Waste Processing Cost Recovery at Los Alamos National Laboratory—Analysis and Recommendations - 9008

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ABSTRACT

Los Alamos National Laboratory is implementing full cost recovery for waste processing in fiscal year 2009 (FY2009), after a transition year in FY2008. Waste processing cost recovery has been implemented in various forms across the nuclear weapons complex and in corporate America. The fundamental reasoning of sending accurate price signals to waste generators is economically sound, and leads to waste minimization and reduced waste expense over time. However, Los Alamos faces significant implementation challenges because of its status as a government-owned, contractor-operated national scientific institution with a diverse suite of experimental and environmental cleanup activities, and the fact that this represents a fundamental change in how waste processing is viewed by the institution. This paper describes the issues involved during the transition to cost recovery and the ultimate selection of the business model.

Of the six alternative cost recovery models evaluated, the business model chosen to be implemented in FY2009 is Recharge Plus Generators Pay Distributed Direct. Under this model, all generators who produce waste must pay a distributed direct share associated with their specific waste type to use a waste processing capability. This cost share is calculated using the distributed direct method on the fixed cost only, i.e., the fixed cost share is based on each program's forecast proportion of the total Los Alamos volume forecast of each waste type. (Fixed activities are those required to establish the waste processing capability, i.e., to make the process ready, permitted, certified, and prepared to handle the first unit of waste. Therefore, the fixed cost ends at the point just before waste begins to be processed. The activities to actually process the waste are considered variable.) The volume of waste actually sent for processing is charged a unit cost based solely on the variable cost of disposing of that waste. The total cost recovered each year is the total distributed direct shares from generators plus the unit cost times actual volumes processed.

INTRODUCTION

Until the early 1990s, waste processing and management were considered overhead functions at Los Alamos, included as part of the general and administrative (G&A) tax. In 1991, these activities moved under the jurisdiction of Department of Energy-Environmental Management (DOE-EM), which began direct-funding both legacy (including clean-up) and newly-generated waste management. Starting in FY1999, the responsibility was divided between DOE-EM handling legacy waste and Defense Programs (DP) via the Readiness in Technical Base and Facilities (RTBF) program managing newly-generated waste and pollution prevention activities. In FY2000 Los Alamos implemented an indirect recharge on non-DP newly-generated waste so those programs would pay their fair share of the waste management expenses. The non-DP recharge system is still in use today. DOE-EM pays the cost of processing waste generated from EM-funded work such as environmental restoration and legacy waste disposition at Los Alamos; the Facilities and Infrastructure Recapitalization Project (FIRP) pays waste disposal costs associated with its activities. The overall waste management FY2008 perspective at Los Alamos is shown in Figure 1.

In January 2008, Los Alamos Principal Associate Director-Weapons Program (PADWP) management chartered a process improvement and business model (PI&BM) team to assess and recommend process improvements in cost recovery for waste processing at Los Alamos. The results of this analysis are summarized in this paper.[1]

OVERALL RECOMMENDATIONS

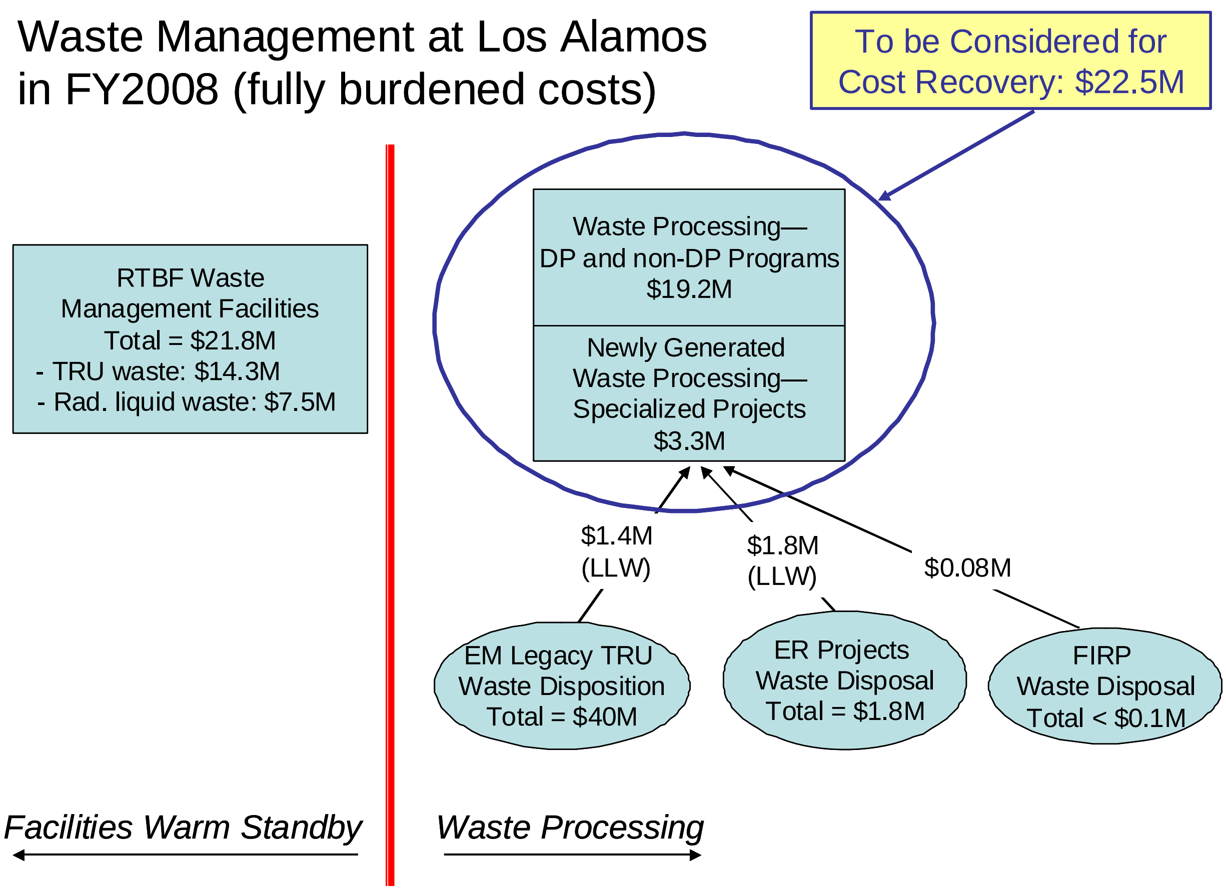

Figure 1: The focus of waste processing cost recovery is just one part of the whole waste management picture at Los Alamos. Fiscal year 2008 DP and non-DP new-generated waste processing is $19.2M, as reflected in RTBF work packages (DP) and indirect recharge budgets (non-DP). Another $3.3M of waste processing is specialized projects from environmental management (EM) legacy transuranic (TRU), environmental restoration (ER), and Facilities and Infrastructure Revitalization Project (FIRP). Funding for Pollution Prevention (P2) and Generator Set Aside Fund (GSAF) is also considered by the team.

Waste processing cost recovery has been implemented in various forms across the nuclear weapons complex and in corporate America. The fundamental reasoning of sending accurate price signals to waste generators is economically sound, and leads to waste minimization and reduced waste expense over time.

[1] For full documentation of the cost recovery team's assessment effort, see "Cost Recovery for Waste Processing at Los Alamos—Analysis and Recommendations," LA-CP-08-0404, Official Use Only, April 2008.

However, Los Alamos faces significant implementation challenges because of its status as a government-owned, contractor-operated, national scientific institution with a diverse suite of experimental and environmental cleanup activities that change over time and take place in many different facilities. In contrast, manufacturing corporations are characterized by relatively stable processes with predictable waste streams disposed of by commercial subcontractors. A waste processing cost recovery system at Los Alamos must be carefully planned and have flexibility to handle special cases that will invariably arise given our situation.

There are important lessons to be learned from cost recovery efforts at other DOE sites. First, accurate waste volume forecasting is critical to the cost recovery effort—but it is also very difficult to accomplish. The multitude of scientific and ER programs that come and go over time at Los Alamos will lead to significant variances between the predicted and actual waste generated. The good news is that over time improvements in waste tracking and forecasting will occur even under an admittedly imperfect forecasting system as generators adapt to paying for waste disposal and monitoring their processes. Second, an investment will be required to set up a modern computerized waste tracking system that tracks the quantity of waste associated with each generator throughout the disposal process. Los Alamos is somewhat behind other sites in this. Third, cost accounting accuracy will entail staff assignments to verify accurate cost code application to waste. Fourth, careful and thoughtful implementation of a cost recovery system is needed to allow generators time to adjust their budgets to the new reality.

DEFINITION OF FIXED AND VARIABLE COST

Waste processing costs within work breakdown structures can be split into two categories, fixed and variable, as follows. Fixed activities are those required to establish the waste processing capability, i.e., to make the process ready, permitted, certified, and prepared to handle the first unit of waste. Therefore, the fixed cost (FC) ends at the point just before waste begins to be processed. The activities to actually process the waste are considered variable.

Activities such as personnel management, group administration, training, certification, environmental compliance, and the information system to track waste and process performance must all be in place before any waste can be handled. We define these costs as fixed—*insensitive* to waste volume and *supporting and establishing* the processing capability.

Variable cost (VC) begins when the operating crew starts *processing* waste. This is the first step on the process map, for example when a waste pickup request is received from a low-level waste (LLW) generator or when acid transuranic (TRU) liquid waste is received from TA-55 at Room 60 of the radioactive liquid waste treatment facility (RLWTF). Although variable, these activities may still rely on "lumpy" resources that are not easily varied across a range of volume. For example a single operating crew may be able to handle from one to 1,000 drums of waste during the year. But since this crew is actually processing waste, by our definition it is considered a variable cost. Other variable inputs may be more flexible and immediately responsive to volume changes, such as offsite disposal expense that is tied to the volume actually buried.

ALTERNATIVE BUSINESS MODELS AND EVALUATION

In the Los Alamos case, the cost of waste facilities is covered by National Nuclear Security Administration (NNSA) via the RTBF warm-standby mission; the waste processing cost (both fixed and variable) will be borne by the generators under cost recovery.

In several of the business model alternatives the FC is paid by the generators. Under these alternatives, for waste processing that has a large fixed cost, generators who lower their volumes will not see an immediate and large decrease in their waste bill. However, adjustments in the fixed component of the process can be made over time to make it more optimal to the actual (lower) volume throughput, ultimately reducing the cost paid by generators.

No matter which alternative model is selected for collecting costs from generators, there are some general recommendations that were noted during interviews with subject matter experts (SMEs) at Los Alamos and other sites. First, for all alternative models, prepare waste volume forecasts, unit rates, and cost shares mid-year to allow generators to budget for waste processing expenses for the next fiscal year. Second, although the PI&BM team made a first pass on the FC/VC split for waste processing based on economic principles, more time is needed by SMEs to review this carefully to better understand how work breakdown structure (WBS) elements vary with respect to different volume levels. An accurate FC/VC split is needed for several cost recovery alternative models. Third, to avoid “gaming” of the system by generators who will have an incentive to under-predict waste volume, some method to ensure accuracy will be needed such as an independent review board or a forecast model based on actual historic data such as Sandia National Laboratories (SNL) uses. Also, a means to handle new mid-year projects is needed.

The PI&BM team evaluated six alternatives for recovering waste processing costs. Each has advantages and disadvantages that are considered below. All alternatives assume waste facility cost at Los Alamos is borne by RTBF under the warm standby mission. The team considered all waste processing activities in each WBS and identified the fixed cost activities that may be appropriate to be transferred under the RTBF umbrella. For each of the alternative models, we assume these have been removed from the waste processing costs as shown in Figure 2.

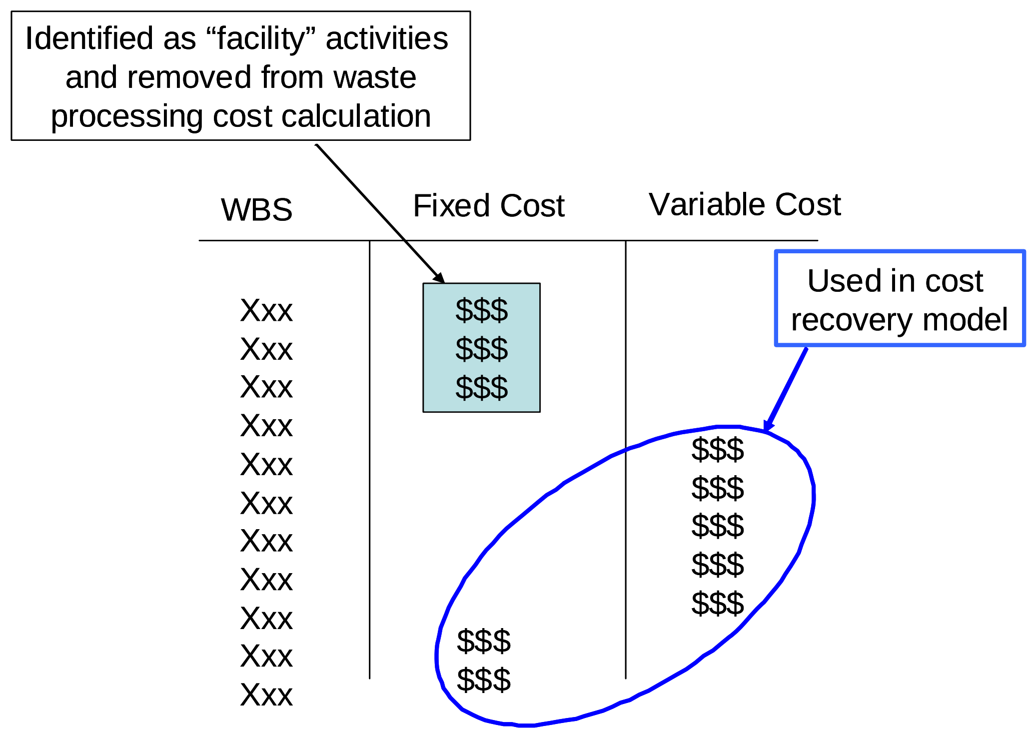

Figure 2: After defining the activities that occur in processing each waste stream, their associated costs are split into fixed and variable cost categories following economic principles as applied to the Los Alamos situation. Some fixed cost WBS elements are identified as facility activities that should be considered for funding outside of waste processing. The total of the remaining costs is what must be recovered by the cost recovery model alternatives.

The alternatives are described in order from the least accurate and easiest to implement (distributed direct) to the most accurate and difficult to implement (recharge), with hybrids in between. The first extreme is the distributed direct method, which charges programs based on *volume estimates* or historical data. The other extreme is the recharge alternative, which relies on a per unit charge applied to *actual volumes* of waste. It combines a detailed process of collecting all the correct cost codes, careful cost accounting verification, and accurate waste tracking. Although it may be more difficult than the other options, Los Alamos has experience with recharge because it is currently used for non-DP waste processing cost recovery. The graphic in Figure 3 places the alternatives in "accuracy-implementation space" to provide a quick view of their relative positions. More detailed advantages and disadvantages are highlighted below, as are mathematical formulas to precisely define the computation of each model.

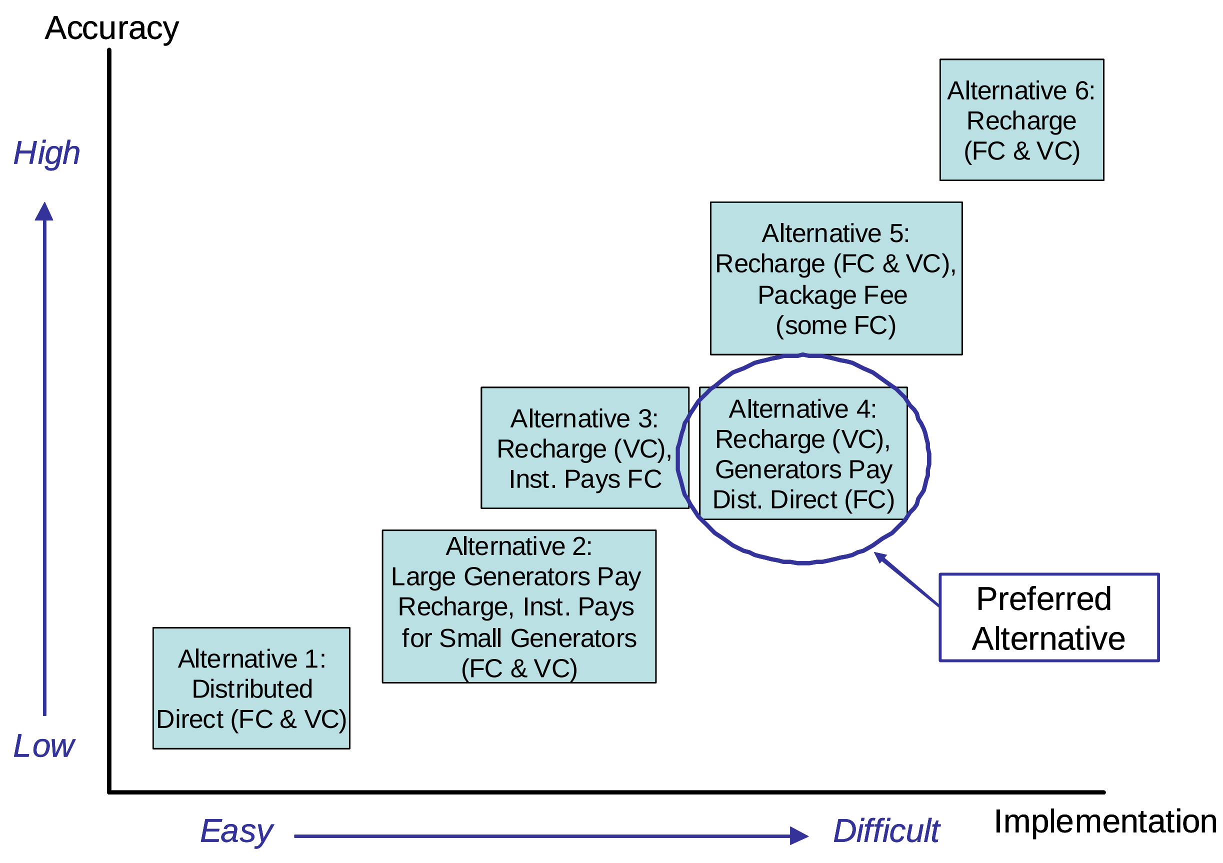

Figure 3: The continuum from low to high accuracy is combined with easy to difficult implementation to show the range of evaluated alternative cost recovery models. Each model handles fixed cost (FC) and variable cost (VC) differently. The preferred alternative is #4.

Alternative 1: Distributed Direct

The total cost for waste processing is spread proportionately between the projected users via the distributed direct model using volume forecast as the basis. Equation (1) shows how the waste processing cost shares for all programs are computed. As the predicted volume changes each year, the distribution between programs will also vary. There is no per unit cost. This model lies at the lower-left extreme of accuracy/implementation space in Figure 3, i.e., it is the easiest to implement but has the lowest accuracy. An example of this model is used to apportion warm standby facility costs at the plutonium facility (TA-55) based on the square footage occupied by each program rather than waste volume.

$$Share_{x,i} = (FC_i + VC_i) \times \frac{Vol_{x,i}^{Forecast}}{Vol_i^{Forecast}} \qquad \text{(Eq. 1)}$$

$$TotalCost_i = \sum_{x=1}^{X} Share_{x,i} \quad \text{(Eq. 2)}$$

where $Share_{x,i}$ = waste processing cost share of generator *x* for waste *i*,
FC_i = annual fixed cost for processing waste *i*,
VC_i = annual variable cost for processing waste *i*,
$Vol_{x,i}^{Forecast}$ = annual volume forecast of waste *i* for generator *x*,
$Vol_{i}^{Forecast}$ = annual volume forecast of waste *i* over all programs,
$TotalCost_i$ = annual cost to process all Los Alamos waste *i*,
i = waste type by stream (LLW, mixed low-level waste--MLLW, hazardous/chemical--haz/chem, radioactive liquid waste--RLW, TRU) and category (1 to 8 depending on waste stream),
x = waste generator, (e.g., pit manufacturing, RTBF, etc.), and
X = total number of waste generators.

Advantages of Alternative 1:

- Stable funding is provided to processing groups for ease of planning.
- If volume estimates are known with a small margin of error, this is a relatively easy and practical way to distribute costs to programs without having to track each waste unit and charge by per-unit cost.
- There is a higher level of certainty as to the total cost shared by each program for the fiscal year than under any other model.

Disadvantages of Alternative 1:

- Distributed direct method requires DOE approval which may be difficult to obtain without good confidence in the waste volume forecast method.
- Limited incentive for waste minimization because cost is not tied to volume generated.
- An improved system for volume forecasting that is agreed to by generators is needed as the basis for distributing costs.
- There is less incentive to the processing groups to become more efficient.
- Relies solely on volume forecasts; evidence from other DOE sites shows that accurately forecasting volumes is very difficult.

Alternative 2: Large Generators Pay Recharge, Institution Pays for Small Generators

This model copies the method currently implemented at Los Alamos for electricity charges. Most users and programs consume what is considered to be a "normal" amount of electricity, which is paid by the infrastructure tax. There are two facilities that have usage levels that far exceed these normal levels (Los Alamos Neutron Science Center and the Strategic Computing Complex). These two facilities are charged for the additional usage above and beyond the normal amount covered by the infrastructure tax. So in this case, the majority of users consume amounts of electricity that do not materially differ, but in the cases of those that have a material impact on the overall utility bill, they are charged directly. This alternative method may be applicable to waste processing *if most of the waste is generated by only a few programs*. This option is relatively easy to implement because it focuses waste forecasting, tracking, and recharging efforts on a few large generators, whereas the institution pays all remaining waste processing. Accuracy is low because actual waste volumes of many generators are ignored; it is one step above the extreme case of distributed direct in Figure 3 accuracy/implementation space.

$$SmallGenFee_i = FC_i^{Small} + VC_i^{Small} = \text{paid by institution} \quad \text{(Eq. 3)}$$

$$UnitCost2_i = \frac{(FC_i + VC_i - SmallGenFee_i)}{(Vol_i^{Forecast} - Vol_i^{ForecastSmall})} \quad \text{(Eq. 4)}$$

$$TotalCost_i = SmallGenFee_i + \sum_{y=1}^{Y} UnitCost2_i \times Vol_{y,i}^{Actual} \quad \text{(Eq. 5)}$$

where $SmallGenFee_i$ = total annual processing costs associated with small or typical generators of waste i,

FC_i^{Small} = fixed cost of processing waste i for all small generators at Los Alamos,

VC_i^{Small} = variable cost of processing waste i for all small generators at Los Alamos,

$Vol_i^{ForecastSmall}$ = annual forecast of waste i from small generators,

$UnitCost2_i$ = Alternative 2 cost per unit volume for processing waste i,

$Vol_{y,i}^{Actual}$ = actual annual volume of waste i by large generator y,

y = large waste generator (e.g., pit manufacturing), and

Y = total number of large waste generators.

Advantages of Alternative 2:

- System may be easier to implement and socialize because it is already in place for electricity cost recovery.
- Simplifies the waste tracking system because waste processing for the large number of small, “typical” waste generators is paid via infrastructure tax. Waste tracking and forecasting is used only for the few large waste generators. Efficient use of scarce waste management and cost accounting resources.
- Sends a price signal to large generators based on actual waste volume to encourage waste minimization.

Disadvantages of Alternative 2:

- Possibly significant fixed costs that are insensitive to volume changes remain in the unit cost.
- Pattern of waste generation at Los Alamos is not characterized by a few large generators and a multitude of small ones. Consequently, the model may not be suitable.
- System for detailed waste tracking and record keeping for large generators is required before this alternative can be accurately implemented. Such a system does not currently exist at Los Alamos.
- Requires infrastructure tax to increase to cover waste processing for small generators.
- No waste minimization incentive provided to small generators.

Alternative 3: Recharge Plus Institution Pays Fixed Cost

In this hybrid option the variable cost is paid via a recharge and the fixed cost of waste processing is paid by the institution rather than the generators. This model is similar to how many private corporations handle these expenses (e.g., Honeywell Phoenix Valley): generators pay a unit cost (that includes VC only) for each unit of waste generated and the corporation covers the waste management office expense

(FC) through an overhead tax. In Figure 3, this option lies in the middle of the accuracy/implementation space.

$$FC_i = \text{fixed cost of waste processing paid by institution} \qquad \text{(Eq. 6)}$$

$$UnitCost3_i = \frac{VC_i}{Vol_i^{Forecast}} \qquad \text{(Eq. 7)}$$

$$TotalCost_i = FC_i + \sum_{x=1}^{X} UnitCost3_i \times Vol_{x,i}^{Actual} \qquad \text{(Eq. 8)}$$

where $Vol_{x,i}^{Actual}$ = actual annual volume of waste *i* generated by generator *x*, and $UnitCost3_i$ = Alternative 3 cost per unit volume for processing waste *i*.

Advantages of Alternative 3:

- Unexpected big volume swings have lower impact on unit cost under this alternative because there is only variable cost in the numerator.
- The institution covers the fixed cost and the unit cost handles the variable cost; this correctly separates the different natures of FC and VC.
- Sends a price signal to generators based on volume to encourage waste minimization, but is balanced by having a known fixed cost component covered by the institution.

Disadvantages of Alternative 3:

- Current budget horizon makes it very unlikely that the institution will be able to pay the fixed cost required by this alternative.
- System for detailed waste tracking and record keeping is required before this alternative can be accurately implemented. Such a system does not currently exist at Los Alamos.
- Generators see only a portion of processing cost, which may reduce waste minimization incentives.
- The unit cost depends on volume forecast and may result in a year-end variance that requires a unit rate adjustment, but the variability should be less than under pure recharge (Alternative 6) where the unit cost includes both FC and VC.
- Accurate and agreed-to split between fixed and variable cost is needed for all types of waste processing.

Alternative 4: Recharge Plus Generators Pay Distributed Direct

All generators who produce waste must pay a distributed direct “membership fee” associated with their specific waste type to hook up to the processing capability. This membership fee is calculated using the distributed direct method on the fixed cost only, i.e., the FC share is based on each program’s forecast proportion of total Los Alamos volume forecast. This fee is stable for the whole fiscal year; at mid-year, the next fiscal year’s distributed direct fee is negotiated and set. An issue is how to handle the fee when a program unexpectedly disappears mid-year, or if a processing facility goes off-line. The volume of waste actually sent for processing is charged a unit cost based solely on the variable cost of disposing of that waste. The total cost recovered each year is the total membership fees from generators plus the unit cost times actual volumes processed as in Equation (11). In Figure 3 this option lies to the right of Alternative 3 because it has the same accuracy but requires more volume forecasts to compute the distributed direct fee.

$$MembershipFee_{x,i} = FC_i \times \frac{Vol_{x,i}^{Forecast}}{Vol_i^{Forecast}} \qquad \text{(Eq. 9)}$$

$$UnitCost4_i = \frac{VC_i}{Vol_i^{Forecast}} \qquad \text{(Eq. 10)}$$

$$TotalCost_i = \sum_{x=1}^{X} MembershipFee_{x,i} + \sum_{x=1}^{X} UnitCost4_i \times Vol_{x,i}^{Actual} \qquad \text{(Eq. 11)}$$

where $MembershipFee_{x,i}$ = annual waste processing fee paid by generator *x* for waste *i*,
$Vol_{x,i}^{Actual}$ = actual annual volume of waste *i* generated by generator *x*, and
$UnitCost4_i$ = Alternative 4 cost per unit volume for processing waste *i*.

Advantages of Alternative 4:

- Unexpected big volume swings have lower impact on unit cost under this alternative because there is only variable cost in the numerator.
- The distributed direct membership fee covers the fixed cost and the unit cost handles the variable cost; this correctly captures the different natures of FC and VC.
- Using distributed direct will require DOE approval, and having a cost component based on actual volumes will make this approval more likely.
- Sends a price signal to generators based on volume to encourage waste minimization, but is balanced by establishing a known fixed cost component shared proportionally by the right programs for ease of budget planning.
- Provides stable component of waste processor budget. Adjustments can be made in fixed cost over time to match capacity to volumes.

Disadvantages of Alternative 4:

- System for detailed waste tracking and record keeping is required before the recharge component of this alternative can be accurately implemented. Such a system does not currently exist at Los Alamos.
- Any errors in the distributed direct membership fee will not be corrected until the following year. Good volume forecasts are critical to limit these errors.
- The unit cost depends on predicted volume and may result in a year-end variance (if actual volume is different) that requires a rate adjustment, but the variability should be less than under pure recharge (Alternative 6).
- There are several complexities that need to be considered such as 1) What is the minimum generation threshold beyond which a membership is required, i.e., how do we handle small or variable generators from Threat Reduction or Office of Science work? 2) Can a new generator buy a membership mid-year? 3) What adjustments can be made mid-year if the initial membership is deemed to be incorrect?
- Accurate and agreed-to split between fixed and variable cost is needed for all types of waste processing.
- Oversight board is needed to monitor volume forecasts for accuracy and encourage waste processors to increase efficiency.

Alternative 5: Recharge Plus Package Fee

This option collects a portion of the fixed cost via a "package management fee," that is, a fixed fee for each waste package, whether small or large, as shown in Equation (12). The remainder of the waste processing cost is recharged to the generator based on actual volume. As an example, at Sandia National Laboratories the FY2008 package management fee is $27 per package of hazardous waste and $950 per package of LLW or MLLW. This model was also used by Bechtel-Idaho at the Idaho National Engineering and Environmental Laboratory from FY2003 to FY2006. Because actual volumes may be unexpectedly different, periodic adjustment of unit costs may be needed during the year to avoid under- or over-collection of revenues. This option is relatively accurate and detailed because it relies heavily on a unit cost multiplied by actual volume generated. It is one step away from a full recharge system in Figure 3 and is more accurate than Alternative 4 because it has charges based on the number of actual packages rather than volume forecasts.

$$PackageFee_i = \frac{FC_i^{Package}}{\#Packages_i^{Forecast}} \quad \text{(Eq. 12)}$$

$$UnitCost5_i = \frac{\left(FC_i - FC_i^{Package} + VC_i\right)}{Vol_i^{Forecast}} \quad \text{(Eq. 13)}$$

$$TotalCost_i = \sum_{x=1}^{X} \#Packages_{x,i}^{Actual} \times PackageFee_i + \sum_{x=1}^{X} UnitCost5_i \times Vol_{x,i}^{Actual} \quad \text{(Eq. 14)}$$

where $FC_i^{Package}$ = fixed cost of waste processing activities for handling and managing one package of waste *i*,

$\#Packages_i^{Forecast}$ = number of packages of waste *i* forecast for the year,

$\#Packages_i^{Actual}$ = number of actual packages of waste *i* handled during the year, and

$UnitCost5_i$ = Alternative 5 cost per unit volume for processing waste *i*.

Advantages of Alternative 5:

- All generators, even small ones, share in some portion of the fixed cost.
- Encourages more efficient consolidated waste pickups.
- The charging mechanism mirrors the actual economics of handling a unit of waste--no matter how small an individual pickup, handling a package requires a certain fixed amount of effort.
- Does not require a request to DOE for approval of a new distributed direct model.
- Relatively detailed, transparent, and accurate matching of waste processing generators with processing costs.
- Relatively large price signal against each unit of volume, which is a bigger waste minimization incentive.

Disadvantages of Alternative 5:

- System for detailed waste tracking and record keeping is required before this alternative can be accurately implemented. Such a system does not currently exist at Los Alamos.
- Possibly significant fixed cost that is insensitive to volume changes remain in the unit cost. If actual volume is different than the forecast, there will be over- or under-collection for the year, requiring accounting adjustments which may cause budgetary impacts to waste generating programs.

- System must clearly define what constitutes a "package."
- Difficult to adjust unit cost mid-year.

Alternative 6: Recharge

The fixed and variable costs for each waste stream are summed and then divided by the forecast volume of the waste stream to calculate the average or unit cost as in Equation (15). The total cost recovered is the unit cost multiplied by the actual volumes generated in Equation (16). So each generator pays a share of the total equal to their specific annual volume times the unit cost of the waste type. This is what is currently used at Los Alamos for non-DP indirect recharge for LLW, hazardous/chemical, and MLLW. Because actual volumes may be unexpectedly different, periodic adjustment of unit costs may be needed during the year to avoid under- or over-collection of revenues.

$$UnitCost6_i = \frac{\left(FC_i + VC_i\right)}{Vol_i^{Forecast}} \quad \text{(Eq. 15)}$$

$$TotalCost_i = \sum_{x=1}^{X} UnitCost6_i \times Vol_{x,i}^{Actual} \quad \text{(Eq. 16)}$$

where $UnitCost6_i$ = Alternative 6 cost per unit volume for processing waste *i*.

Advantages of Alternative 6:

- Very detailed, transparent, and accurate matching of waste processing generators with processing costs.
- Large, all encompassing unit cost implies a bigger price signal against each unit of volume, which is a bigger waste minimization incentive.
- Each program producing waste pays the same per-unit fee for waste processing and will pay a share of total costs that is proportional to the quantity of waste they actually produce each year. This is the “fair” alternative.

Disadvantages of Alternative 6:

- System for detailed waste tracking and record keeping is required before this alternative can be accurately implemented. Such a system does not currently exist at Los Alamos.
- All money collected is based on volume, and a significant portion of the processing cost is fixed and included in the unit cost. If actual volume is different than the forecast, there will be over- or under-collection for the year, requiring accounting adjustments which may cause budgetary impacts to waste generating programs.
- Difficult and disruptive to adjust unit cost mid-year.
- Programs have to rely on volume forecast as the sole basis for planning future year’s costs.

PREFERRED ALTERNATIVE

Based on the above analysis, in April 2008 the PI&BM team recommended Alternative 4, Recharge Plus Generators Pay Distributed Direct, be used for full cost recovery of waste processing. This model was adopted by Los Alamos management, and is currently being used in FY2009. This choice is grounded in the twin realities Los Alamos faces: 1) accurate volume data are lacking and hard to predict, and 2) Los Alamos uses a mixture of in-house and contractor services to manage and dispose of waste. Los Alamos is an experimental science institution and as such generates different types of waste at different volume levels each year. Projects largely come and go based on decisions by the U.S. Congress or government sponsors rather than institutional directions. Under such conditions, accurate forecasting is not an easy task—it is much more difficult than for a typical manufacturing firm with established markets. Some types of our waste require government handling and special disposition at taxpayer-financed installations such as the Waste Isolation Pilot Plant (WIPP). The capability to manage such waste is currently maintained at Los Alamos; it is unclear whether a private firm can undertake this task. We essentially have a captive capability that has no competitors (in a sense, a monopoly) that is beholden to the type of science that occurs at Los Alamos. The fixed cost of maintaining that processing capability must be consistently and predictably paid each year. Also, because the Los Alamos processor is not allowed the profit/loss freedom a commercial firm has, there is very little room for error in estimating the unit cost each year. Given these twin realities, we believe a model which recognizes the need to cover the fixed and variable costs would be preferable to a pure recharge (Alternative 6).

A key benefit of Alternative 4 is that it addresses the difficulties of tracking actuals and of forecasting future volumes by splitting the total costs between recharge and distributed direct based on fixed and variable cost. In a sense, the model spreads the risks by having two methods of revenue collection.

Requirements for success of cost recovery using Alternative 4 are as follows. First, a system for accurate waste tracking will be required with strong cost accounting verification to make sure wastes are correctly associated with generator charge codes. Second, a waste volume forecast system is needed for each program to give accurate predictions in time for budget planning for the next fiscal year. Third, an oversight board should be established to push for processor efficiency over time and monitor volume forecasts to reduce cheating.