STEP	1	294	40	0	315
585	25	0	0	0	0	0	0	RJH	Contingency	STEP	1	294	40	0	863
585	30	0	0	0	0	0	0	RJH	Labour	STEP	6	294	289	0	3,291
585	30	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	6	294	289	0	0
585	30	0	0	0	0	0	0	RJH	Other	STEP	6	294	289	0	16,080
585	30	0	0	0	0	0	0	RJH	Contingency	STEP	6	294	289	0	4,843
585	35	0	0	0	0	0	0	RJH	Labour	STEP	1	14	10	0	684
585	35	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	1	14	10	0	0
585	35	0	0	0	0	0	0	RJH	Other	STEP	1	14	10	0	462
585	35	0	0	0	0	0	0	RJH	Contingency	STEP	1	14	10	0	573
585	40	0	0	0	0	0	0	AM	Labour	STEP	8	289	7	0	52067.8945
585	40	0	0	0	0	0	0	AM	Materials and Equipment	STEP	8	289	7	0	48600.4555
585	40	0	0	0	0	0	0	AM	Other	STEP	8	289	7	0	6257.66574
585	40	0	0	0	0	0	0	AM	Contingency	STEP	8	289	7	0	29363.9709
585	45	0	0	0	0	0	0	AM	Labour	STEP	15	294	280	0	493,727
585	45	0	0	0	0	0	0	AM	Materials and Equipment	STEP	15	294	280	0	226,949
585	45	0	0	0	0	0	0	AM	Other	STEP	15	294	280	0	109,619
585	45	0	0	0	0	0	0	AM	Contingency	STEP	15	294	280	0	223,786
585	55	0	0	0	0	0	0	RJH	Labour	STEP	8	294	287	0	14,856
585	55	0	0	0	0	0	0	RJH	Materials and Equipment	STEP	8	294	287	0	4,200
585	55	0	0	0	0	0	0	RJH	Other	STEP	8	294	287	0	1,667
585	55	0	0	0	0	0	0	RJH	Contingency	STEP	8	294	287	0	6,217
585	90	0	0	0	0	0	0	AM	Labour	STEP	1	14	14	0	930
585	90	0	0	0	0	0	0	AM	Materials and Equipment	STEP	1	14	14	0	0
585	90	0	0	0	0	0	0	AM	Other	STEP	1	14	14	0	176
585	90	0	0	0	0	0	0	AM	Contingency	STEP	1	14	14	0	221

B2 Cost Estimate Schedules for Gentilly Site

WBS No 583 – Vaults
WBS No 584 – SMV
WBS No 585 - VST

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	WBS Comments	Ammendment No	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmt	12
	1	1	583								**BASKETS IN VAULTS - HQ GENTILLY**													
	2	2	583	15							**SITING**	Db Sm												
	3	3	583	15	10						TECHNICAL SITING MANAGEMENT	Db Act	FIXED	OPG	RJH			1	86	7				
	4	3	583	15	70						PREFERRED SITE	Db Sm												
	5	4	583	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING	Db Act	FIXED	OPG	RJH			83	83	1				
	6	4	583	15	70	30					PREFERRED SITE - CHARACTERIZATION	Db Act	FIXED	OPG	RJH			83	83	1				
	7																							
	8	2	583	20							**SYSTEM DEVELOPMENT**	Db Sm												
	9	3	583	20	02						SYSTEM DEVELOPMENT MANAGEMENT	Db Act	FIXED	CTECH	AM			283	289	7				
	10	3	583	20	05						SYSTEM OPTIMIZATION	Db Act	FIXED	CTECH	AM			283	286	4				
	11	3	583	20	20						PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)	Db Act	FIXED	CTECH	AM			283	289	7				
	12	3	583	20	30						STORAGE SYSTEM ENG'NG	Db Act	FIXED	CTECH	AM			283	289	7				
	13	3	583	20	40						SECURITY & SAFEGUARD ENG'NG	Db Act	FIXED	CTECH	AM			286	286	1				
	14																							
	15	2	583	25							**SAFETY ASSESSMENT**	Db Sm												
	16	3	583	25	10						SAFETY ASSESSMENT MANAGEMENT	Db Act	FIXED	OPG	RJH			1	89	11				
	17	3	583	25	30						SA - SITING	Db Act	FIXED	OPG	RJH			82	83	2				
	18	3	583	25	40						SA - OPERATING LICENSE	Db Act	FIXED	OPG	RJH			88	89	2				
	19	3	583	25	50						SA - FACILITY OPERATIONS	Db Act	FIXED	OPG	RJH			19	289	30				
	20	3	583	25	70						SA - DECOMMISSIONING (Processing Facilities)	Db Act	FIXED	OPG	RJH			285	285	1				
	21																							
	22	2	583	30							**LICENSING & APPROVALS**	Db Sm												
	23	3	583	30	30						LIAISON WITH CNSC	Db Act	FIXED	CTECH	MG			80	83	4				
	24	3	583	30	50						CNSC CONSTRUCTION LICENCE	Db Act	FIXED	CTECH	MG			84	86	3				
	25	3	583	30	60						OTHER GOVN'MT APPROVALS	Db Act	FIXED	CTECH	MG									
	26	4	583	30	60	10					APPROVAL REQUIREMENTS	Db Act	FIXED	CTECH	MG			80	83	4				
	27	4	583	30	60	30					FEDERAL APPROVALS	Db Act	FIXED	CTECH	MG			84	89	6				
	28	4	583	30	60	40					PROVINCIAL APPROVALS	Db Act	FIXED	CTECH	MG			84	89	6				
	29	4	583	30	60	50					MUNICIPAL APPROVALS	Db Act	FIXED	CTECH	MG			84	89	6				
	30	3	583	30	65						CNSC OPERATING LICENCE (Initial Application)	Db Act	FIXED	CTECH	MG			88	89	2				
	31	3	583	30	70						CNSC OPERATING LICENCE (Maintenance and Renewal)	Db Act	FIXED	CTECH	MG			19	294	276				
	32																							
	33	2	583	35							**PUBLIC AFFAIRS**	Db Sm												
	34	3	583	35	45						PUBLIC AFFAIRS - PREFERRED SITE	Db Act	FIXED	OPG	RJH			83	83	1				
	35	3	583	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL	Db Act	FIXED	OPG	RJH			84	86	3				
	36	3	583	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION	Db Act	FIXED	OPG	RJH			87	89	3				
	37	3	583	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH			1	89	10				
	38	3	583	35	120						COMMUNITY OFFSETS AND BENEFITS	Db Act	FIXED	OPG	RJH			87	89	3				
	39																							
	40	2	583	40							**FACILITY DESIGN AND CONSTRUCTION**	Db Sm												
	41	3	583	40	10						SITE & IMPROVEMENTS	Db Act	STEP FIXED	CTECH	GA			44	44	1				
	42	3	583	40	30						COMMON ANCILLARY FACILITIES	Db Sm												
	43	4	583	40	30	10					ADMIN AND SUPPORT FACILITIES	Db Sm												
	44	5	583	40	30	10	01				ADMIN AND VISITOR RECEPT'N BLDG	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	45	5	583	40	30	10	02				OPS SUPPT & HEALTH PHYSICS BLDG	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	46	5	583	40	30	10	03				EQUIP STORAGE AND MAINT'CE BLDG	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	47	5	583	40	30	10	05				ACTIVE SOLID WASTE HDLG BLDG (build at RPBB event)	Db Act	STEP FIXED	CTECH	GA			288	289	2				
	48	5	583	40	30	10	06				SOLID WASTE STORAGE AREA (build at RPBB event)	Db Act	STEP FIXED	CTECH	GA			288	289	2				

	LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	WBS Comments	Ammendment No	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt	12
	49	5	583	40	30	10	07				ACTIVE LIQ/W TRT'MT BLDG (build at RPBB event)	Db Act	STEP FIXED	CTECH	GA			288	289	2				
	50	5	583	40	30	10	08				LOW LVL LIQ/W STRG BLDG (build at RPBB event)	Db Act	STEP FIXED	CTECH	GA			288	289	2				
	51	5	583	40	30	10	09				WAREHOUSE BLDG	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	52	5	583	40	30	10	10				GUARDHOUSE AND SECURITY FENCE	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	53	5	583	40	30	10	11				TRUCK INSP'N / WASH STATION (build at RPBB event)	Db Act	STEP FIXED	CTECH	GA			Not required for RES						
	54	5	583	40	30	10	12				UTILITY BLDG	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	55	5	583	40	30	10	13				TEST FACILITY CONSTRUCTION	Db Act	STEP FIXED	CTECH	GA			46	47	2				
	56	4	583	40	30	20					OTHER SITE SYSTEMS	Db Sm												
	57	5	583	40	30	20	01				FIRE PROTECTION SYSTEMS	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	58	5	583	40	30	20	02				SECURITY AND COMMUNICATION SYSTEM	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	59	5	583	40	30	20	03				ELECTRICAL AND EMERGENCY POWER	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	60	5	583	40	30	20	04				SANITARY SEWER SYSTEM	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	61	5	583	40	30	20	05				POTABLE WATER SYSTEM	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	62	5	583	40	30	20	06				RETENTION/SEDIMENTATION POND	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	63	5	583	40	30	20	07				STORM WATER DETENTION POND	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	64	5	583	40	30	20	08				CONST'N MAT'L STOCKPILE AREA	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	65	5	583	40	30	20	09				SITE MATERIALS STORAGE AREA	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	66	5	583	40	30	20	10				ACCESS ROADS AND VEHICLE COMPOUNDS	Db Act	STEP FIXED	CTECH	GA			*	*	*				
	67	4	583	40	30	30					CONST'N INDIRECTS ANCILLARY FACILITIES	Db Act	STEP FIXED	CTECH	GA			46	47	2				
	68										*** Existing buildings and services adopted by RES facility.**														
	69	2	583	45							**FACILITY OPERATION**	Db Sm												
	70	3	583	45	20						OPERATIONS - EXTENDED MONITORING	Db Sm												
	71	4	583	45	20	05					PROGRAM MANAGEMENT	Db Act	STEP FIXED	CTECH	AM			19	294	276				
	72	4	583	45	20	40					MONITORING AND SURVEILLANCE	Db Act	STEP FIXED	CTECH	AM			19	294	276				
	73	4	583	45	20	50					OPERATION INDIRECTS (MONITORING)	Db Act	STEP FIXED	CTECH	AM			19	294	276				
	74	4	583	45	20	60					COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)	Db Act	STEP FIXED	CTECH	GA			19	294	276				
	75	4	583	45	20	70					FUEL INTEGRITY MONITORING (25 YEARLY)	Db Act	STEP FIXED	CTECH	AM			19	294	276				
	76	3	583	45	30						OPERATIONS - FACILITY REPEATS	Db Sm												
	77	4	583	45	30	20					BASKET VAULTS 100 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	GA			87	94	8				
	78	4	583	45	30	30					BASKET VAULTS 200 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	GA			187	194	8				
	79	4	583	45	30	40					BASKET VAULTS 300 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	GA			287	294	8				
	80	3	583	45	40						OPERATIONS - REPACKAGING	Db Sm												
	81	4	583	45	40	05					PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)	Db Act	STEP FIXED	CTECH	AM			85	294	30				

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	WBS Comments	Ammendment No	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt	12
82	5	583	45	40	10	40				COMMON ANCILLARY FACILITIES REPLACEMENT	Db Act	STEP FIXED	CTECH	AM			145	289	9				
83	6	583	45	40	10	600	30			ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)	Db Act	STEP FIXED	CTECH	GA			87	294	24				
84	4	583	45	40	40					BASKET TO BASKET 300 YEAR REPACKAGING	Db Sm												
85	5	583	45	40	40	05				CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)	Db Act	STEP FIXED	CTECH	AM			288	289	2				
86	5	583	45	40	40	10				PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)	Db Sm												
87	6	583	45	40	40	10	20			RPBB EQUIP. DESIGN, SUPPLY & INSTALL	Db Sm												
88	7	583	45	40	40	10	20	10		RECEIPT & TRANSFER (EQUIP)	Db Act	STEP FIXED	CTECH	AM			288	289	2				
89	7	583	45	40	40	10	20	20		BASKET TO BASKET FUEL TRANSFER	Db Act	STEP FIXED	CTECH	AM			288	289	2				
90	7	583	45	40	40	10	20	30		BASKET DECONTAMINATION	Db Act	STEP FIXED	CTECH	AM			288	289	2				
91	6	583	45	40	40	10	30			RPBB BUILDING DESIGN AND CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM			288	289	2				
92	6	583	45	40	40	10	60			BUILDING SERVICES (RPB)	Db Act	STEP FIXED	CTECH	AM			289	289	1				
93	6	583	45	40	40	10	70			COMMISSIONING (RPB)	Db Act	STEP FIXED	CTECH	AM			289	289	1				
94	6	583	45	40	40	10	80			CONST'N INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM			288	289	2				
95	5	583	45	40	40	400				CONSTRUCTION MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM			288	289	2				
96	5	583	45	40	40	500				COMMISSIONING MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM			289	289	1				
97	5	583	45	40	40	600				REPACKAGING OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM			290	294	5				
98	5	583	45	40	40	700				OPERATION INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM			290	294	5				
99	5	583	45	40	40	800				STORAGE OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM			290	294	5				
100																							
101	2	583	55							**ENVIRONMENTAL MANAGEMENT SYSTEM**	Db Sm												
102	3	583	55	10						EA & MONITORING PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH			19	294	276				
103	3	583	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT	Db Act	FIXED	OPG	RJH			84	86	3				
104	3	583	55	40						GROUNDWATER MONITORING	Db Act	FIXED	OPG	RJH			19	294	276				
105	3	583	55	50						RADIOLOGICAL BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH			19	294	276				
106	3	583	55	60						NON-RAD BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH			19	294	276				
107	3	583	55	80						HUMAN HEALTH MONITORING	Db Act	FIXED	OPG	RJH			19	294	276				
108																							
109	2	583	90							**PROGRAM MANAGEMENT (YEARS 1 TO 18)**	Db Act	STEP FIXED	CTECH	AM			1	18	18				

LINE No	Level sp sht	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Respo nsible	WBS Comm ents	Ammen dment No	Start Yr	Finish Yr	DUR - Yrs	PRED	Sc he du le	Sch edul e Amn
1	1	584								**SURFACE MODULAR VAULT (SMV) - HQ GENTILLY**												
1	2	584	15							**SITING**												
2	3	584	15	10						SITING MANAGEMENT	Db Act	FIXED	OPG	RJH			1	11	7			
3	3	584	15	70						PREFERRED SITE	Db Sm											
4	4	584	15	70	10					PREFERRED SITE - SUPPORT AND REPORTING	Db Act	FIXED	OPG	RJH			8	8	1			
5	4	584	15	70	30					PREFERRED SITE - CHARACTERISATION	Db Act	FIXED	OPG	RJH			8	8	1			
6		584																				
7	2	584	20							**SYSTEM DEVELOPMENT**												
8	3	584	20	02						SYSTEM DEVELOPMENT MANAGEMENT	Db Sm											
9	3	584	20	05						SYSTEM OPTIMIZATION	Db Act	FIXED	CTECH	AM			1	7	7			
10	3	584	20	20						PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)	Db Act	FIXED	CTECH	AM			1	4	4			
11	3	584	20	30						STORAGE SYSTEM ENG'NG	Db Act	FIXED	CTECH	AM			1	7	7			
12	3	584	20	40						SECURITY & SAFEGUARD ENG'NG	Db Act	FIXED	CTECH	AM			1	7	7			
13		584									Db Act	FIXED	CTECH	AM			4	4	1			
14	2	584	25							**SAFETY ASSESSMENT**												
15	3	584	25	10						SAFETY ASSESSMENT MANAGEMENT	Db Sm						1	14	10			
16	3	584	25	30						SA - SITING	Db Act	FIXED	OPG	RJH			7	8	2			
17	3	584	25	40						SA - OPERATING LICENSE	Db Act	FIXED	OPG	RJH			12	13	2			
18	3	584	25	50						SA - FACILITY OPERATIONS	Db Act	FIXED	OPG	RJH			20	285	30			
19	3	584	25	70						SA - DECOMMISSIONING (Processing Facilities)	Db Act	FIXED	OPG	RJH			290	290	1			
20		584																				
21	2	584	30							**LICENSING & APPROVALS**												
22	3	584	30	30						LIAISON WITH CNSC	Db Sm						6	9	4			
23	3	584	30	50						CNSC CONSTRUCTION LICENCE	Db Act	FIXED	CTECH	RJH			9	11	3			
24	3	584	30	60						OTHER GOVN'MT APPROVALS	Db Act	FIXED	CTECH	RJH								
25	4	584	30	60	10					APPROVAL REQUIREMENTS	Db Sm			RJH			6	9	4			
26	4	584	30	60	30					FEDERAL APPROVALS	Db Act	FIXED	CTECH	RJH			9	14	6			
27	4	584	30	60	40					PROVINCIAL APPROVALS	Db Act	FIXED	CTECH	RJH			9	14	6			
28	4	584	30	60	50					MUNICIPAL APPROVALS	Db Act	FIXED	CTECH	RJH			9	14	6			
29	3	584	30	65						CNSC OPERATING LICENCE (Initial Application)	Db Act	FIXED	CTECH	RJH			9	14	6			
30	3	584	30	70						CNSC OPERATING LICENCE (Maintenance & Renewal)	Db Act	FIXED	CTECH	RJH			15	294	280			
31		584																				
32	2	584	35							**PUBLIC AFFAIRS**												
33	3	584	35	45						PUBLIC AFFAIRS - PREFERRED SITE	Db Sm						8	8	1			
34	3	584	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL	Db Act	FIXED	OPG	RJH			8	11	3			
35	3	584	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION	Db Act	FIXED	OPG	RJH			12	14	3			
36	3	584	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH			1	14	10			
37	3	584	35	120						COMMUNITY OFFSETS and BENEFITS	Db Act	FIXED	OPG	RJH			12	14	3			
38		584																				
39	2	584	40							**SMV FACILITY DESIGN AND CONSTRUCTION**												
40	3	584	40	10						SITE & IMPROVEMENTS		STEP FIXED	CTECH	GA			12	12	1			
41	3	584	40	30						COMMON ANCILLARY FACILITIES												
42	4	584	40	30	10					ADMIN AND SUPPORT FACILITIES												
43	5	584	40	30	10	01				ADMIN AND VISITOR RECEPT'N BLDG		STEP FIXED	CTECH	GA			*	*	*			
44	5	584	40	30	10	02				OPS SUPPT & HEALTH PHYSICS BDLG		STEP FIXED	CTECH	GA			*	*	*			

LINE No sht	Level sp	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Respo nsible	WBS Comm ents	Ammen dment No	Start Yr	Finish Yr	DUR - Yrs	PRED	Sc he du le	Sch edul e Amn
45	5	584	40	30	10	03				EQUIP STORAGE AND MAINT'CE BLDG		STEP FIXED	CTECH	GA			*	*	*			
46	5	584	40	30	10	05				ACTIVE SOLID WASTE HDLG BLDG		STEP FIXED	CTECH	GA			286	286	1			
47	5	584	40	30	10	06				SOLID WASTE STORAGE AREA		STEP FIXED	CTECH	GA			286	286	1			
48	5	584	40	30	10	07				ACTIVE LIQ/W TRT'MT BLDG		STEP FIXED	CTECH	GA			286	286	1			
49	5	584	40	30	10	08				LOW LVL LIQ/W STRG BLDG		STEP FIXED	CTECH	GA			286	286	1			
50	5	584	40	30	10	09				WAREHOUSE BLDG		STEP FIXED	CTECH	GA			*	*	*			
51	5	584	40	30	10	10				GUARDHOUSE AND SECURITY FENCE		STEP FIXED	CTECH	GA			*	*	*			
52	5	584	40	30	10	11				TRUCK INSP'N / WASH STATION		STEP FIXED	CTECH	GA			Not required for RES					
53	5	584	40	30	10	12				UTILITY BLDG		STEP FIXED	CTECH	GA			*	*	*			
54	5	584	40	30	10	13				TEST FACILITY		STEP FIXED	CTECH	GA			46	47	2			
55	4	584	40	30	20					OTHER SITE SYSTEMS												
56	5	584	40	30	20	01				FIRE PROTECTION SYSTEMS		STEP FIXED	CTECH	GA			*	*	*			
57	5	584	40	30	20	02				SECURITY AND COMUNICATION SYSTEM		STEP FIXED	CTECH	GA			*	*	*			
58	5	584	40	30	20	03				ELECTRICAL AND EMERGENCY POWER		STEP FIXED	CTECH	GA			*	*	*			
59	5	584	40	30	20	04				SANITARY SEWER SYSTEM		STEP FIXED	CTECH	GA			*	*	*			
60	5	584	40	30	20	05				POTABLE WATER SYSTEM		STEP FIXED	CTECH	GA			*	*	*			
61	5	584	40	30	20	06				RETENTION/SEDIMENTATION POND		STEP FIXED	CTECH	GA			*	*	*			
62	5	584	40	30	20	07				STORM WATER DETENTION POND		STEP FIXED	CTECH	GA			*	*	*			
63	5	584	40	30	20	08				CONST'N MAT'L STOCKPILE AREA		STEP FIXED	CTECH	GA			*	*	*			
64	5	584	40	30	20	09				SITE MATERIALS STORAGE AREA		STEP FIXED	CTECH	GA			*	*	*			
65	5	584	40	30	20	10				ACCESS ROADS AND VEHICLE COMPOUNDS		STEP FIXED	CTECH	GA			*	*	*			
66	4	584	40	30	30					CONST'N INDIRECTS ANCILLARY FACILITIES		STEP FIXED	CTECH	GA			46	47	2			
67	3	584	40	40						STORAGE CONSTRUCTION (STAGE 1)												
68	5	584	40	40	10	05				CONSTRUCTION FACILITIES		STEP FIXED	ALSTEC	CC			13	14	2			
69	5	584	40	40	10	10				STORES ENGINEERING		STEP FIXED	ALSTEC	CC			13	14	2			
70	4	584	40	40	10	20				STORES EQUIP. DESIGN, SUPPLY & INSTALL		STEP FIXED	ALSTEC	CC			13	14	2			
71	4	584	40	40	10	30				SURFACE MODULAR VAULT DESIGN AND CONST'N		STEP FIXED	ALSTEC	CC			13	14	2			
72	4	584	40	40	10	40				COMMISSIONING		STEP FIXED	ALSTEC	CC			14	14	1			
73	4	584	40	40	10	50				CONST'N INDIRECTS		STEP FIXED	ALSTEC	CC			13	14	2			
74	3	584	40	500						COMMISSIONING MANAGEMENT		STEP FIXED	CTECH	AM			14	14	1			
75	3	584	40	600						EQUIPMENT, SPARES AND CONSUMABLES		STEP FIXED	CTECH	AM			14	14	1			
76	3	584	40	650						ENERGY CONSUMPTION		STEP FIXED	CTECH	AM			14	14	1			
77		584								*** Existing buildings and services adopted by RES facility.**													
78	2	584	45							**FACILITY OPERATION**												
79	3	584	45	10						OPERATIONS INITIAL FUEL RECEIPT												
80	4	584	45	10	05					PROGRAM MANAGEMENT		STEP FIXED	CTECH	AM			15	26	12			
81	4	584	45	10	10					BASKET PROCESSING OPERATIONS		STEP FIXED	CTECH	AM			15	26	12			
82	4	584	45	10	20					COMMON ANCILLARY FACILITIES OPERATIONS (INITIAL FUEL RECEIPTS)		STEP FIXED	CTECH	GA			15	26	12			
83	4	584	45	10	25					MONITORING AND SURVEILLANCE (INITIAL FUEL RECEIPTS)		STEP FIXED	CTECH	AM			15	26	12			
84	4	584	45	10	30					OPERATION INDIRECTS (INITIAL FUEL RECEIPTS)		STEP FIXED	CTECH	AM			15	26	12			
85	4	584	45	10	40					STORAGE OPERATIONS		STEP FIXED	CTECH	AM			15	26	12			
86	4	584	45	10	50					ADDITIONAL STORAGE CONSTRUCTION												
87	5	584	45	10	50	10				STORAGE CONSTRUCTION (STAGE 2)		STEP FIXED	CTECH	AM			17	18	2			
88	5	584	45	10	50	20				STORAGE CONSTRUCTION (STAGE 3)		STEP FIXED	CTECH	AM			19	20	2			
89	5	584	45	10	50	30				STORAGE CONSTRUCTION (STAGE 4)		STEP FIXED	CTECH	AM			21	22	2			
90	3	584	45	20						OPERATIONS - EXTENDED MONITORING												

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Respo nsible	WBS Comm ents	Ammen dment No	Start Yr	Finish Yr	DUR - Yrs	PRED	Sc he du le	Sch edul e Amn
91	4	584	45	20	05					PROGRAM MANAGEMENT		STEP FIXED	CTECH	AM			27	294	268			
92	4	584	45	20	40					MONITORING AND SURVEILLANCE (EXTENDED)		STEP FIXED	CTECH	AM			27	294	268			
93	4	584	45	20	50					OPERATION INDIRECTS (MONITORING)		STEP FIXED	CTECH	AM			27	294	268			
94	4	584	45	20	60					COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)		STEP FIXED	CTECH	GA			27	294	268			
95	4	584	45	20	70					FUEL INTEGRITY MONITORING (25 YEARLY)		STEP FIXED	CTECH	AM			27	294	268			
96	3	584	45	30						OPERATIONS - FACILITY REPEATS												
97	4	584	45	30	20					VAULT 100 YEAR REPLACEMENT		STEP FIXED	ALSTEC	CC			113	121	9			
98	4	584	45	30	30					VAULT 200 YEAR REPLACEMENT		STEP FIXED	ALSTEC	CC			213	221	9			
99	4	584	45	30	40					VAULT 300 YEAR REPLACEMENT		STEP FIXED	ALSTEC	CC			287	294	8			
100	3	584	45	40						OPERATIONS - REPACKAGING												
101	4	584	45	40	05					PROGRAM MANAGEMENT FACILITY REPEATS & REPACKAGING		STEP FIXED	CTECH	AM			113	294	30			
102	4	584	45	40	10					BASKET TO BASKET (B to B) 300 YEAR REPACKAGING												
103	5	584	45	40	10	20				CONSTRUCTION FACILITIES - REPACK'NG PLANT B TO B		STEP FIXED	CTECH	AM			288	289	2			
104	5	584	45	40	10	30				REPACKAGING BUILDING - REPACK'NG PLANT B to B												
105	6	584	45	40	10	30	20			RB, B-B EQUIP. DESIGN, SUPPLY & INSTALL												
106	7	584	45	40	10	30	20	10		RECEIPT & TRANSFER (EQUIP)		STEP FIXED	CTECH	AM			289	289	1			
107	7	584	45	40	10	30	20	20		BASKET TO BASKET FUEL TRANSFER (EQUIP)		STEP FIXED	CTECH	AM			289	289	1			
108	7	584	45	40	10	30	20	30		BASKET DECONTAMINATION (EQUIP)		STEP FIXED	CTECH	AM			289	289	1			
109	6	584	45	40	10	30	30			RB, BB BUILDING DESIGN & CONST'N		STEP FIXED	CTECH	AM			288	289	2			
110	6	584	45	40	10	30	60			BUILDING SERVICES (RP BB)		STEP FIXED	CTECH	AM			288	289	2			
111	6	584	45	40	10	30	70			COMMISSIONING (RP BB)		STEP FIXED	CTECH	AM			289	289	1			
112	6	584	45	40	10	30	80			CONST'N INDIRECTS (RP BB)		STEP FIXED	CTECH	AM			288	289	2			
113	5	584	45	40	10	40				COMMON ANCILLARY FACILITIES (REPLACEMENT)		STEP FIXED	CTECH	GA			288	289	2			
114	5	584	45	40	10	500				COMMISSIONING MANAGEMENT (RP BB)		STEP FIXED	CTECH	AM			289	289	1			
115	5	584	45	40	10	600				REPACKAGING OPERATIONS (RP BB)		STEP FIXED	CTECH	AM			290	294	5			
116	6	584	45	40	10	600	30			ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)		STEP FIXED	CTECH	GA			290	294	5			
117	5	584	45	40	10	700				OPERATION INDIRECTS (RB, B-B)		STEP FIXED	CTECH	AM			290	294	5			
118	5	584	45	40	10	800				STORAGE OPERATIONS (RB, B-B)		STEP FIXED	CTECH	AM			290	294	5			
119		584																				
120	2	584	55							**ENVIRONMENTAL MANAGEMENT SYSTEM**												
121	3	584	55	10						EA & MONITORING PROGRAM MANAGEMENT		FIXED	OPG	RJH			8	294	287			
122	3	584	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL		FIXED	OPG	RJH			8	11	4			
123	3	584	55	40						GROUNDWATER MONITORING		FIXED	OPG	RJH			15	294	280			
124	3	584	55	50						RADIOLOGICAL BIOSPHERE MONITORING		FIXED	OPG	RJH			15	294	280			
125	3	584	55	60						NON-RAD BIOSPHERE MONITORING		FIXED	OPG	RJH			15	294	280			
126	3	584	55	80						HUMAN HEALTH MONITORING		FIXED	OPG	RJH			15	294	280			
127		584																				
128	2	584	90							**PROGRAM MANAGEMENT (YEARS 1 TO 14)**		STEP FIXED	CTECH	AM			1	14	14			

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	WBS Comments	Ammendment No	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt
1	1	585								**VAULTS IN SHALLOW TRENCHES (VST) - HQ GENTILLY**												
2	2	585	15							**SITING**	Db Sm											
3	3	585	15	10						TECHNICAL SITING MANAGEMENT	Db Act	FIXED	OPG	RJH			1	11	7			
4	3	585	15	20						PREFERRED SITE	Db Sm											
5	4	585	15	20	10					PREFERRED SITE - SUPPORT AND REPORTING	Db Act	FIXED	OPG	RJH			8	8	1			
6	4	585	15	20	40					PREFERRED SITE - CHARACTERIZATION	Db Act	FIXED	OPG	RJH			8	8	1			
7																						
8	2	585	20							**SYSTEM DEVELOPMENT**	Db Sm											
9	3	585	20	02						SYSTEM DEVELOPMENT MANAGEMENT	Db Act	FIXED	CTECH	AM			283	289	7			
10	3	585	20	05						SYSTEM OPTIMIZATION	Db Act	FIXED	CTECH	AM			283	286	4			
11	3	585	20	20						PROCESS SYSTEM ENG'NG (PACK'G, REPACK'G & DEC'NT'M)	Db Act	FIXED	CTECH	AM			283	289	7			
12	3	585	20	30						STORAGE SYSTEM ENG'NG	Db Act	FIXED	CTECH	AM			283	289	7			
13	3	585	20	40						SECURITY & SAFEGUARD ENG'NG	Db Act	FIXED	CTECH	AM			286	286	1			
14																						
15	2	585	25							**SAFETY ASSESSMENT**	Db Sm											
16	3	585	25	10						SAFETY ASSESSMENT MANAGEMENT	Db Act	FIXED	OPG	RJH			1	14	10			
17	3	585	25	30						SA - SITING	Db Act	FIXED	OPG	RJH			7	8	2			
18	3	585	25	40						SA - OPERATING LICENSE	Db Act	FIXED	OPG	RJH			12	13	2			
19	3	585	25	50						SA - FACILITY OPERATIONS	Db Act	FIXED	OPG	RJH			20	294	30			
20	3	585	25	70						SA - DECOMMISSIONING (Processing Facilities)	Db Act	FIXED	OPG	RJH			285	286	2			
21																						
22	2	585	30							**LICENSING & APPROVALS**	Db Sm											
23	3	585	30	30						LIAISON WITH CNSC	Db Act	FIXED	CTECH	MG			6	9	4			
24	3	585	30	50						CNSC CONSTRUCTION LICENCE	Db Act	FIXED	CTECH	MG			9	11	3			
25	3	585	30	60						OTHER GOVN'MT APPROVALS	Db Act	FIXED	CTECH	MG								
26	4	585	30	60	10					APPROVAL REQUIREMENTS	Db Act	FIXED	CTECH	MG			6	9	4			
27	4	585	30	60	30					FEDERAL APPROVALS	Db Act	FIXED	CTECH	MG			9	14	6			
28	4	585	30	60	40					PROVINCIAL APPROVALS	Db Act	FIXED	CTECH	MG			9	14	6			
29	4	585	30	60	50					MUNICIPAL APPROVALS	Db Act	FIXED	CTECH	MG			9	14	6			
30	3	585	30	65						CNSC OPERATING LICENCE (Initial Application)	Db Act	FIXED	CTECH	MG			13	14	2			
31	3	585	30	70						CNSC OPERATING LICENCE (Maintenance and Renewal)	Db Act	FIXED	CTECH	MG			15	294	280			
32																						
33	2	585	35							**PUBLIC AFFAIRS**	Db Sm											
34	3	585	35	45						PUBLIC AFFAIRS - PREFERRED SITE	Db Act	FIXED	OPG	RJH			8	8	1			
35	3	585	35	50						PUBLIC AFFAIRS - PUBLIC REVIEW & EA APPROVAL	Db Act	FIXED	OPG	RJH			9	11	3			
36	3	585	35	70						PUBLIC AFFAIRS - DESIGN & CONSTRUCTION	Db Act	FIXED	OPG	RJH			12	14	3			
37	3	585	35	110						PUBLIC AFFAIRS - PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH			1	14	10			
38	3	585	35	120						COMMUNITY OFFSETS AND BENEFITS	Db Act	FIXED	OPG	RJH			12	14	3			
39																						
40	2	585	40							**FACILITY DESIGN AND CONSTRUCTION**	Db Sm											
41	3	585	40	10						SITE & IMPROVEMENTS	Db Act	STEP FIXED	CTECH	GA			12	12	1			
42	3	585	40	30						COMMON ANCILLARY FACILITIES	Db Sm											
43	4	585	40	30	10					ADMIN AND SUPPORT FACILITIES	Db Sm											
44	5	585	40	30	10	01				ADMIN AND VISITOR RECEPT'N BLDG	Db Act	STEP FIXED	CTECH	GA			*	*	*			
45	5	585	40	30	10	02				OPS SUPPT & HEALTH PHYSICS BLDG	Db Act	STEP FIXED	CTECH	GA			*	*	*			
46	5	585	40	30	10	03				EQUIP STORAGE AND MAINT'CE BLDG	Db Act	STEP FIXED	CTECH	GA			*	*	*			
47	5	585	40	30	10	05				ACTIVE SOLID WASTE HDLG BLDG (build at RPBB event)	Db Act	STEP FIXED	CTECH	GA			288	289	2			

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	WBS Comments	Ammendment No	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt
48	5	585	40	30	10	06				SOLID WASTE STORAGE AREA (build at RPBB event)	Db Act	STEP FIXED	CTECH	GA			288	289	2			
49	5	585	40	30	10	07				ACTIVE LIQ/W TRT'MT BLDG (build at RPBB event)	Db Act	STEP FIXED	CTECH	GA			288	289	2			
50	5	585	40	30	10	08				LOW LVL LIQ/W STRG BLDG (build at RPBB event)	Db Act	STEP FIXED	CTECH	GA			288	289	2			
51	5	585	40	30	10	09				WAREHOUSE BLDG	Db Act	STEP FIXED	CTECH	GA			*	*	*			
52	5	585	40	30	10	10				GUARDHOUSE AND SECURITY FENCE	Db Act	STEP FIXED	CTECH	GA			*	*	*			
53	5	585	40	30	10	11				TRUCK INSP'N / WASH STATION (build at RPBB event)	Db Act	STEP FIXED	CTECH	GA			Not required for RES					
54	5	585	40	30	10	12				UTILITY BLDG	Db Act	STEP FIXED	CTECH	GA			*	*	*			
55	5	585	40	30	10	13				TEST FACILITY CONSTRUCTION	Db Act	STEP FIXED	CTECH	GA			46	47	2			
56	4	585	40	30	20					OTHER SITE SYSTEMS	Db Sm											
57	5	585	40	30	20	01				FIRE PROTECTION SYSTEMS	Db Act	STEP FIXED	CTECH	GA			*	*	*			
58	5	585	40	30	20	02				SECURITY AND COMMUNICATION SYSTEM	Db Act	STEP FIXED	CTECH	GA			*	*	*			
59	5	585	40	30	20	03				ELECTRICAL AND EMERGENCY POWER	Db Act	STEP FIXED	CTECH	GA			*	*	*			
60	5	585	40	30	20	04				SANITARY SEWER SYSTEM	Db Act	STEP FIXED	CTECH	GA			*	*	*			
61	5	585	40	30	20	05				POTABLE WATER SYSTEM	Db Act	STEP FIXED	CTECH	GA			*	*	*			
62	5	585	40	30	20	06				RETENTION/SEDIMENTATION POND	Db Act	STEP FIXED	CTECH	GA			*	*	*			
63	5	585	40	30	20	07				STORM WATER DETENTION POND	Db Act	STEP FIXED	CTECH	GA			*	*	*			
64	5	585	40	30	20	08				CONST'N MAT'L STOCKPILE AREA	Db Act	STEP FIXED	CTECH	GA			*	*	*			
65	5	585	40	30	20	09				SITE MATERIALS STORAGE AREA	Db Act	STEP FIXED	CTECH	GA			*	*	*			
66	5	585	40	30	20	10				ACCESS ROADS AND VEHICLE COMPOUNDS	Db Act	STEP FIXED	CTECH	GA			*	*	*			
67	4	585	40	30	30					CONST'N INDIRECTS ANCILLARY FACILITIES	Db Act	STEP FIXED	CTECH	GA			46	47	2			
68	3	585	40	40						STORAGE DESIGN & CONSTRUCTION STAGE 1 (STORAGE CHAMBERS)	Db Act	STEP FIXED	CTECH	GA			13	14	2			
69	3	585	40	50						STORAGE DESIGN & CONSTRUCTION STAGE 1 (STORAGE VAULTS)	Db Act	STEP FIXED	CTECH	GA			13	14	2			
70	3	585	40	650						ENERGY CONSUMPTION	Db Act	STEP FIXED	CTECH	AM			14	14	1			
71										*** Existing buildings and services adopted by RES facility.**													
72	2	585	45							**FACILITY OPERATION**	Db Sm											
73	3	585	45	10						OPERATIONS INITIAL FUEL TRANSFER	Db Sm											
74	4	585	45	10	05					PROGRAM MANAGEMENT	Db Act	STEP FIXED	CTECH	AM			15	26	12			
75	4	585	45	10	25					MONITORING AND SURVEILLANCE (INITIAL FUEL TRANSFER)	Db Act	STEP FIXED	CTECH	AM			15	26	12			
76	4	585	45	10	30					OPERATION INDIRECTS (INITIAL FUEL TRANSFER)	Db Act	STEP FIXED	CTECH	AM			15	26	12			
77	4	585	45	10	40					STORAGE OPERATIONS (INITIAL FUEL TRANSFER)	Db Act	STEP FIXED	CTECH	AM			15	26	12			
78	4	585	45	10	50					ADDITIONAL STORAGE CONSTRUCTION	Db Sm											
79	5	585	45	10	50	10				STORAGE DESIGN & CONSTRUCTION STAGE 2 (VAULTS)	Db Act	STEP FIXED	CTECH	GA			18	18	1			
80	5	585	45	10	50	20				STORAGE DESIGN & CONSTRUCTION STAGE 3 (VAULTS)	Db Act	STEP FIXED	CTECH	GA			20	20	1			
81	5	585	45	10	50	30				STORAGE DESIGN & CONSTRUCTION STAGE 4 (VAULTS)	Db Act	STEP FIXED	CTECH	GA			22	22	1			
82	3	585	45	20						OPERATIONS - EXTENDED MONITORING	Db Sm											
83	4	585	45	20	05					PROGRAM MANAGEMENT	Db Act	STEP FIXED	CTECH	AM			27	294	268			
84	4	585	45	20	40					MONITORING AND SURVEILLANCE	Db Act	STEP FIXED	CTECH	AM			27	294	268			
85	4	585	45	20	50					OPERATION INDIRECTS (MONITORING)	Db Act	STEP FIXED	CTECH	AM			27	294	268			
86	4	585	45	20	60					COMMON ANCILLARY FACILITIES OPERATIONS (EXTENDED MONITORING)	Db Act	STEP FIXED	CTECH	GA			27	294	268			

	LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	WBS Comments	Ammendment No	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt
	87	4	585	45	20	70					FUEL INTEGRITY MONITORING (25 YEARLY)	Db Act	STEP FIXED	CTECH	AM			27	294	268			
	88	3	585	45	30						OPERATIONS - FACILITY REPEATS	Db Sm											
	89	4	585	45	30	20					BASKET VAULTS 100 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	GA			113	121	9			
	90	4	585	45	30	30					BASKET VAULTS 200 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	GA			213	221	9			
	91	4	585	45	30	40					BASKET VAULTS 300 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	GA			287	294	8			
	92	4	585	45	30	50					STORAGE CHAMBER 200 YEAR REPLACEMENT	Db Act	STEP FIXED	CTECH	GA			213	215	3			
	93	3	585	45	40						OPERATIONS - REPACKAGING	Db Sm											
	94	4	585	45	40	05					PROGRAM MANAGEMENT (FACILITY REPEATS & REPACKAGING)	Db Act	STEP FIXED	CTECH	AM			87	294	30			
	95	5	585	45	40	10	40				COMMON ANCILLARY FACILITIES REPLACEMENT	Db Act	STEP FIXED	CTECH	AM			145	294	9			
	96	6	585	45	40	10	600	30			ANCILLARY FACILITIES OPERATIONS (FACILITY REPEATS AND REPACKAGING)	Db Act	STEP FIXED	CTECH	GA			90	294	24			
	97	4	585	45	40	40					BASKET TO BASKET 300 YEAR REPACKAGING	Db Sm											
	98	5	585	45	40	40	05				CONSTRUCTION FACILITIES - REPACK'NG PLANT Basket (RPB)	Db Act	STEP FIXED	CTECH	AM			288	289	2			
	99	5	585	45	40	40	10				PROCESSING BUILDING - REPACK'NG PLANT Basket (RPB)	Db Sm											
	100	6	585	45	40	40	10	20			RPBB EQUIP. DESIGN, SUPPLY & INSTALL	Db Sm											
	101	7	585	45	40	40	10	20	10		RECEIPT & TRANSFER (EQUIP)	Db Act	STEP FIXED	CTECH	AM			288	289	2			
	102	7	585	45	40	40	10	20	20		BASKET TO BASKET FUEL TRANSFER	Db Act	STEP FIXED	CTECH	AM			288	289	2			
	103	7	585	45	40	40	10	20	30		BASKET DECONTAMINATION	Db Act	STEP FIXED	CTECH	AM			288	289	2			
	104	6	585	45	40	40	10	30			RPBB BUILDING DESIGN AND CONSTRUCTION	Db Act	STEP FIXED	CTECH	AM			288	289	2			
	105	6	585	45	40	40	10	60			BUILDING SERVICES (RPB)	Db Act	STEP FIXED	CTECH	AM			289	289	1			
	106	6	585	45	40	40	10	70			COMMISSIONING (RPB)	Db Act	STEP FIXED	CTECH	AM			289	289	1			
	107	6	585	45	40	40	10	80			CONST'N INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM			288	289	2			
	108	5	585	45	40	40	400				CONSTRUCTION MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM			288	289	2			
	109	5	585	45	40	40	500				COMMISSIONING MANAGEMENT (RPB)	Db Act	STEP FIXED	CTECH	AM			289	289	1			
	110	5	585	45	40	40	600				REPACKAGING OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM			290	294	5			
	111	5	585	45	40	40	700				OPERATION INDIRECTS (RPB)	Db Act	STEP FIXED	CTECH	AM			290	294	5			
	112	5	585	45	40	40	800				STORAGE OPERATIONS (RPB)	Db Act	STEP FIXED	CTECH	AM			290	294	5			
	113																						
	114	2	585	55							**ENVIRONMENTAL MANAGEMENT SYSTEM**	Db Sm											
	115	3	585	55	10						EA & MONITORING PROGRAM MANAGEMENT	Db Act	FIXED	OPG	RJH			8	294	287			
	116	3	585	55	20						CNSC CONSTRUCTION LICENCE - ENVIRONMENTAL ASSESSMENT	Db Act	FIXED	OPG	RJH			8	11	4			
	117	3	585	55	40						GROUNDWATER MONITORING	Db Act	FIXED	OPG	RJH			15	294	280			
	118	3	585	55	50						RADIOLOGICAL BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH			15	294	280			
	119	3	585	55	60						NON-RAD BIOSPHERE MONITORING	Db Act	FIXED	OPG	RJH			15	294	280			
	120	3	585	55	80						HUMAN HEALTH MONITORING	Db Act	FIXED	OPG	RJH			15	294	280			

LINE No sp sht	Level	01	02	03	04	05	06	07	08	WBS Desc	Output	Type	Owner	Responsible	WBS Comments	Ammendment No	Start Yr	Finish Yr	DUR - Yrs	PRED	Schedule Co	Schedule Amndmnt
121																						
122	2	585	90							**PROGRAM MANAGEMENT (YEARS 1 TO 14)**	Db Act	STEP FIXED	CTECH	AM			1	14	14			

APPENDIX C

C1 COST ESTIMATE DATABASE CD

The contents of the attached CD comprise three 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
583	Vaults	Gentilly
584	SMV	Gentilly
585	VST	Gentilly