LARGE COMPONENT DISPOSITION
DO IT NOW OR DO IT LATER?

P. J. Larsen
Envirocare of Utah

INTRODUCTION

As operational nuclear plants age, equipment and components need to be replaced. Some components are replaced to provide increased operational capacity and other components are replaced due to normal or abnormal wear. Many of these radioactive components are quite large in volume and weight, which presents a unique waste disposal problem.

There are limited alternatives for the management of large components. As these components are generated, utilities evaluate management options and economic impact of disposition, decontamination, and onsite storage. Utilities are faced with the decision to Do it now or Do it later? Later typically means to wait until the plant's decommissioning plan is executed after the operating license has expired.

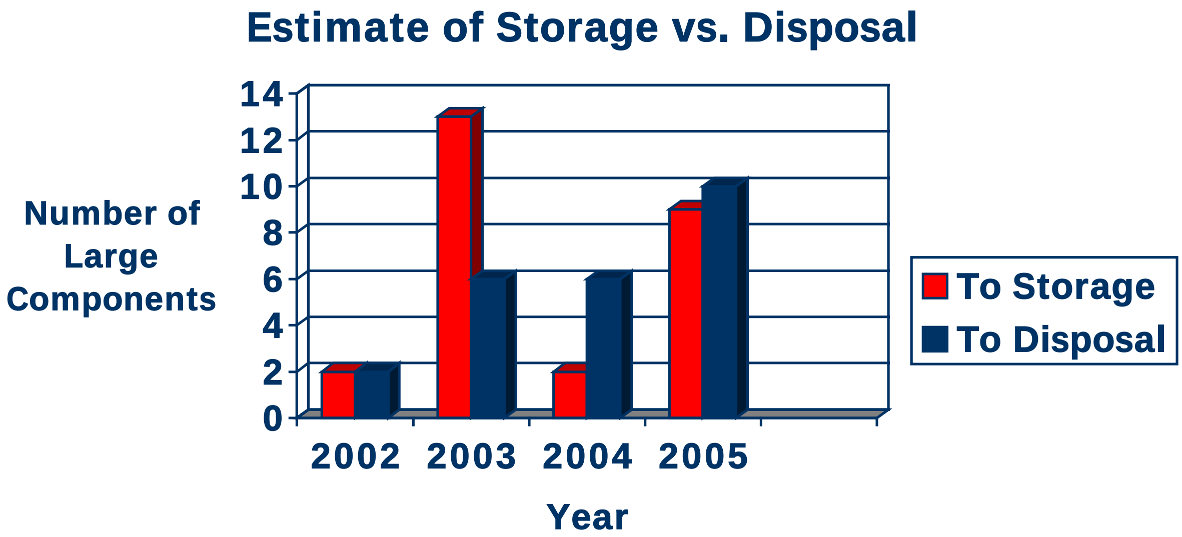
The decision to store components onsite is not a trivial one, in that it involves the construction of new facilities as well as significant financial considerations.

Although both boiling water reactors (BWR) and pressurized water reactors (PWR) generate large components, the PWRs generate a significantly greater number and volume of large components during continued operation of the plants. For example, over fifty steam generators are currently held in inventory at PWR sites and at least thirty more are projected to be generated over the next five years.

The currently stored inventory represents a deferred disposal liability of over $200 million. The potential future liability after just twenty years is over $8 billion for just the items currently in storage.

All utilities continue to attempt to reduce their current operating costs. The financial pressures of deregulation have forced companies to reduce overhead by shortening outages, cutting back on operational and capital budgets, and downsizing the work force. Regulated companies face similar pressures from the State Public Service Commissions.

The chart below summarizes the reported disposition of large components from U.S. nuclear plants for the period of 2002 to 2005(estimated). The comparison shows that over this four year period 26 components were stored and 24 were or will be disposed. Clearly a near even split is indicated between those choosing to store and those choosing to dispose now.



Why Store?

The significant onsite inventories of large components are consistent with many companies' current philosophy to minimize operational cost by deferring "unnecessary" expenditures. The cost per kilowatt hour produced is a major determinant of the financial health and viability of the utility. Managers are forced to look for anyway to reduce their current operating costs.

When components are replaced, the cost of disposal is not always included in the capital project. Inclusion would further increase the overall cost of the capital project making it even more difficult to have approved by Board of Directors and those affected by the utilities financial planning and decisions. Thus, disposition of large components is often deferred until plant decommissioning. Covering disposal of large components with operating funds has a impact on current cost per kilowatt hour produced.

Although storage requires construction of new storage facilities, much of the associated costs can be accounted as part of a capital expenditure. Accounting for these costs this way generally has a positive impact to current financial statements.

Deferring disposal also defers the cost of transporting large components. The current cost of transport is almost always greater than the cost of disposal for the component.

There is one potential technical advantage of storing components onsite for a period prior to disposal. Allowing decay time reduces the dose from the component. Typically the predominant radionuclide contributing to the external dose of the object is Co60 with a half-life of 5.6 years. Waiting for twenty years for disposal allows nearly four half lives of decay time reducing the Co60 activity by roughly 90%.

Finally, the overall scope of a component replacement project is potentially reduced by not including permanent disposal as part of the replacement. Reducing the scope of the replacement project helps to streamline and potentially reduce outage times.

Why Dispose Now?

Disposing of large components now, as they are removed, reduces the uncertainty of disposal in the future and allows completion in today's known and quantifiable financial and regulatory terms. The same can be said for decisions to remove components from storage to dispose now.

Onsite storage and deferral of disposal of large components normally results in increased costs over the long term. Current disposal costs are known, while future disposal costs remain uncertain.

The future availability of disposal cell space is also an uncertainty. Although the disposal facility in Barnwell, South Carolina, currently accepts radioactive wastes form all U.S. generators except those in the Rocky Mountain and Northwest compacts, beginning in 2008 Barnwell reportedly will only accept waste from the Atlantic compact states. This fact creates uncertainty and risk for nearly all of the U.S. nuclear plants.

The cost of complying with future transportation and disposal regulations is uncertain. New DOT requirements for packaging of radioactive material for transport took effect October 2004. Also, new Transportation Security Plan Requirements have been implemented (49CFR172.800). Historically these sort of regulatory changes have continued to increase overall project costs.

With security in mind, storage of components onsite is just another item that must be addressed in site security plans. Storage thus adds to the perceived and real liability at the plant site. In general, onsite storage also results in a negative public perception.

Storage of components results in double handling of items in that they require substantial rigging and handling to be moved into storage mausoleums as well as the same sort of requirements to be removed and loaded at the time of final disposition. Storage also can result in an increased volume of waste for disposal at eventual disposition when accounting for demolition of mausoleums and incidental waste generated during storage.

Overall the lifecycle cost of storage with disposition at a later time exceeds the cost of real time disposition. A further case study of the cost for disposal of a typical large component (Steam Generator) is presented below.

In the case study, the first scenario considered is the storage of a steam generator. This scenario assumes that it costs $1 million to construct the mausoleum. The annual cost of storage is assumed to be $20,000 to cover utilities and required inspection costs etc. The cost to place the large component into storage was assumed to be the same as to prepare the component for transportation. This cost is identified as the cost to mobilize and place the component into storage and is estimated to be $100,000. At the end of twenty years of storage, it is assumed that the large component is then disposed. Very conservative assumptions for increase in storage costs were used (6%). Other costs were assumed to inflate at the average inflate rate of 3%.

The second scenario simply assumes that resources are mobilized to transport and dispose of the component now. The estimated transportation cost of $2 million is based on an east coast location with a combination of barge, truck, and/or rail used to transport the component for disposal in the West. The $1.5 million estimate for disposal is consistent with current utility costs.

The Net Present Value (NPV) for each scenario is compared using a risk free interest rate of 4.74%. The resulting comparison of the total cost for each scenario in today's dollars shows that current disposal has a NPV of potential savings of over $1 million.

Case Study for Typical Large Component

	Timing of Cost	In Today's Dollars	Inflated Cost	NPV
Option 1: Onsite Storage				
Cost of Mausoleum	Current	$ 1,000,000	$ 1,000,000	$ 1,000,000
Cost to Store ($20k per year)	Annual - 20 years	$ 400,000	$ 538,228	$ 327,659
Cost to Decommission Storage	21st Year	$ 50,000	$ 90,569	$ 35,870
Cost to Mobilize (to Mausoleum)	Current	$ 100,000	$ 100,000	$ 100,000
Cost to Mobilize (to transport)	21st Year	$ 100,000	$ 181,138	$ 71,739
Cost to Transport	21st Year	$ 2,000,000	$ 3,622,758	$ 1,434,789
Cost to Dispose	21st Year	$ 1,500,000	$ 4,930,087	$ 1,952,554
Total		$ 5,150,000	$ 10,462,780	$ 4,922,611
Option 2: Current Disposal				
Cost to Mobilize (to transport)	Current	$ 100,000	$ 100,000	$ 100,000
Cost to Transport	Current	$ 2,000,000	$ 2,000,000	$ 2,000,000
Cost to Dispose	Current	$ 1,500,000	$ 1,500,000	$ 1,500,000
Total		$ 3,600,000	$ 3,600,000	$ 3,600,000
NPV of Potential Savings				$ 1,322,611

Assumptions for case study:

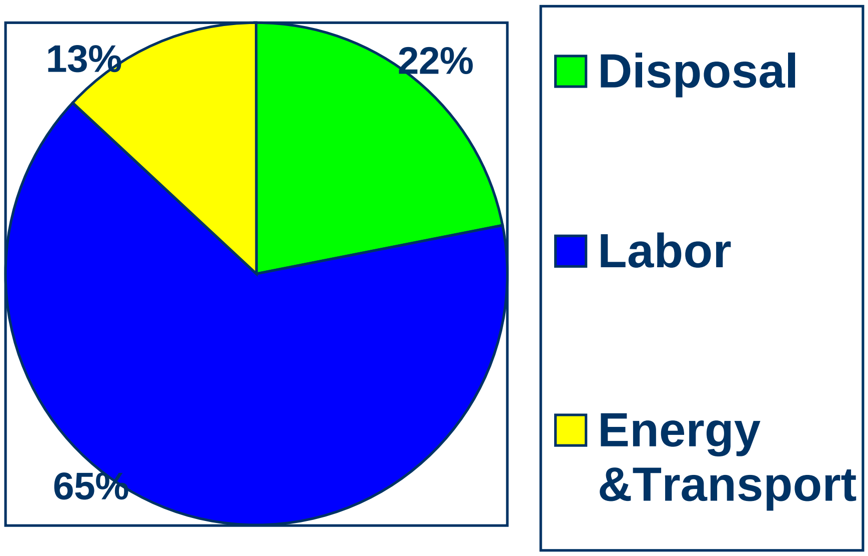
4.74%	Assumed Risk Free Interest Rate
6.13%	Very Conservative assumption of increase in disposal cost
3.02%	Average U.S. Inflation Rate - 1985 to 2004

In summary, those choosing to dispose of components now benefit from the following advantages:

- Reduced Financial liability in the long term
- Reduced onsite Health & Safety liability
- Better public perception
- Assured disposition path for disposal of large component
- Known disposal price
- Reduced regulatory uncertainty

Decommissioning Costs

As shown above, utilities are divided between the use of onsite storage and choosing to dispose of large components now. An additional consideration in selecting the disposition path for a large component is an analysis of the overall decommissioning costs. The pie chart below shows the current distribution of costs as tabulated in NUREG -1307 Revision 10.



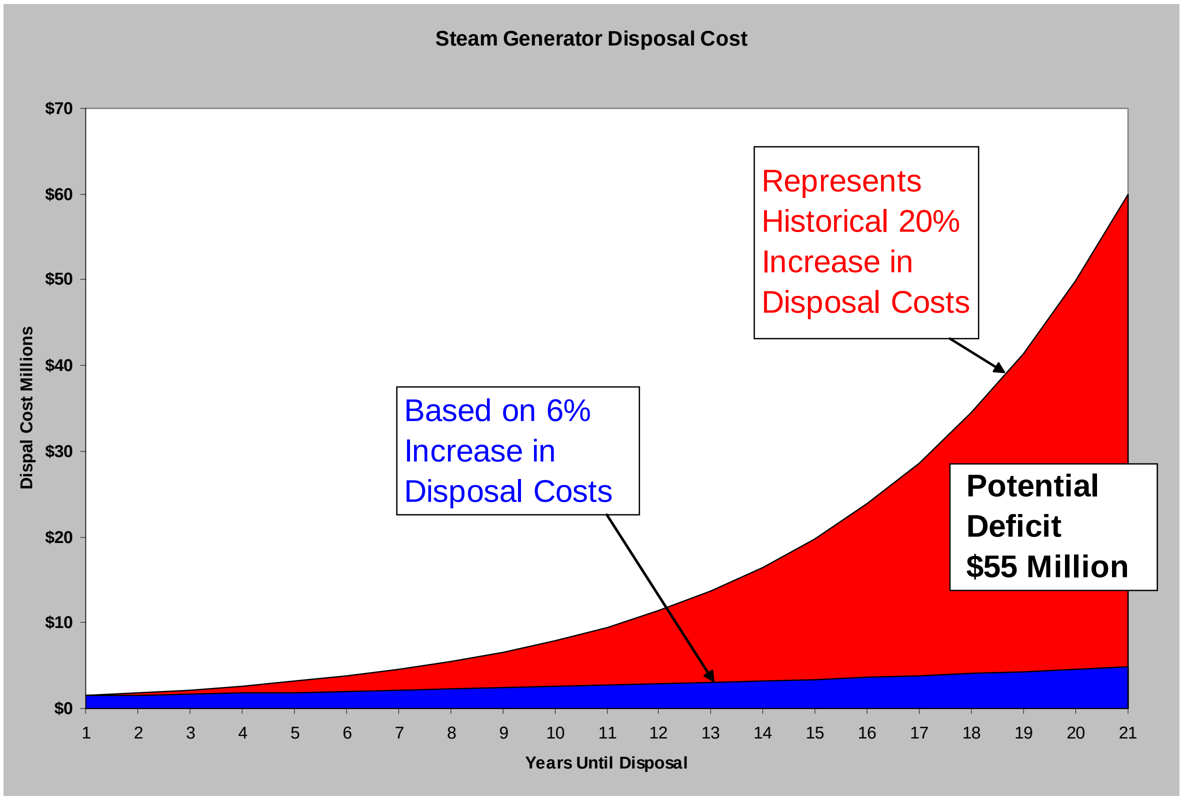
Consistent with the case study shown, the estimated cost of removal and transportation of a component is typically more than disposal.

Disposal Cost Issues

It is informative to review the historical trends associated with disposal costs specifically as they relate to decommissioning costs. Guidance in NUREG 1577 (2.c.2b) states that inflation rates for decommissioning costs should be in the 2% - 5% range; however, licensees may use higher rates for low-level disposal. The recently published GAO Report 04-32 (App I, footnote 7) documents that on average nuclear power plants have assumed decommissioning costs would increase annually at a rate of 4.6%. This appears to be in stark contrast to history. Revision 10 of NUREG 1307 shows that disposal rates have increased over 1700% since 1986, which equates to an annual rate of approximately 20%.

Disposal costs have been driven by increases in taxes and fees, increased security requirements, changes in regulation and licenses maintenance. Even if a new facility were to be sited and opened for low level waste, it seems highly unlikely that any of the current cost increase drivers would not be present.

The chart below demonstrates the significance of this analysis in that for a single component (Steam Generator) the potential funding deficit in decommissioning funds over a twenty year period would be $55 million based on the difference between an assumption of 6% and the historical rate of 20%.



CONCLUSIONS

The least cost option today may not be the best overall financial decision or represent the least amount of risk to the nuclear plant owner. Historical trends and total lifecycle costs must be considered in determining appropriate actions for large components today.

One innovative approach may be to persuade the Nuclear Regulatory Commission to allow the use of decommissioning funds now to mitigate the significant financial liabilities and negative public perception created by storage.