(1) What are the likely economic impacts of the four technologies on the SRS region and the other regions if US taxpayers pay the full cost of the project though a tax increase, raising the overall DOE budget? (We call this the 'new money' option.)
(2) What are the likely economic impacts if the DOE decides to pay for this project by reducing its defence, science and energy and other budgets across all of its sites? In other words, SRS gains more funding for salt waste management, but other programmes, including some at SRS, lose funding. (We label this the 'DOE zero-sum' question.)
(3) What are the likely economic impacts if the DOE decides to pay for this project by reducing environmental projects across all of its sites? In other words, SRS gains more funding, but Hanford, Oak Ridge and others lose funding. (We label this the 'DOE EM zero-sum' question.)
(4) What are the likely economic impacts if no new environmental funding is provided to SRS for this project? In other words, this is a zero-sum game for the SRS region. (We call this the 'SRS zero-sum' question.)
(5) What are the likely differences in the economic impacts between the four alternative tank waste technologies using the 'all new money' scenario? This question examines the differences between the technologies, independent of the funding issues.

Other options were also plausible, such as zero-sum major EM sites (SRS, Hanford, INEEL and Rocky Flats). The chosen scenarios are representative of what could happen, and are not meant to be definitive. The DOE might choose to implement a hybrid of these alternatives.

In undertaking this analysis, we were aware of two limitations that needed to be noted. We recognized that the engineering cost estimates for the four technologies were the initial set and that these would change as each technology was tested. It is quite possible that the technology that has the best regional economic impact credentials could be eliminated for health, safety, engineering and various other reasons. Secondly, although DOE engineers indicated where the design and testing of each technology were likely to occur, in fact their suggestions might not materialize. Overall, it is important that the reader recognizes that the results are not to be interpreted as final estimates but, rather, are initial estimates that we hope will provoke discussion about the choice of technology, where the project is designed and who pays for it.

## Data, Methods and Preliminary Computations

An economic simulation model built by Regional Economic Modeling Inc. (REMI) (1997) was used to determine the implications of the technological alternatives. The simulation model uses a modified national forecast based on estimates developed by the US Bureau of Labor Statistics. It incorporates econometric estimates of the relationships between factors such as population, employment, income, wages, prices, trade and migration by industry and by region in order to produce regional forecasts (Treyz, 1993). In essence, the model allows the user to understand how the forecast would change in response to changes that occur within a region, for example changes in final demand for regional products. In order to measure the regional impacts, the national forecasts are adjusted according to the historical performance of the region from

1969 to 1996 to generate regional multipliers, regional purchase coefficients, regional trade coefficients and other important characteristics, such as migration and population growth. Because the model is multi-regional, we are able to determine how a change in one region impacts on other regions, which provides a national perspective on the project.

Five key decisions were made about the methods. Briefly, all counties in the primary metropolitan statistical areas of nine regions with major DOE facilities were selected. In addition, headquarters (Washington, DC), and the rest of the USA as an aggregate, were considered as regions. The forecasting period was a second design issue. REMI provides a baseline forecast from 1997 to 2035 based on historical data from 1969 to 1996. However, studies show that estimates that go much beyond a decade deviate substantially from reality because assumptions built into models are no longer valid (Treyz, 1993). Legally, the HLW tanks are to be emptied by 2022. Our analysis begins with the first investments in 2000, but we were reluctant to use the model beyond 15 years, so we chose 2015 as the end of our forecasting period, which provides results for the design, construction, start-up and operating periods. The extent of inter-industry detail was a third design decision. The model has 53 economic sectors, which means that we get considerable detail on purchases from manufacturing sectors of the economy. The development of a baseline to compare with the salt waste-influenced results was the fourth decision. Description of the steps is beyond the scope of this paper (Frisch & Lewis, 2000). The end result was a DOE budget with explicit EM, defence, science and energy, and administrative and other elements that could be altered. In the analyses that follow, the changes are made relative to this derived DOE baseline. That is, the DOE baseline produces employment, GRP, personal income and other output estimates for every year. When we make an explicit change in the DOE budget, the regional economic differences are attributable to the change in the DOE budget because everything else has been held constant within the model. For example, if the DOE baseline forecasts 5000 jobs in a region and a policy modification produces an estimate of 4000 jobs, then the 1000 fewer jobs are attributable to that policy change. The fifth and most difficult set of decisions involved converting the technology plans of the DOE and its contractors into investments in the economy. This required studying the engineering plans and meeting with DOE engineers. We were able to categorize the DOE's investments into 26 labour and 19 capital cost sectors (which themselves are an aggregation of roughly 150 different four-digit standard industrial codes). Another important decision was how to regionalize the design and engineering portion of the budget. Our proportioning of this expenditure by region was based on discussions with SRS engineers. The proportioning of the design and engineering expenditures is a potential source of error. The regionalization of other purchases is based on historical data of the percentage of national production of a particular product or service in a region. These data by region are contained in the regional purchase coefficients that are embedded in the REMI model (Treyz, 1993). This fifth set of decisions was critical to the results of this study.

### Results

Before describing the regional economic impacts, a lot can be learned by examining the investments themselves. The aggregate cost (in 1999 dollars) is

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estimated to be $1.36 billion for the caustic technology, $1.19 billion for the ion exchange, $1.08 billion for the small tank system and $0.91 billion for grout. These differences of up to $450 million between the technologies were not expected to be proportional in their regional economic impacts because much of the development of the grout and small tank technologies has been at SRS, whereas caustic and particularly the ion technologies have been heavily developed outside the region. The amount of economic leakage out of the region by technology is a critical factor that determines the economic impacts on the SRS region. The percentage of expenditure made in the SRS region, the retention rate, is quite different between the four technologies. Grout, which mostly relies on local products and labour, has a retention rate of 84%, and the small tank technology has a retention rate of 82%, primarily because much of the design and early development has occurred in the SRS region. In contrast, more of the design and construction work for caustic side extraction and ion exchange has taken place outside the SRS region, and so their retention rates are 78% and 65%, respectively. In other words, even though the caustic and ion exchange technologies cost more to design, build and operate, the fact that a lot of the money is spent outside the SRS region means that the economic impact on the SRS region is less than what is implied by looking at the total cost of the project.

*Technology Options*

Presenting all of the results from the simulations is beyond the scope of this paper. Here we focus on changes in total employment and changes in GRP as measures of economic impacts. Table 2 provides summary results of the new money scenarios, which assume that the US population pays for the technology fully through a tax increase. The tax increase that proportionately distributes the total by region is based on the historical proportion of the taxes paid by each of

**Table 2.** Economic impacts of four technology options and new money option on SRS region (values are differences from DOE baseline, 1992 constant dollars)

| Technology | Average design, 2001–03 | Average construction, 2004–07 | Average start-up, 2008–09 | Percentage difference from small tank, all phases, 2001–09 |
|---|---|---|---|---|
| Small tank | | | | |
| Employment | 2650 | 3085 | 1242 | — |
| GRP[a] | 90 | 145 | 85 | — |
| Grout | | | | |
| Employment | 1417 | 2606 | 1167 | −25 |
| GRP[a] | 43 | 112 | 91 | −26 |
| Ion exchange | | | | |
| Employment | 2927 | 2863 | 1539 | 2 |
| GRP[a] | 100 | 133 | 119 | 5 |
| Caustic | | | | |
| Employment | 2157 | 3749 | 2287 | 14 |
| GRP[a] | 76 | 171 | 161 | 21 |

[a] In millions of chained 1992 dollars.

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the 12 regions. Over the course of the 9 years, on average there is not much difference between the small tank, ion exchange and caustic technologies in their ability to create jobs and add to GRP. Each creates an average of more than 600 jobs and $25 million more GRP than grout.

Looking back at the differences in total cost shows that the small tank technology produces more local jobs and greater GRP in the SRS region per unit of cost than do the other three technologies. Small tank costs 16% more than grout, but produces about 25% more jobs. Small tank costs 9% less than ion exchange, but we estimate it to produce almost as many jobs for the region. Similarly, small tank costs 26% less than caustic, but we estimate that the investment in the caustic technology will add only 14% more jobs in the SRS region.

Results averaged over the life of a facility can obscure important variations in the economic impacts. Therefore, we examine differences between the technologies in four phases of the project. The last phase, operations and maintenance, is the most similar across the technologies. There are three reasons for this last outcome: there are significantly fewer leakages out of the regions across technologies for this phase; the amount of additional investment is approximately the same for each technology at this phase; and the model assumptions of national growth and our assumptions regarding the DOE baseline dominate the results. The 1–2% differences between the four technologies in operation and maintenance will not be noticeable in the SRS region.

In essence, the economic differences occur during the design, construction and start-up phases. Table 2 presents the results for each technology and the new money payment option. There is a jump in employment through the design and construction phases, with an equally rapid and steady decline as construction winds down and the start-up phase ensues. The caustic extraction technology is a good one to illustrate the complexity of regional economic impacts. It has the highest overall cost. Yet a lot of up-front design and engineering work is done off-site, notably at Oak Ridge, INEEL and Los Alamos/Sandia, which are estimated to add 480, 710 and 230 jobs, and $14 million, $16 million and $6 million in GRP, respectively, during 2002–04. However, the bulk of the work is done on-site, including the construction of large tanks and engineered systems to support the technology. So, in terms of creating jobs, if the DOE does not need to reallocate money from other projects to pay for this one, i.e. there is new money, then multiple regions will gain jobs and GRP.

*Payment Options*

The results presented in Table 2 assume that new money is added to the DOE SRS budget, which is likely to be a much better payment arrangement than the SRS region will get. The DOE's overall budget has been under a great deal of pressure since the end of the Cold War, and within that budget the EM budget has been declining relative to the DOE's defence, energy and science budgets (Frisch & Lewis, 2000). Hence, our zero-sum options are probably closer to reality than is the new money one. Using the small tank and ion exchange options as illustrations, Table 3 and Figures 1 and 2 illustrate the impact of the three zero-sum payment scenarios. We can see a scaling down of benefits to the SRS region, depending on the payment option. When we examine the SRS zero-sum funding option, we see a bottoming out, which clearly demonstrates

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**Table 3.** Payment options, small tank option (values are differences from DOE baseline, 1992 constant dollars)

| Payment option | Average design, 2001–03 | Average construction, 2004–07 | Average start-up, 2008–09 | Percentage difference from new money, all 2001–09 |
|---|---|---|---|---|
| New money | | | | |
| Employment | 2650 | 3085 | 1242 | — |
| GRP[a] | 90 | 145 | 85 | — |
| DOE zero-sum | | | | |
| Employment | 2512 | 2877 | 1195 | −6 |
| GRP[a] | 85 | 137 | 93 | −3 |
| EM zero-sum | | | | |
| Employment | 2310 | 2573 | 1127 | −14 |
| GRP[a] | 77 | 125 | 91 | −10 |
| SRS zero-sum | | | | |
| Employment | 879 | 424 | 638 | −77 |
| GRP[a] | 21 | 40 | 76 | −63 |

[a] In millions of chained 1992 dollars.

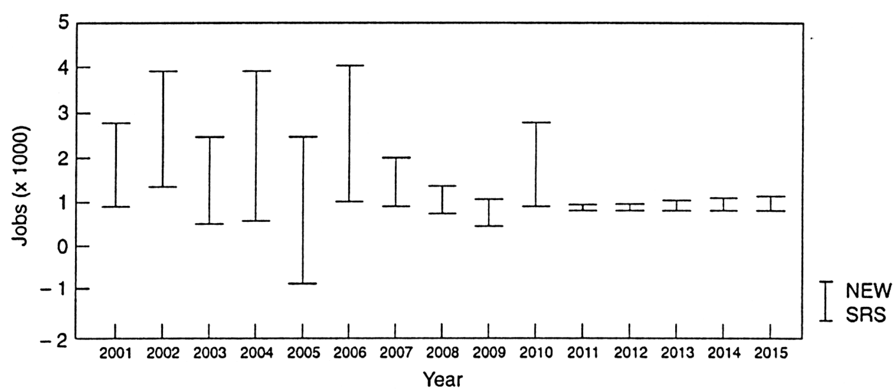


**Figure 1.** Small tank: new money vs. SRS pays.

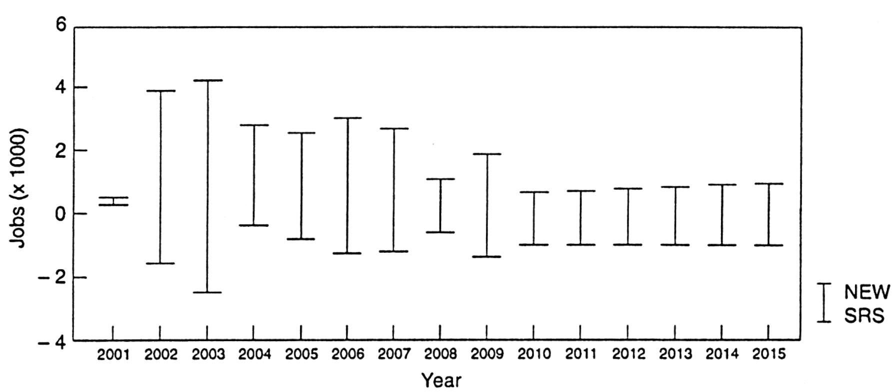


**Figure 2.** Ion exchange: new money vs. SRS pays.

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the negative economic effects of investment leakage on the SRS regional economy.

The average annual difference in the SRS region of paying for the salt tank clean-up out of the full $16 billion DOE budget is estimated to be about 100 fewer jobs and $4 million in GRP, or about 5% of the potential economic impact. The impact of the DOE EM zero-sum option is slightly more serious for the SRS region, estimated annually at 300 jobs and $9 million less in GRP, or 12% of the total. The larger impact occurs because the SRS region has received about 20% of the EM budget for more than a decade. So, in fact, the SRS site would pay about 20% of the salt waste tank costs out of its existing funding under the EM zero-sum payment option.

The most severe economic impact for the SRS region clearly is the SRS zero-sum option, where the net SRS budget for all purposes is reduced by the amount of the cost of the tank waste project. Table 3 offers two noteworthy insights into this option. One is that the SRS region has an overall annual average job benefit of about 600 jobs, rather than no net job change. This finding is explained by the fact that much of the small tank technological development is on-site, whereas other SRS activities, by comparison, make more purchases of products and labour off-site (Greenberg *et al.*, 1999a; Frisch & Lewis, 2000). In addition, the hiring of many more engineers (many of whom will migrate into the region), paid at a higher rate than the average engineer in the region, will increase demand for upmarket housing, and their substantial disposal income will increase demand for many other services and recreations. However, even this SRS-friendly technology suggests some cause for concern. The simulation suggests that 805 jobs and $34 million in GRP are estimated to be lost in 2005. According to site plans for the small tank technology, a considerable amount of the budget for that year is for buying steel pipe and other products outside the region, so the retention rate drops and hence the region loses jobs and GRP. In addition, many of the engineers may leave the region as regional demand for their services declines.

Figure 1 illustrates graphically the combination of new money and SRS zero-sum payment options for the small tank option. Before describing the sequence, we should say that we expect the DOE and its contractors to attempt to smooth this forecasted roller-coaster for the period 2001–07. The first 2 years involve building the pilot facility on-site, and so many jobs are created. In 2003, the start of construction of the permanent facility is signalled by off-site purchases, hence local jobs drop. Employment jumps again in 2004 as the products are used to build the facility. However, in 2005 a great deal of money is used to purchase engineered systems, pipe and other products from outside the region, and hence the region loses jobs. A year later, the employment impact peaks to almost 4100 jobs as the construction phase peaks. On-site activities change dramatically after 2006. In 2007, pilot testing and personnel training become the major activities. Training becomes the major activity in 2009. The facility begins operation in 2010. The graph also clearly shows that the real difference to regional economic impact is during design and construction. After 2009, there is little difference in the operational costs by technology, and total operational costs are relatively low compared with construction costs. Hence, the difference in funding mechanism (who pays) does not lead to large differences in impact after 2010.

Figure 2 shows the new money vs. SRS pays options for ion exchange. The

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difference between the best-case scenario (new money funding for the ion exchange technology) and the worst-case scenario (SRS zero-sum funding option for the ion exchange technology) illustrates graphically the dramatic negative effects of economic leakage on the SRS region. The ion exchange technology has the lowest investment retention rate of all four technologies, punctuated by a loss of over 40% of investment during the construction phase. Looking at the salt waste EM problem as an economic issue, Figure 2 is a provocative demonstration of the need to think hard about who pays for this technology, because the SRS region loses employment every year from 2000 to 2015 as a result of the expected site budget absorbing the full costs of this project.

*Peak Impacts and Inter-regional Effects: 2006*

Clearly, most of the economic impacts of managing salt waste fall within the SRS region. However, there are inter-regional impacts of this SRS-centred EM programme that must be reported in more detail. Table 4 shows these for the small tank option and the four payment options for the peak construction year, 2006, when the site is gaining the most investment. The new money option has almost no impact on the other DOE sites. The job gains in the SRS region are matched by losses in the rest of the USA. The DOE zero-sum option shows losses in the rest of the USA. However, Los Alamos/Sandia, Oak Ridge and the headquarters regions, which have major budget commitments from the DOE defence, energy and science programmes, also lose about 1300 jobs.

The DOE EM zero-sum scenario has more concentrated impacts, falling on Hanford and INEEL; the two relatively poor regions with major EM programmes lose 950 jobs. Oak Ridge, Los Alamos/Sandia, the Nevada Test Site region and Fernald/Mound also each lose over 100 jobs in this peak year. The SRS zero-sum option shows a gain of only 1000 jobs in the region during the peak year. Nearly all the losses are in the rest of the nation.

**Table 4.** Employment impact by site region, 2006, small tank option (numbers in table are rounded to nearest 10)

| Site region | New money | DOE zero-Sum | EM zero-Sum | SRS zero-Sum |
|---|---|---|---|---|
| SRS | 4100 | 3850 | 3500 | 1000 |
| Hanford | — | − 250 | − 550 | — |
| Oak Ridge | — | − 300 | − 210 | − 30 |
| Rocky Flats | 40 | − 110 | − 40 | 40 |
| INEEL | — | − 200 | − 400 | — |
| Los Alamos Sandia | — | − 650 | − 220 | 10 |
| Pantex | — | − 40 | — | — |
| Nevada | 10 | − 70 | − 140 | 20 |
| Fernald Mound | 30 | − 60 | − 170 | 10 |
| Headquarters | — | − 330 | − 260 | 50 |
| Rest of U.S. | − 4600 | − 2600 | − 1800 | − 1400 |
| Total U.S. | − 400 | − 750 | − 610 | − 200 |

*Note:*—, Impact is fewer than ± 10 jobs.

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**Discussion**

The authors of this paper do not have the ability to assess the public health and environmental implications of each of the technologies proposed for the salt wastes in the HLW tanks. Assuming that the DOE's engineering cost estimates are currently reasonable and will become more accurate as design and testing continue, that our sectorizing of them into the economy is accurate, that the regional cost allocations (particularly for engineering services) are realistic and that the historical patterns of trade in the USA captured in the model are appropriate for the near future, then, from an economic perspective, we are able to estimate the impact of each technology on the SRS-centred region and other regions of the USA.

The policy message is not subtle. The assumption that new projects lead to host-region economic benefits is not necessarily true. In an era when budgeting seems to have become a zero-sum game or is close to that reality, a new project is going to be paid for by postponing or eliminating another project. Regional planners need to probe beyond the technological choices because the decisions about where the design and engineering are done and how the project is funded are critical. If the host region pays the full cost of the project by postponing or cancelling other tasks, then the overall net benefit will be reduced, including job and GRP losses in some years. Smoothing out the building process can help flatten the roller-coaster, but it is unrealistic to assume that any of these new technologies can be optimized in the way an off-the-shelf technology could be. Lastly, as practitioners of environmental risk management, it would be remiss of us if we did not conclude by noting that the regional economic benefits are only an important consideration if all four technologies protect public health, safety and the environment.

**Acknowledgements**

The authors would like to thank Charles Powers, Bernard Goldstein, Elaine Faustman, Arthur Upton and other colleagues for encouraging this work. The project was begun under a co-operative grant to the Consortium for Risk Evaluation with Stakeholder Participation from the US DOE, Instrument DE-FC01–95EW 55084, and it was completed under a second co-operative grant, DE-FG26–00NT40938. The authors would like to thank DOE scientists and engineers, notably John Reynolds, Thomas Heenan and Howard Gnann, for spending a lot of time with us explaining the details of the project estimates and reviewing an initial version of the larger economic study of the salt waste management issue. Finally, they would like to thank their colleagues Henry Mayer and Karen Lowrie for participating in conversations about this study for many months. The observations, conclusions and interpretations drawn from the data are solely the responsibility of the authors and should not be interpreted as representing the views of any of the people acknowledged, nor should it be inferred that they agree with the conclusions drawn from the analysis.

**References**

Brauer, J. (1995) US Military nuclear production sites: do they attract or reject jobs? *Medicine and Global Survival*, 2, pp. 35–44.
Brauer, J. (1997) Do military expenditures create net employment? The case of US military–nuclear

production sites, in: J. Brauer & W. Gissy (Eds) *Economics of Conflict and Peace* (Brookfield, VT, Ashgate).

Citizens Advisory Board (2000) Selection of HLW salt processing alternative, *Recommendation 112*, 25 January (Aiken, SC).

Frisch, M. & Lewis, D. (2000) What happened to conversion in the nuclear weapons complex? An analysis of regional spending on environmental management and defense programs in the Department of Energy, *Report 34 to CRESP-EOHSI* (New Brunswick, NJ).

Frisch, M., Solitare, L., Greenberg, M. & Lowrie, K. (1998) Regional economic benefits of environmental management at the US Department of Energy's major nuclear weapons sites, *Journal of Environmental Management*, 54, pp. 23–37.

Greenberg, M., Solitare, L., Frisch, M. & Lowrie, K. (1999a) Economic impact of accelerated cleanup on regions surrounding the US DOE's major nuclear weapons sites, *Risk Analysis*, 19, pp. 629–641.

Greenberg, M., Isserman, A., Frisch, M., Krueckeberg, D., Lowrie, K., Mayer, H., Simon, D. & Sorenson, D. (1999b) Questioning conventional wisdom; the regional economic impacts of major US nuclear weapons sites: 1970–1994, *Socio-economic Planning Sciences*, 33, pp. 183–204.

Lancaster, J. (1984) Aiken, SC—town that lives by the bomb, *Atlanta Constitution*, 6 December, p. A-1.

Lowrie, K. (2000) Land use planning at energy sites involves communication, coordination, and commitment, *Public Management*, 82, pp. 18–23.

Lowrie, K., Greenberg, M. & Frisch, M. (1999) Economic fallout, *Forum for Applied Research and Public Policy*, 14(2), pp. 119–125.

Lowrie, K., Greenberg, M. & Waishwell, L. (2000) Hazards, risk, and the press: a comparative analysis of newspaper coverage of nuclear and chemical weapons sites, *Risk: Health, Safety, & Environment*, 49, pp. 49–67.

Mitchell, R., Payne, B. & Dunlap, R. (1989) Stigma and radioactive waste: theory, assessment, and some empirical findings from Hanford, Washington, *CENTED Report No. 78* (Worcester, MA).

Office of Environmental Management (1995a) *Estimating the Cold War Mortgage*, 2 vols (Springfield, VA, US DOE).

Office of Environmental Management (1995b) *Closing the Circle on Splitting the Atom* (Washington, DC, US DOE).

Office of Environmental Management (1995c) *Baseline Environmental Management Report* (Washington, DC, US Government Printing Office).

Office of Environmental Management (1997a) Accelerated cleanup: focus on 2006, *Discussion Draft* (Washington, DC, US DOE).

Office of Environmental Management (1997b) *Linking Legacies* (Washington, DC, US Government Printing Office).

Office of Worker and Community Transition (1999) *Annual Report of Contractor Work Force Restructuring* (Washington, DC, US DOE).

Regional Economic Modeling Inc. (REMI) (1997) *The REMI EDFS-53 Forecasting & Simulation Model, Volume 1, Model Documentation* (Amherst, MA, REMI).

Reynolds, J.M. (1999) High level waste salt disposition alternatives, historical overview, *Briefing to Citizens Advisory Board*, Aiken, SC, 27, July.

Schill, K. (1996) SRS losses mount, *Augusta Chronicle*, 20 March, p. 1.

Slovic, P., Layman, M. & Flynn, J. (1991) Risk perception, trust and nuclear waste: lessons from Yucca Mountain, *Environment*, 33, pp. 6–11.

Stakeholder Focus Group of Citizens Advisory Board (1998) *Independent Review of WSRC Process for Selection of HLW Salt Disposition Alternatives, Aiken, SC* (Aiken, SC, Citizens Advisory Board).

Treyz, G. (1993) *Regional Economic Modeling: A Systematic Approach to Economic Forecasting and Policy Analysis* (Boston, MA, Kluwer).

US Environmental Protection Agency (1985) High level and transuranic wastes, *Background Information Document [for final rules*, see EPA 520/1–85–023].

US General Accounting Office (US GAO) (1999) Nuclear waste: process to remove radioactive waste from Savannah River tanks fails to work, *GAO/RCED-99–69* (Washington, DC, US GAO).

Williams, B., Brown, S., Greenberg, M. & Kahn, M. (1999) Risk perception in context: the Savannah River Site Stakeholder Study, *Risk Analysis*, 19, pp. 1019–1035.

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**Response to Comment Letter L12:**

L12-1 DOE did not attempt to estimate the total number of jobs generated in the region by implementation of the salt processing alternatives, but estimated the number of direct construction and operations jobs that might be created. DOE believes the differences in numbers of construction and operations jobs estimated by CRESP and DOE are attributable to different assumptions used in the analyses. Further, DOE does not believe that the project cost estimates, an important basis for the CRESP analysis, are refined enough to distinguish between the alternatives, with the exception that Direct Disposal appears to be less costly than the other alternatives.

L12-2 DOE agrees that the results are explained by a number of factors, and that cost of the technologies is an important factor. DOE also agrees that the location of the design and testing functions will affect the local economic impact of the salt processing technology implementation.

L12-3 DOE agrees that the funding mechanism would be important in determining the local economic impacts. DOE does not assume that funds for any specific project would be in addition to a baseline of SRS funding. Funds for SRS operations are appropriated annually by the Congress, on the basis of the President's budget request and the Congress' own analysis of priorities.

L12-4 DOE agrees that the CRESP analysis provides more specific evaluations of the economic impacts, and that the data are based on very preliminary design and cost estimates. The CRESP analysis tends to support DOE's evaluation that economic impacts are not a discriminating factor among the alternatives, especially when the preliminary nature of the design and cost estimates is recognized. The scope of this study exceeded what DOE considered to be necessary to understand the potential impacts of the salt processing alternatives.

L12-5 DOE used several factors to evaluate the alternatives, including cost, schedule, technical maturity, technical implementability, environmental impacts, facility interfaces, process simplicity, process flexibility, and safety.