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Downsizing U.S. Department of Energy Facilities: Evaluating Alternatives for the Region Surrounding the Savannah River Nuclear Weapons Site Region

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Abstract

The economic impacts of reduced investments by the U.S. Department of Energy (DOE) are estimated for the period 2000 to 2035 for the region surrounding the Savannah River Nuclear Weapons Site in South Carolina and for the states of South Carolina and Georgia. The detrimental economic impact, which reaches more than 20 percent of jobs, and personal income in the multi-county area immediately surrounding the site, can be reduced by on- and off-site investments. The impacts of building an accelerator to produce tritium and to destroy extremely dangerous nuclear wastes, and of investing in the region's educational system and infrastructure are explored as illustrations. The findings imply a need for considerable thought about what kinds of investments should be made in the region by an interdepartmental group rather than relying solely on the DOE.

Key words: nuclear weapons site, downsizing, countermeasures

1. Introduction

When the U.S. government chose a site on the Savannah River, near Aiken (SC) in 1950, national security was the paramount concern. The tens of thousands of construction workers and site employees who moved into the surrounding area to make tritium and other elements for nuclear weapons brought more economic growth to this area and its counterpart in Hanford (WA) than other part of the nation during the late 1940s and early 1950s. Economic growth continued during the Cold War. During the period 1970-1993, for example, Aiken, Barnwell, and Columbia counties grew much more in employment, population, and personal income than comparable counties that had no nearby major nuclear weapons site (Greenberg, Isserman, Krueckeberg, et al., 1998).

Even after the Cold War ended, at first, there appeared to be no let up in economic development near the major weapons sites because the U.S. Department of Energy (DOE) embarked on a massive environmental remediation program. By the early 1990s, the DOE was spending $6 billion a year on environmental management. Not only was this the largest environmental management budget of any government department/agency in the world, but 70% of the total was concentrated at five sites in Colorado, Idaho, Tennessee, South Carolina, and Washington. In 1997, the environmental management budget at the Savannah River weapons site exceeded a billion dollars (in constant $1992) (U.S. DOE 1995a,b,c; Frisch et al., 1998).

However, also in 1997, DOE upper management announced that the environmental management program was too costly and inefficient and was in need of strategic reassessment. Their accelerated cleanup plan was the direct result of this reassessment (U.S.DOE, 1997a). The goal of accelerated cleanup is to address as many of the costly cleanups as soon as possible. This acceleration,

the DOE asserts, will reduce long-term costs by increasing productivity without sacrificing public health and environmental protection. In its 1997 and earlier reports the DOE's mid-range estimated environmental management costs for the period 1995 through 2070 were $230 billion. The mid-range of the first version of accelerated cleanup estimated the cost as $133 billion, a remarkable difference.

Using data from the first versions of the plan and subsequent documents published in 1998 (U.S.DOE, 1997a), we estimated the off-site economic impacts on the areas immediately surrounding the massive DOE sites in Colorado, Idaho, New Mexico, South Carolina, Tennessee, and Washington. We found that job and personal income impacts fell most heavily on the three most rural regions around the Savannah River (SC), Hanford (WA) and Idaho National Engineering and Environmental Laboratory sites (Greenberg et al., 1997). This was not surprising because we calculated that 8, 14, and 17 percent of the gross regional product of these three regions, respectively, could be accounted for by the DOE's environmental management expenditures.

Compared to baseline estimates of what employment levels would be expected, the Savannah River region was 20,000-25,000 jobs below its expected year 2010 employment, or 8 percent of its total employment. The impact on personal income was estimated to be slightly higher. An even more distressing view was obtained when we compared accelerated cleanup impacts with estimates based on DOE's (1995a,b,c; 1996, 1997b,c) pre-accelerated cleanup estimates of its expected budgetary expenditures. Investing these pre-accelerated environmental management dollars in the SRS regional economy created 11,000 additional jobs above the national estimates. The difference in jobs produced by the pre-accelerated cleanup estimates and accelerated cleanup numbers was 36,000 in the year

2010, or over 10 percent of all jobs expected in the region. A relative loss of 36,000 jobs would be the largest impact sustained by any of the major DOE site regions.

Some caveats are in order about the previous study. First, the environmental management budgets were provided in a form that did not permit us to gradually reduce the allocations after the year 2006, which was the expected end of accelerated cleanup. Consequently, a massive decrease in DOE environmental management budgets hit in the year 2007, in other words, we simulated near-term worst-case economic situations for the regions. New DOE documents provide much greater detail about the temporal pattern of environmental management expenditures. Second, the economic simulation model we used had only 10 business sectors, so interindustry transactions were not captured in classifying the investments, which may have led to misallocation errors in the calculations. Third, the first simulations included Burke (GA), Richmond (GA), Aiken (SC), Allendale (SC), and Barnwell (SC) as the Savannah River region. In fact, the impact of the SRS reaches beyond those counties. In particular, we wanted to include the rest of the states of South Carolina and Georgia to estimate the impacts on the larger two-state area. Fourth, the DOE's site management has been working to bring new projects to the sites, and regional leaders are trying to bring DOE-related as well as other activities which will buttress their regional economy. These were not formally tested as economic countermeasures in the previous study.

Personal interviews with many business leaders, elected officials, and government employees, reviews of mass media coverage of the site, and a sample survey of over 1,000 residents allow us to say that the public as a whole is as concerned about the economic health of their region as they are about on-site nuclear hazards (Williams et al., 1998; Lowrie and Greenberg, 1997; Lowrie, Waishwell and

Greenberg, 1998). As a university-based group funded by the DOE to be responsive to community concerns, the research reported here examines the economic impact of downsizing at the site and potential countermeasures. The paper concludes by reviewing the hard policy choices that need to be made.

To make the presentation more manageable, four simplifications were made. All the dollar estimates in the paper were converted to constant 1992 dollars, unless otherwise indicated. The simulations were actually made for nine regions, but we present results summarized into three regions in the text. In fact, most of the results presented here are for the region immediately surrounding the site because it is the one with the most to lose and gain. Third, annual results are too numerous to present. Instead, selected years are presented. Fourth, the analysis produced results for employment, personal income, gross regional product, and population. We concentrate on the employment results and present some personal income and population results in the text.

2. Methods and Their Limitations

An economic simulation model designed by Regional Economic Modeling Inc. (REMI) was built for the research. The model uses national forecasts developed by the U.S. Department of Labor as national estimates (Treyz, 1993; Grimes, Fulton, Bonardelli, 1992) . The model is a dynamic representation of the economic relationships among capital stock, final demand, labor supply, output, prices, profits, and wages from the period 1969-1994**.** The forecasts include measures of economic output, inter-industry detail, multi-regional effects, and a demographic element.

We made seven decisions about the design and application of the model which influence the

results. Each of these is briefly discussed. The first decision was choice of regions. The model is built around county units. With the advice of Christopher Noah of the Westinghouse Savannah River Company, South Carolina and Georgia were divided into eight regions (Table 1). The rest of the United States (48 states and District of Columbia) is the ninth region.

Table one about here

Four counties adjacent to the SRS site in South Carolina constituted the SRS-SC group. With a 1995 population of 187,000, it is the smallest region in population. Yet all the SRS facilities are located in this region and 64 percent of the SRS labor force reside in these four counties.

SRS-GA consists of three counties west of the SRS site in Georgia. Only 300,000 people live in the three counties, but 28 percent of the SRS labor force resides in the three counties. Aggregate SRS-region results are presented for the combination of SRS-SC and SRS-GA.

The SRS-region is heavily dependent on the DOE site. With a total gross regional product of $9.4 billion in 1994, the DOE environmental management budget accounted for $764 million, or 8.2 percent of the SRS regional product. Defense and other site-related activities accounted for an equal amount as environmental management, so 16.5 percent of the gross regional product is directly related to the DOE site.

Four of the study regions are major metropolitan areas in South Carolina and Georgia. The Atlanta metropolitan area with a population of almost 3.5 million is the biggest, containing almost 1/3 of the population of the two states. The Savannah, Columbia and Charleston metropolitan regions account for another 12 percent of the population. The remaining 52 percent of the population is composed of the residents of the remaining 176 counties in the two states.

While site impacts are concentrated in the SRS-region, we present aggregate results for an aggregate of the above six regions, which is called "Rest of SC and GA."

A second important decision was to build a model that could capture transactions that occur among these eight regions and the rest of the United States. The multi regional composition of the model allows us to examine flows of dollars in and out of regions.

The forecasting period was a third design issue. REMI provides a baseline forecast from 1995 to 2035. We know that economic conditions change rapidly in the world and that long-term forecasts with REMI or any simulation model are dubious. For context, Treyz (1993) found average U.S. national employment estimates were 1.4 to 1.8 percent off in the first year and 5 to 7.5 percent off in the eighth year. Recognizing that simulations produce more accurate estimates in the near rather than in the long term, while we present annual results out to the year 2035, we focus on the next 15 years.

The extent of inter-industry detail was a fourth design decision. The model we used has 53-economic sectors: 11 durable products manufacturing; 10 non-durable products manufacturing; mining; construction; 7 transport and public utilities; 4 finance, insurance and real estate; 2 retail trade; wholesale trade; 11 services; agricultural services; state and local government; federal civilian; federal military; and farm. The U.S. Bureau of Economic Analysis, which prepared the data used in REMI, characterizes employment at these DOE sites by the business of the site contractor. In this case, Westinghouse-SRS, the contractor for SRS, is characterized as chemical manufacturing.

A fifth decision was to run the simulations with and without compensation from other federal government programs. Since the DOE EM budget is a tiny part of the overall United States budget, we could assume for purposes of the analyses that the additional funds added to budget do not come from

another federal source. However, in these tight budgetary times, new federal spending is typically offset by cuts in spending some place else. Therefore, we ran the model in a way that cut federal funds from other programs across the board to pay for changes in expenditures in environmental management. In regions that have a military base, for example, we expected to see a measurable, albeit small difference between the compensated and uncompensated runs. We also ran the analyses without compensation for comparison. Since the net result of accelerated cleanup is an increase in the rest of the nation's budget, we present the results without compensation. Differences between compensated and uncompensated results are reported as part of the preliminary results.

The sixth decision was to utilize a combination of assumptions about regional economic response to stimulation that allow for up to a three-year lag in local market adjustments to the inflows of capital. This allows for some multiplier effects within the economy, and implies that the market cannot always respond quickly to changes in prices and employment.

The seventh choice was where to invest the funds. DOE-SRS and Westinghouse-SRS purchase products from national and regional markets. We do not have the locations of these purchases. One possibility was to invest all of it in the SRS-SC region where all the site jobs are located. However, we know from DOE reports that many of the purchases and a large number of employees do not live in the four SRS-SC counties. We invested the accelerated cleanup funds in direct proportion to the distribution of the employees' residents. This decision may slightly overestimate the impact on SRS-Georgia and underestimate the impact on SRS-South Carolina.

3. Results

3.1. Preliminary Tests

Before presenting the results of the economic impact analysis, we summarize the results of simulations done with and without compensation from other federal programs. The uncompensated runs assume that the additional budgetary resources come from another source outside the model. The compensated runs assume that every one of the $1.17 billion added to the off-site economic development comes out of another federal government program. As expected, there were only small differences between the compensated and uncompensated education investment analyses in our regions of interest. For example, in the year 2000, the uncompensated simulations produced 1.7 more jobs and 2.9 percent more personal income than their corresponding compensated simulations. This small difference declined even more during the study period.

The difference between compensated and uncompensated for high technology systems such as an accelerator are larger than for education. Columbia, Charleston, and SRS-Georgia have major military and other federal installations that account for a large proportion of the local economy. Therefore, the compensated simulation results for these three sub-regions were about 10% different from uncompensated ones. Since the compensated and uncompensated runs are strongly correlated, it is unnecessary to present both sets of results. We present the uncompensated ones and note that the compensated runs produce slightly fewer jobs and less increase in personal income.

3.2. REMI-BEA Baseline Results

Before reviewing the estimated impacts of accelerated cleanup and counter economic measures, the baseline needs to be reviewed for context. The baseline uses moderate estimates of U.S.

economic growth and apportions these to the regions based on historical trends in regional growth. Relative growth by regions is accommodated in the model by macroeconomic equations representing relationships in the U.S. economy from 1969 to 1994 with regard to the extent of local demand met locally, amount of trade between regions, and extent of labor migration.

The model continues the historical pattern of concentrating economic growth in major metropolitan regions and relative decline more in rural areas. The population of the Atlanta metropolitan region is estimated to grow 43 percent during the period 1995 to 2015. The populations of the three other metropolitan regions (Savannah, Columbia, Charleston) are forecasted to grow 28 to 31 percent. SRS-South Carolina and SRS-Georgia are predicted to grow 18 and 26 percent, respectively. The slowest growth forecasted is 15 percent for the remainder of Georgia and 13 percent for the remainder of South Carolina, which include less urbanized areas of the two states.

The baseline forecast implies that regions like Atlanta and Columbia South Carolina are better able to tolerate a loss of a major employer than more rural places like the SRS region. For example, the SRS region is expected to increase employment by 24 percent between 1995 and 2035. This compares to 28 percent for the rest of SC and GA and 30 percent for the rest of the U.S. Personal income is lower in the SRS region than the two comparable regions. It was $19.5 thousand per capita in the SRS region in 1995 compared to $20.4 thousand in the rest of the two states and $23.0 thousand in the rest of the U.S. Furthermore, personal income in real dollars (not in constant $1992) is expected to be 4.5 times higher in 2035 than in 1995 in the SRS region compared to 4.8 times in the rest of SC and GA. In other words, the SRS region is relatively poor and expected to become relatively poorer than the comparable areas, even without the added economic losses due to downsizing at the nuclear

weapons site.

Because the study area is less urban and less affluent than the rest of the United States, theory predicts and our model confirms that it takes more investment in this region to produce jobs and personal income than in more populous, urbanized and affluent regions. For example, a million dollar investment in the educational system of the Atlanta metropolitan region produces 50 jobs and $2.2 million dollars in personal income. In comparison, the same investment in the SRS-SC region produces 42.5 jobs and $1.4 million in personal income. In other words, large metropolitan regions have an advantage in turning investments into local jobs.

3.3. Accelerated Cleanup and Other DOE On-Site Activities

Environmental management at SRS includes environmental restoration, facilities decommissioning and deactivating, high level waste management, infrastructure maintenance and development, nuclear materials stabilization, solid waste management, spent nuclear fuel management, and administrative support, including security (U.S.DOE, 1997a,c;1998a,b). These general labels include more than 50 specific projects. DOE records show that environmental management budgets grew at SRS from $501 million in 1990 to almost three times that number in 1996 when it reached $1.3 billion. Under accelerated cleanup the budget is expected to sharply decrease (Table 2). It declines to $1.1 billion in the year 2000, to $846 million in 2010, reaches $558 million in the year 2020 and drops below $300 million in the year 2025. The environmental management budget in the year 2035 is estimated at $64 million. In other words, the site environmental management budget it expected to decrease to half of its recent amount, or by $500 million dollars during the next two decades. These

estimates obviously could change as the DOE and the U.S. Congress respond to changes in nuclear-related security needs and political pressure to invest more in this and other nuclear weapons regions.

Table 2 shows that the billion dollar a year budget for defense (mostly for tritium-related activities), security and other on-site activities shrank dramatically during the 1990s and is expected to drop to one-fourth of early 1990s budgets in three decades. Overall, the SRS site budget, which exceeded $1.5 million during the later 1990s, could fall to less than a billion dollars by the year 2010 and less than $500 million after the year 2025. Jobs follow the pattern of budgets. The site had over 20,000 employees in 1994. By 1998, it had less than 14,000. Site-related employment should fall below 10,000 after the year 2015, and reach less than 5,000 after the year 2025 without new activities.

Table two about here

Table 3 shows the major impact of these cutbacks estimated by the model in the year 2005. Jobs in the region fall over 17,000 below the baseline; personal income falls almost a billion dollars; and population drops 25,000 below expectations. These represent 6, 7, and 5 percent of the SRS-region economy, respectively. The rest of the SC and GA economies are larger and less dependent on the SRS site. They are expected to lose over 8,000 jobs, almost ½billion dollars in personal income, and 13,000 people. Yet these represent about one-tenth of one percent of their jobs, personal income and population. The rest of the US is the beneficiary of the decline of projects at the DOE sites, gaining more than 20,000 jobs and equivalent amounts of personal income and population.

Table three about here

The site loses more DOE budget between 2005 and 2015. Consequently, the SRS-region is expected to fall 23,000 jobs, $1.8 billion in personal income, and 40,000 people below the baseline.

These represent 8, 8, and 6 percent, respectively, of these indicators in the year 2015. The decline at the site is even greater between 2015 and 2035. The relative decline in the region is expected to continue, with a loss of 43,000 jobs, $6.1 billion in personal income, and 81,000 people. These represent 13, 14, and 12 percent of these economic indicators in the SRS-region.

Losses in the rest of South Carolina and Georgia also increase, but they remain far below one percent, and the remainder of the United States benefits from these losses in the two states.

3.4. New DOE On-Site Activities

SRS site management is pursuing new-defense and environmental management-related activities such as construction of an accelerator to produce tritium for nuclear weapons and destroy dangerous radioactive elements, and other facilities to dispose of surplus plutonium. DOE staff provided us with detailed information about the accelerator, which we used to estimate the potential impact on the SRS-region, even though we recognize that the facility may not be built at SRS or at all (Lobsenz, 1997).

Tritium has been produced in DOE reactors at SRS and occasionally in much smaller quantities at other sites. Accelerator production of tritium recently became more economical with improved technology. The accelerator would be a large facility with a footprint of 2000' by 500' (Wike, Moore-Shedrow, and Shedrow, 1996). The project is estimated to cost $3.9 billion (in constant 1992$), including $1.2 billion in contingency and escalation costs. Operating costs are estimated to cost $124 million a year, most of which is for energy and wages (LLNL, 1997). We met with design engineers and developed a process for assigning the project costs to the model's 53 industrial sectors and 9 regions. It is notable that much of the design and engineering, which began in 1996, takes place outside

of the SRS region, at Los Alamos (NM), Lawrence Livermore (CA), and New Jersey.

In fiscal 1999, when over $400 million is expected to be spent on the facility, only $154 million would be spent in the SRS-region. Expenditures for construction rise rapidly at the site to $286 million in fiscal 2000, $414 in 2001, and to a peak of $456 million in 2002 (Table 4). Plant construction costs decline rapidly, and the plant is opened in the year 2007. Thereafter an annual operating cost of $117 million is allocated.

Table four about here

Table 4 shows the job impact of these investments during the period 2000 to 2007 for the area surrounding the SRS counties. The text provides data on the rest of the two states. Over 4,000 jobs are expected to be added in the SRS region and another 1,100 in the rest of South Carolina and Georgia in the year 2000 by the construction of the facility. This increases to 6,000 jobs in SRS-region and 1,600 in the rest of SC and GA in the year 2002, the peak year for construction. Thereafter, job impacts decrease reaching a steady state of 1,800 in the SRS region and another 900 in the rest of SC and GA.

The importance of this impact depends upon the reader's values. Figure 1 shows the baseline employment, and employment impacts related to accelerated cleanup and construction of the accelerator in the SRS-SC region. This region, which is the South Carolina part of the SRS region, is the most heavily impacted by declines in activity at SRS. In the year 2002, this region is expected to fall 7,700 jobs, or 8 percent below the baseline regional total. This increases to over 10,000 jobs in the year 2007. Figure 1 shows that the construction of the accelerator has a major employment impact. A total of 3, 600 jobs are estimated to be added to the SRS-SC region by the accelerator construction in

the year 2002, in other words, about 45 percent of the estimated job loss. In the year 2007, with the construction completed, the gain of almost 1,000 jobs at SRS-SC makes up a declining fraction of the 10,000 plus jobs expected to be lost in this heavily DOE-dependent region. Overall, residents of the region would be expected to view the accelerator construction as a major economic benefit, especially during the period of construction.

Figure one about here

A less charitable view of the impact would come from economic efficiency experts who would be distressed by the relatively few jobs created per million dollars invested. Typical businesses in the American economy generate about 20 jobs per million invested. An investment of a million dollars to produce about 14 jobs (Table 4) is an expensive way of generating jobs in a relatively rural region.

In fact, this level of job multiplier is typical of high technology and infrastructure in rural regions. The long-term national impact may be beneficial in the form of new technologies and consumer products, and rural regions may benefit in the long-run if infrastructure and high-technology lure new developments. But these long-term benefits are most certainly not assured. In the short-run, rural regions do not benefit as much as urban ones because they lack the forward and backward linkages to the economy, which means that a good deal of the labor, especially the high salaried labor and products are purchased outside the region. In the case of the accelerator, for example, we noted that much of design and engineering work was done outside of the SRS region in New Mexico, California, and New Jersey. Our experimental simulations, as illustrated below, suggest that many of the high technology projects planned for the site will have an employment multiplier and pattern of expenditure that resembles the tritium accelerator.

3.5. Off-Site Activities

Regions are always seeking to improve their attractiveness to outside business and the ability of local entrepreneurs to build business. They have different ideas about how to invest their funds. Expanding educational systems and building infrastructure, such as roads and sewers, are two common choices (Anderson, Bischak, Oden, 1991; Employment Research Associates, 1988; Warren, 1996; Peltier, 1997; PH Fantus 1995). Both have the attributes of attracting new business from the outside, stimulating local entrepreneurs to build new home-grown businesses, and reassuring local businesses that may be considering relocation to another region to stay. We examined the impact of investing in education and infrastructure in South Carolina and Georgia. The simulation alternatives presented here were developed by the authors and do not have any official standing with any government or local stakeholders group.

In order to make this analysis completely transparent, we used a simple investment process. Currently, the two states invest an average of $915 per capita on education (U.S. Bureau of the Census, 1996). An additional $100 per capita across the two states would correspond to an increase of $1.17 billion across the two states in the year 2000 and $1.37 billion in the year 2015. For context, the DOE environmental management budget at SRS during the late 1990s has averaged about $1.1 billion.

We allocated the education and infrastructure investments in two ways. The "di allocation method invested the money in direct proportion to the population. In contrast, the "SRS-concentrated" method allocated $500 per capita to the SRS region and the remaining funds to the rest of the two states. This means that when $500 per capita was added to the seven SRS counties, only

$82.18 was added per capita to the rest of the states. The money was invested in direct proportion to current investment practices in the two states in 1998. For example, regarding education, we averaged allocations of the two states, leading to an assignment of 70 percent of the funds to primary and secondary education, 26 percent to colleges and universities, and 4 percent to vocational and other schools.

Table 5 estimates the job impact of the dispersed and concentrated investments. The $500 per capita investment in education would make up much of the impact of the expected job losses at the SRS site. The difference between the results for education and infrastructure are striking. An investment of $52.5 million in education in the year 2000 is estimated to produce 2,400 jobs in the SRS region compared to only 1,000 jobs for a similar investment in infrastructure. An investment of $500 per capita in education in the SRS region, which corresponds to a 50 percent increase above present state rates is estimated to produce 11,600 jobs. The same investment in infrastructure is estimated to generate 3,800 jobs. The reason for the difference is obvious. The employment multiplier for education is over 40 jobs per million invested compared to less than 20 for infrastructure.

As further context, the job multiplier for infrastructure is quite similar to that for the accelerator, primarily because most of the money is spent on expensive technology and products and employees are more well-paid and fewer in number. In contrast, recreation is an activity, like education, with a job multiplier of over 40 per million. Much of the money is spent in the region in the form of hotels, food, fishing bait, and so on. Workers are not paid wages comparable to the workers who construct sophisticated technologies or highways.

Table five about here

In addition to the difference associated with type of investment, our simulations point out that a gap between the benefits of investing in urban metropolitan regions and relatively rural regions is big and widens over time. That is, the gap between job creation in the metropolitan and less developed regions widens throughout the study period. A way of demonstrating this metropolitan advantage is by investing the same amount of money in regions that are roughly comparable in population but different in urbanization. In this case, the population of SRS region was 487,000 in 1995 and the population of the Columbia metropolitan region was 495,000, a small difference. But Columbia is a much more urbanized region with a larger infrastructure and educational system in place. We invested $100 per capita in the SRS region, then we invested the exactly the same amount of money in the Columbia metropolitan region. In other words, we pretended that the SRS region's money was invested in Columbia.

Regarding the SRS region, 2284 jobs are estimated to be created in the year 2000 compared to 2622 when the same amount of money was invested in the Columbia economy, a 15 percent difference. Furthermore, the gap between the two economies widens each year. In the year 2015, the gap reaches 19 percent. The differences in personal income and gross regional product are less than they are for employment, but they also increase during the study period.

4. Tough Choices: a Need for Strategic Regional Planning

Before summarizing the major findings and discussing policy implications, we briefly reiterate the point that economic simulation analysis is an inexact science because of the limitations of the data and methods. Econometric models rely on historical relationships to simulate the future. The farther into the future the prediction, the less likely the model is capable of capturing major changes that

impact the future. A second limitation of the present study is that we chose education and infrastructure to illustrate off-site investments and an accelerator for an on-site one. Each region and jurisdiction within it doubtless has their own ideas of how they want to rebuild their economy, and SRS site management is engaged in competing for a variety of on-site activities.

With these caveats in mind, we began the study with the knowledge that the SRS region has been suffering economically. The economic simulations did nothing to alleviate those concerns. The seven county region is not expected to grow as rapidly as the two states as a whole. The simulations suggest that the continuing loss of defense and potential loss of environmental management jobs will lead to the region falling 5 to 9 percent below expected levels of employment, personal income, gross regional product, and population by the year 2005. Furthermore, these relative losses will widen.

The point of these simulations is not to make a case that the national government must provide funds to the SRS or any of the other former major weapons regions or that the states must divert funds to these regions. Many researchers have thoughtfully presented the pros and cons of government bolstering sagging economies (Anderson, Bischak, and Oden, 1991; Employment Research Associates, 1988; Hooks and Getz, 1996; Weida, 1993; Oden and Markusen, 1995; Office of Policy Research, 1997).

We recognize that a great deal of political pressure is being exerted on the national government to provide assistance beyond that in the DOE's small community transition programs, which allocated $200 million to 11 major sites during the period 1993 to 1998 (U.S. DOE, 1998c). We fully expect the political system will produce some economic investments in this region. The real issue for us is what kinds of investments make sense and what process should be used to make the decisions.

One option is to delay accelerated cleanup so that the kinds of budget reductions in environmental management tested here are delayed. Delay has major implications for the DOE's efforts to meet its environmental management missions in a cost-efficient manner. A second option is for the federal government to build an accelerator, a plutonium management system, and other high-technology missions on the site. The combination of these projects would abate the regional economic decline. However, the price to be paid is high cost per job created. In essence, the rest of the United States would be subsidizing this region. Off-site investments in education, recreation and other activities produce far more local economic impacts per dollar invested. However, the DOE is not the organization best suited to manage the construction of colleges and high schools and hiring teachers.

We think the logical policy response to these difficult choices is for the U.S. government to create an interdepartmental committee consisting of the DOE, the departments of Housing and Urban Development, Commerce, Transportation, and EPA, and their state and local counterparts, and to charge this group with developing a strategic economic and environmental plan for this region and the for large DOE sites in Idaho and Washington with similar economic and environmental problems. A criticism of this suggestion is that it only delays the inevitable pain the region needs to endure before making its way toward economic diversification. However, we strongly believe that funding and a national-state-local planning effort is morally warranted by the twin legacies of severe long-term contamination and economic dependence left to this region. A multi department group needs to contend with the striking difference between economic sectors in producing jobs, income, and gross regional product. Local journalists write about the pros and cons of becoming the place where more tritium is produced and plutonium is managed (Burris, 1997; Seabrook, 1996; Livingston, 1996), and

about the need for better sewers, roads, and small businesses to promote local growth, and the need to increase education funding (Warren, 1996, Surratt, 1996, Peltier, 1997, Immergluck, 1993, Levin, 1998). In the short run, it is clear that investing in education, recreation, and other activities that rely mostly on local people and local products produces the most jobs and income. Concentrating investments on roads, bridges, sewers, and other local infrastructure produces far fewer jobs and income in the short run. In the long run, improved infrastructure may be essential to making the region attractive to outside investors and retaining local entrepreneurs. As a development strategy, on-site investment in DOE projects brings a lot of construction employment, but much less certainty about local economic benefits in the long run. Clearly, multiple on-site projects will be required to compensate for losses of defense and environmental projects that have helped sustain the economy of this region.

Not to have an interdepartmental group engage in these decisions is by default to expect a single department, the DOE, to assume the national responsibility for this region. The DOE is not an economic development organization and if it has to sustain this region with its current mission it will make inefficient environmental management decisions. This region, and the ones surrounding the facilities in Idaho and Washington, need targeted strategic investments to replace 50 years of dependency on a single federal department.

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Table 1

Areas included in the Savannah River site planning model

Name	Counties	Population, 1995 (1000s)	% of population in SC&GA
SRS-region			
SRS-South Carolina	Aiken, Allendale, Barnwell, Edgefield	187	1.7
SRS-Georgia	Burke, Columbia, Richmond	301	2.8
Rest of SC and GA			
Atlanta, MSA, Georgia	Barrow, Bartow, Carroll, Cherokee, Clayton, Cobb, Coweta, De Kalb, Douglas, Fayette, Forsyth, Fulton, Gwinnett, Henry, Newton, Paulding, Pickens, Rockale, Spaulding, Walton	3,429	31.4
Savannah, MSA, Georgia	Bryan, Chatham, Effingham	279	2.6
Columbia, MSA, South Carolina	Lexington, Richland	495	4.5
Charleston, MSA, South Carolina	Berkeley, Charleston, Dorchester	531	4.9
Rest of Georgia	139 counties	2,507	23.0
Rest of South Carolina	37 counties	3,176	29.1
Rest of United States			
	Rest of 48 States and District of Columbia	-----	----

Table 2

Estimated environmental management and other budgets at the Savannah River site, 1994-2035*

(constant $1992, millions)

Year	Environmental management	Other SRS budget	Security budget	Total of three	change since 1994
1994	723	985	61	1769	---
1996	1302	161	47	1510	-259
2000	1118	210	46	1374	-395
2005	922	210	36	1168	-601
2010	846	210	37	1093	-676
2015	713	210	37	960	-809
2020	558	210	38	806	-963
2025	298	210	38	546	-1223
2030	143	210	23	376	-1393
2035	64	210	9	283	-1486

*Sources: U.S. DOE, 1995c, 1996, 1997b,c, 1998a,b.

Table 3

Impact of accelerated cleanup and other disinvestment

Year	Indicators	SRS-region	Rest of SC & GA	Rest of U.S.
1995	Baseline:			
	Employment, 1000s	260.5	5,873.5	141,226.8
	Personal income, $billions	9.5	212.5	5,792.7
	Population, 1000s	488.1	10,416.5	252,029.8
2005	Baseline:			
	Employment, 1000s	281.6	6,413.0	157,413.5
	Personal income, $billions	14.4	328.0	8,894.2
	Population, 1000s	543.5	11,773.7	276,530.7
	Impact of changes in DOE site budgets:			
	Employment, 1000s	-17.3	-8.5	22.5
	Personal income, $billions	-.98	-.48	.89
	Population, 1000s	-25.5	-13.2	38.3
2015	Baseline:			
	Employment, 1000s	301.6	6,932.2	168,532.1
	Personal income, $billions	21.3	495.4	13,015.7
	Population, 1000s	600.1	13,064.7	302,035.3
	Impact of changes in DOE site budget:			
	Employment, 1000s	-22.9	-11.8	28.2
	Personal income, $billions	-1.77	-.90	1.45
	Population, 1000s	-39.8	-20.7	56.1
2035	Baseline:			
	Employment, 1000s	323.5	7,500.2	184,097.8
	Personal income, $billions	42.6	1,015.0	26,573.0
	Population, 1000s	694.2	15,278.2	352.903.0
	Impact of changes in DOE site budget:			
	Employment, 1000s	-43.1	-22.8	49.8
	Personal income, $billions	-6.10	-3.24	4.84
	Population, 1000s	-80.9	-43.1	99.4

Table 4

On-site: tritium plant option to balance projected budget cuts

Year	Indicator	Result
2000	Spent in the SRS region, $millions Employment impact, SRS region, 1000s Jobs per $million, SRS region	286 4.1 14.3
2002	Spent in the SRS region, $millions Employment impact, SRS region, 1000s Jobs per $million, SRS region	456 6.0 13.2
2005	Spent in the SRS region, $millions Employment impact, SRS region, 1000s Jobs per $million, SRS region	207 2.8 13.5
2007	Spent in the SRS region, $millions Employment impact, SRS region, 1000s Jobs per $million, SRS region	117 1.8 14.4

Table 5

Off-site: impact of education and infrastructure investments in SRS region

Year	Indicator	Dispersed Option	Concentrated option
2000	Education,		
	Spent in the SRS region, $millions	52.5	262.5
	Employment impact, SRS region, 1000s	2.4	11.6
	Jobs per million, SRS region	45.7	44.2
	Infrastructure,		
	Spent in the SRS region, $millions	52.5	262.5
	Employment impact, SRS region, 1000s	1.0	3.8
	Jobs per million, SRS region	19.0	14.5
2015	Education,		
	Spent in the SRS region, $millions	60.1	300.5
	Employment impact, SRS region, 1000s	3.1	15.0
	Jobs per million, SRS region	51.6	49.9
	Infrastructure,		
	Spent in the SRS region, $millions	60.1	300.5
	Employment impact, SRS region, 1000s	1.1	4.2
	Jobs per million, SRS region	18.3	14.0

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