

Economic Impact of the US Department of Energy's Oak Ridge Office of Environmental Management for Fiscal Year 2014

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Executive Summary

The Department of Energy's Oak Ridge Office of Environmental Management (DOE-OREM) is responsible for significant economic impact in the state of Tennessee, and more specifically in Anderson, Roane, and Knox Counties. The impacts are measured in terms of jobs and income created for area residents, as well as tax revenues generated for state and local governments. The Howard H. Baker Jr. Center for Public Policy conducted this study to identify the primary economic impact derived from DOE-OREM's programs for Tennessee and the three-county region during fiscal year 2014 (FY2014). The study confirms substantial economic impacts from DOE-OREM's activities.

Key findings (which aside from charitable giving account for direct, indirect and multiplier effects):

- **DOE-OREM and its contractor's spending supported creation of an estimated \$1.3 billion in nominal output (\$638 million in PDV terms) in Tennessee.**
- **Total expenditures (direct, indirect and multiplier effects) by DOE-OREM and its contractors added approximately \$545 million to Tennessee's state gross domestic product (SGDP) in FY2014, including \$422 million in Anderson, Roane, and Knox Counties.**
- **Each in-state dollar directly paid by DOE-OREM translates into almost \$2 in personal income for Tennessee residents. In 2014 DOE-OREM-related activities generated approximately \$317 million, of which \$278 million was in the three-county region.**
- **In 2014 DOE-OREM-related activities generated 6,164 direct and indirect jobs in Tennessee, of which 4,756 were in Anderson, Roane, and Knox Counties. Employment is related in part to the extensive number of subcontractors employed by DOE-OREM contractors.**
- **State and local sales tax revenues of \$17 million were generated from spending by DOE-OREM and its contractors. Of this total, \$15 million in tax revenues were generated in the three-county region.**
- **Direct regional economic impacts include approximately \$511,000 donated by DOE-OREM contractors and their employees to various local charities.**

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I. Introduction

The Oak Ridge Office of Environmental Management is a U.S. Department of Energy field site established to address the environmental legacies that resulted from the Manhattan Project and activities associated with the subsequent Cold War. DOE-OREM's annual operating budgets represent a sizable portion of the regional economy through the creation of jobs and income and the presence of a sustained source of state and local taxes. While DOE-OREM's primary presence is in Anderson, Roane, and Knox counties, the program's economic impact accrues statewide as the ripple effect of initial economic impact multiplies and extends beyond the three-county region.

This report examines the economic impact attributable to the operations of DOE-OREM for fiscal year 2014 in Anderson, Roane, and Knox counties, as well as the aggregate impact for the state of Tennessee. The remainder of the report is composed of four sections. The second section provides DOE-OREM expenditure data for both the state and the three-county region. Section III provides an analysis of the economic impact for Anderson, Roane, and Knox Counties as measured by output, income, jobs, and sales tax revenue arising from activities of DOE-OREM and its major contractors. Section IV provides a comparable analysis of the economic impact for the state of Tennessee. Section V concludes.

II. DOE-OREM Expenditure Data

Estimates of the economic impact derived from DOE-OREM and its contractors are based on actual 2014 spending figures. The economic impact model utilizes direct expenditure data provided by DOE-OREM and its contractors as inputs to generate impact estimates.

The data collection process avoided double counting of contracted and subcontracted spending. The model disaggregated expenditures into 59 major industrial sectors. Table 1 displays DOE-OREM-sponsored FY2014 spending by sector in Tennessee. Total direct payroll, pension, and non-payroll spending in Tennessee totaled \$305.4 million.

The analysis contains three main components of DOE-OREM expenditures: the direct effects, the indirect effects, and the multiplier effects. When DOE-OREM and its contractors provide jobs, they generate direct income impact for employees. Jobs and personal income also are generated indirectly when DOE-OREM and its contractors purchase goods and services from manufacturers, service providers, and vendors that, as a result of these expenditures, hire workers and generate additional income.

The report aggregates direct, indirect, and multiplier effects to yield the total income, employment, and tax revenue impacts of DOE-OREM expenditures. Actual operation of DOE-OREM accounts for direct effects. Specifically, hiring of DOE-OREM and contractor staff

produce the direct employment impact. Payments to these workers provide the direct income effect. Indirect effects result from DOE-OREM-related purchases of goods and services. The multiplier effect occurs as the direct and indirect incomes are spent and re-spent within the three-county economy. For example, DOE-OREM-related employees spend a portion of their wages and salaries on goods and services such as housing, clothing, and food in Tennessee. Likewise, the owners of businesses receiving these payments will use a portion of the proceeds to pay their employees and earn profits, continuing the cycle. Throughout each of these subsequent rounds of spending, a portion of direct and indirect income leaks out of the local economy through federal taxes, payments to non-residents, savings, and spending outside of the local area. (The impacts that arise in Tennessee but outside the three-county area will be captured by the statewide impact analysis presented below.) As a result, the leakages diminish additional impacts on the regional economy and its residents.

The largest DOE-OREM-related expenditure category in 2014 was payroll spending, accounting for \$145.5 million, or 47.6 percent of total expenditures in Tennessee. Other notable spending categories included \$65.6 million in waste management and remediation services. DOE-OREM subcontracts out a substantial portion of its work. The two largest DOE-OREM contracts in 2014 were Isotek Systems, LLC and URS | CH2M Oak Ridge LLC (UCOR). Together, these two contractors accounted for 74.6 percent of total DOE-OREM-related expenditures in Tennessee.

Table 1: FY14 DOE-OREM-Related Expenditures in Tennessee by Industrial Sector

Sector	Expenditures (in dollars)
Mining, Except Oil & Gas	\$0
Utilities	8,642,061
Construction	4,218,449
Wood Product Manufacturing	0
Nonmetallic Mineral Product Manufacturing	0
Primary Metal Manufacturing	0
Fabricated Metal Product Manufacturing	519,977
Machinery Manufacturing	3,916
Computer & Electronic Product Manufacturing	46,545
Electrical Equipment & Appliance Manufacturing	147,133
Other Transportation Equipment Manufacturing	0
Furniture & Related Product Manufacturing	8,423
Miscellaneous Manufacturing	939,964
Textile & Textile Product Mills	0
Apparel, Leather, & Allied Product Manufacturing	32,055
Paper Manufacturing	0
Printing & Related Support Activities	2,179
Chemical Manufacturing	0
Wholesale Trade	193
Retail Trade	1,402,698

Air Transportation	8,855
Water Transportation	9,810
Truck Transportation	523,912
Transit & Ground Passenger Transportation	715
Other Transportation & Support Activities	16,170
Warehousing & Storage	19,135
Publishing Industries, except Internet	661,246
Broadcasting & Telecommunications	1,966,074
Internet & Other Information Services	91,630
Federal Reserve Banks, Credit Intermediation, & Related Services	0
Securities, Commodity Contracts, & Investments	0
Insurance Carriers & Related Activities	470,350
Real Estate	1,304,958
Rental & Leasing Services & Lessors of Intangible Assets	870,998
Professional, Scientific, & Technical Services	6,125,702
Management of Companies & Enterprises	5,948,330
Administrative & Support Services	213,291
Waste Management & Remediation Services	65,612,239
Educational Services	749,156
Ambulatory Health Care Services	98,995
Hospitals & Nursing & Residential Care Facilities	0
Social Assistance	1,075
Amusements, Gambling, & Recreation	0
Accommodation	419,601
Food Services & Drinking Places	1,036,178
Other Services	24,932,400
Postal Service	0
Payroll	145,496,691
Pensions	22,903,557
Health Insurance	9,933,684
Total Expenditures in Tennessee	\$305,378,345
Total Non-Payroll Expenditures in Tennessee	\$127,044,413

III. FY2014 Jobs, Income, Output, and Sales Tax Impact of DOE-OREM in Anderson, Roane, and Knox Counties

This section examines the quantifiable DOE-OREM-related impact from income, jobs, and tax revenue. The Appendix provides an overview of the model used to generate the data.

Summary of Impact

DOE-OREM activities in FY2014 generated a total payroll of \$145.5 million paid directly to employees. Pensions represented an additional \$22.9 million in compensation. DOE-OREM activities generated a total of \$127 million in direct non-payroll expenditures, accompanied by \$9.3 million in direct sales tax contributions. Each of these expenditure categories produced indirect and multiplier impacts in the regional economy.

Table 2 shows that the economic impact of DOE-OREM-related spending in Anderson, Roane, and Knox Counties in 2014 was substantial. Output (measured by SGDP) was approximately \$422.3 million. A total of 4,800 jobs are generated and \$277.9 million in personal income is created. State and local sales tax revenues totaled nearly \$15 million.

Table 2: Summary of FY14 Economic Impact of DOE-OREM in Anderson-Roane-Knox Counties Region

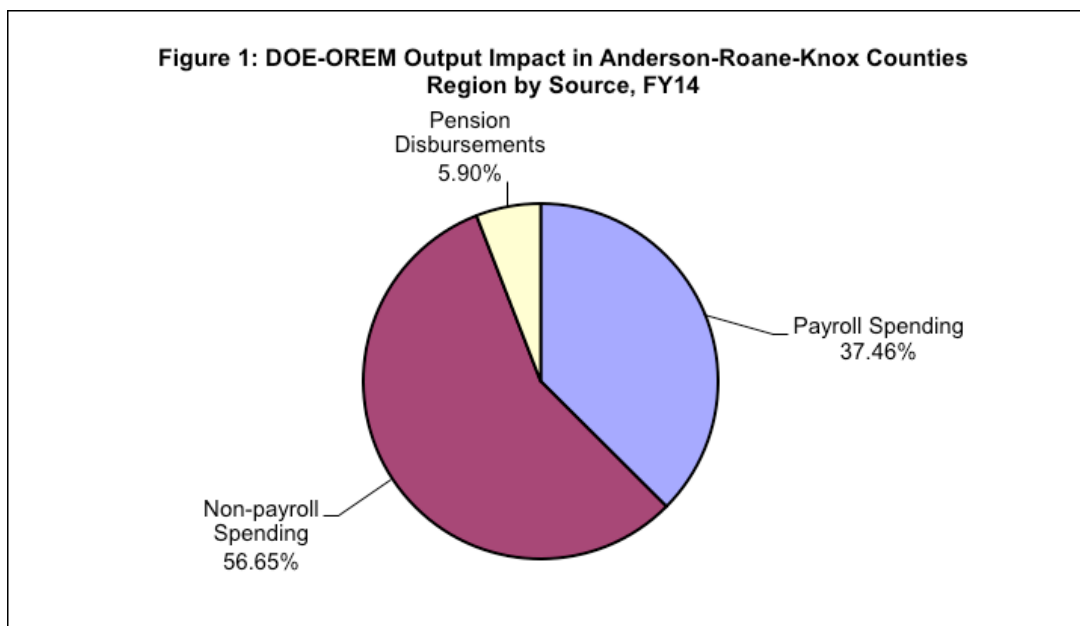
Output (SGDP)	\$422,295,436
Personal Income	\$277,852,568
Sales & Use Tax Revenue	\$14,933,864
Employment	4,756

Output Impact

DOE-OREM and its contractors generated an estimated \$422.3 million in output impact in FY2014. Table 3 provides a breakdown of the three categories that contributed to this output benefit. Non-payroll spending generated the largest portion of output with \$239.2 million in expenditures (or 56.7 percent of total as shown in Figure 1). Approximately \$158.2 million (or 37.5 percent) was linked to payroll spending. Pension disbursements produced \$24.9 million, making up 5.9 percent of the total output benefit.

Table 3: FY14 DOE-OREM Output Impact in Anderson-Roane-Knox Counties Region by Source

Payroll Spending	\$158,184,003
Non-payroll Spending	\$239,210,686
Pension Disbursements	\$24,900,747
Total Output Impact	\$422,295,436



Income Impact

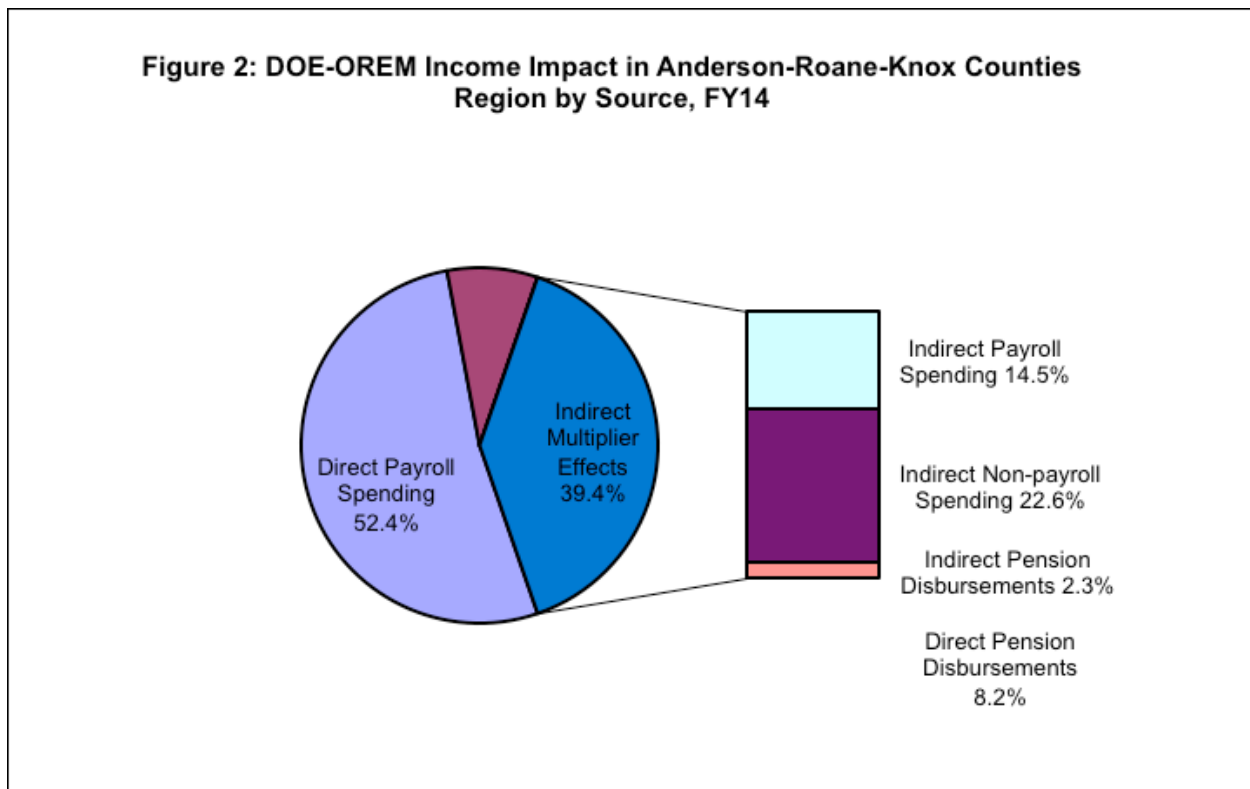
Another measure of DOE-OREM’s economic impact is personal income. This category includes all wages, salaries, profits, interest, rents, and other forms of income earned by residents in the three-county region. Personal income is a uniquely important indicator because it reflects gains that accrue directly to residents in Anderson, Roane, and Knox Counties. Table 4 and Figure 2 summarize these impacts for FY2014. Personal income attributable to DOE-OREM-related spending in the three-county region represented \$277.9 million in FY2014.

The study divides the impact of total income into two categories: direct effects, which made up \$168.4 million (or 60.6 percent), and indirect/multiplier effects, which made up \$109.5 million (or 39.4 percent) of all income impact. Included in direct effects are payroll spending and pension disbursements. Roughly \$145.5 million was spent on payroll and \$22.9 million spent on pension disbursements. Of the three categories that comprise indirect effects that arise from DOE-OREM-related purchases of goods and services, non-payroll spending generated \$62.9 million in income. The multiplier effects from DOE-OREM-related payroll spending and pensions created \$40.2 million and \$6.3 million, respectively, in personal income.

Table 4: FY14 DOE-OREM Income Impact in Anderson-Roane-Knox Counties Region by Source

Direct Effects	
Payroll Spending	\$145,496,691
Pension Disbursements	\$22,903,557
Indirect/Multiplier Effects	
Payroll Spending	\$40,244,385
Non-payroll Spending	\$62,872,811
Pension Disbursements	\$6,335,124
Total Income Impact	\$277,852,568

The implicit multiplier associated with income impact, calculated by dividing the total income benefit by direct spending on payroll and pensions by DOE-OREM, is 1.65. Every dollar of income paid directly to workers of DOE-OREM and its contractors created \$1.65 in total income for Anderson, Roane, and Knox counties in FY2014.



Employment Impact

Table 5 summarizes the direct employment figures of DOE-OREM and its contractors in the state and three-county region by business entity for FY2014. Eight entities are included in this analysis, with direct employment totaling 1,926. UCOR employed the most workers in FY2014 (1,392), while Wastren Advantage, Inc. employed 198. The two contractors combined to account for 82.6 percent of DOE-OREM-related employment in FY2014.

Table 5: FY14 DOE-OREM Direct Employment Impact in Tennessee by Entity

Division/Contractor	Employees
UCOR	1,392
WAI	198
Other Contracts	145
Isotek	108
OREM	83
Total Direct Impact	1,926

DOE-OREM-related expenditures were responsible for a total employment of in Anderson, Roane, and Knox Counties of 4,756 persons. In addition to the 1,926 direct hires, an estimated 2,830 jobs were created indirectly through the multiplier effect, accounting for 59.5 percent of the overall employment impact of DOE-OREM. These indirect effects arise from DOE-OREM-related purchases along with multiplier effects associated with payroll spending and pensions. In FY2014, 10 employees held Ph.D. degrees, 107 held a Master's degree, and 221 employees held a Bachelor's degree.

Table 6: FY14 DOE-OREM Employment Impact in Anderson-Roane-Knox Counties Region by Source

Direct Effects	
OREM-related Employees	1,926
Indirect/Multiplier Effects	
Payroll Spending	1,170
Non-payroll Spending	1,475
Pension Disbursements	184
Total Employment Impact	4,756

The employment multiplier for DOE-OREM-related programs in Anderson, Roane, and Knox Counties for FY2014 was 2.5, calculated by dividing the total employment impact by the direct number of employees. Given the high average salary of DOE-OREM-related employees (\$75,543), the significant degree of subcontracting, and high levels of non-payroll spending, it is

not surprising that the employment multiplier associated with DOE-OREM-related programs is relatively large.

Sales Tax Revenues

Table 7 highlights the state and local sales tax revenues created by DOE-OREM-related expenditures in FY2014. Nearly \$15 million were collected in sales taxes in Tennessee from DOE-OREM-related expenditures. Of this total, \$9.3 million (62.1 percent) were generated from direct expenditures in the Anderson, Roane, and Knox counties region. An additional \$5.7 million (37.9 percent) were created from indirect and multiplier effects.

Table 7: FY14 DOE-OREM Sales Tax Revenue Impact in Anderson-Roane-Knox Counties Region

Direct Payments	
State	\$6,998,215
Local	\$2,270,944
Indirect/Multiplier	
State	\$4,213,914
Local	\$1,450,790
Total Sales Tax Revenue Impact	\$14,933,864

IV. FY2014 Jobs, Income, Output, & Sales Tax Impacts of DOE-OREM in Tennessee

The following analysis focused on statewide impacts is similar to that conducted for Anderson, Roane, and Knox Counties in the previous section. The primary distinction reflects the set of RIMS II output, income, and employment multipliers calculated by the Bureau of Economic Analysis. The multipliers used in Section III were specific to the Anderson, Roane, and Knox County region. This section utilizes the most recent regional multipliers specific to the entire state of Tennessee. The set of direct expenditures for payroll, pension disbursements, non-payroll spending, and sales tax contributions are the same for the state and the three-county area. Statewide impacts will exceed impacts for the three-county region by virtue of capturing additional ripple effects from the multiplier process.

Summary of Impacts

Table 8 displays the collective economic impact of 2014 DOE-OREM-related spending in Tennessee. The data include direct, indirect, and multiplier effects. DOE-OREM-related programs generated \$545.3 million in output, \$316.6 million in personal income, \$16.9 million in state and local sales tax revenues, and 6,164 jobs.

Table 8: FY14 Summary of Economic Impact of DOE-OREM in Tennessee

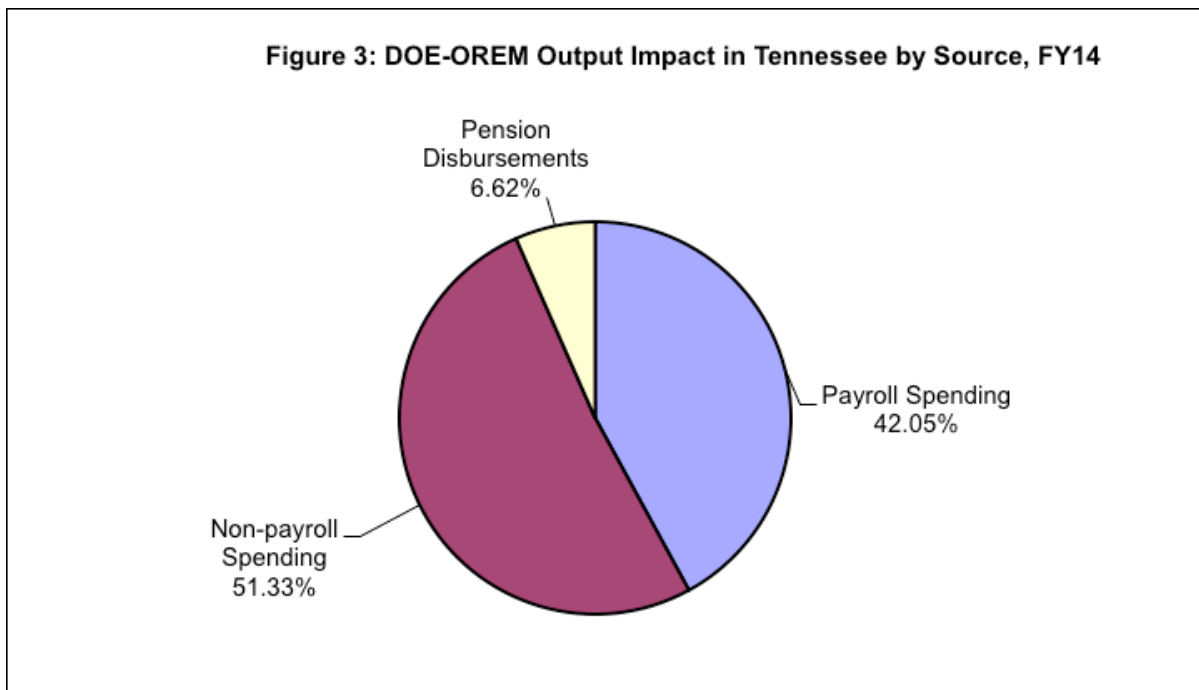
Output (SGDP)	\$545,290,034
Personal Income	\$316,576,744
Sales & Use Tax Revenue	\$16,938,033
Employment	6,164

Output Impact

The total output impact in FY2014 related to DOE-OREM and its contractors amounted to \$545.3 million. Three categories shown in Table 9 contributed to this output. Non-payroll spending represents the largest portion of output impact, amounting to \$279.9 million (or 51.3 percent of the total as shown in Figure 3). Approximately \$229.3 million (42.1 percent) was attributed to payroll spending, and \$36.1 million (6.6 percent) was produced by pension disbursements.

Table 9: FY14 DOE-OREM Output Impact in Tennessee by Source

Payroll Spending	\$229,302,786
Non-payroll Spending	\$279,891,242
Pension Disbursements	\$36,096,006
Total Output Impact	\$545,290,034



Income Impact

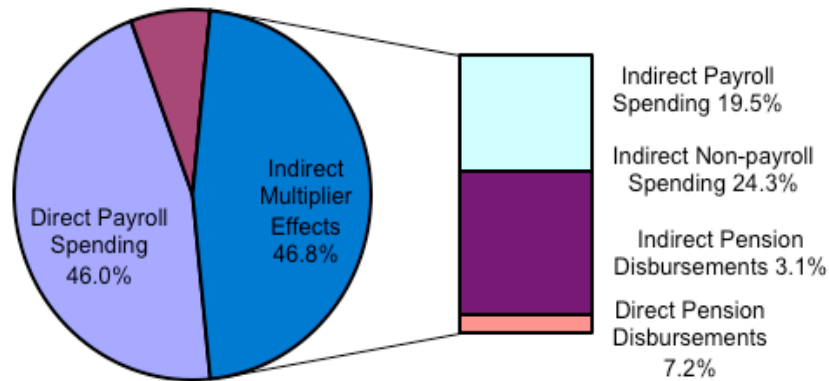
Table 10 and Figure 4 summarize the total economic impact of personal income related to DOE-OREM and its contractors for FY2014. DOE-OREM-related activities generated \$316.6 million in personal income in Tennessee. Direct payroll spending and pension disbursements made up \$168.4 million (53.2 percent) of the total. Indirect non-payroll spending generated \$76.9 million (24.3 percent). The multiplier effects from DOE-OREM-related payroll spending and pensions produced \$61.6 million (19.5 percent) and \$9.7 million (3.1 percent), respectively.

Table 10: FY14 DOE-OREM Income Impact in Tennessee by Source,

Direct Effects	
Payroll Spending	\$145,496,691
Pension Disbursements	\$22,903,557
Indirect/Multiplier Effects	
Payroll Spending	\$61,603,299
Non-payroll Spending	\$76,875,831
Pension Disbursements	\$9,697,366
Total Income Impact	\$316,576,744

The implicit multiplier associated with the income impact is 1.88, a ratio higher for the entire state compared to the three-county region. The multiplier indicates that for every dollar of income paid in FY2014 directly to workers of DOE-OREM and its contractors, \$1.88 in total state income was created.

Figure 4: DOE-OREM Income Impact by Source, FY14



Employment Impacts

In FY2014 the total employment impact of DOE-OREM-related expenditures in Tennessee was 6,164 jobs. At the state-level, 4,238 jobs were created indirectly and through multiplier effects from the 1,926 direct hires. Indirect and multiplier effects accounted for 68.8 percent of the overall employment impact. The employment multiplier for DOE-OREM-related programs in Tennessee for FY2014 was 3.2. For every job directly created by DOE-OREM, an additional 3.2 jobs were created in Tennessee. Again, this employment multiplier is larger for the state as a whole compared to just the Anderson, Roane, and Knox Counties region, which produces a total employment impact that is greater for the entire state than the three-county area.

Table 11: FY14 DOE-OREM Employment Impact in Tennessee by Source

Direct Effects	
DOE-OREM-related Employees	1,926
Indirect/Multiplier Effects	
Payroll Spending	2,055
Non-payroll Spending	1,859
Pension Disbursements	324
Total Employment Impact	6,164

Sales Tax Revenues

DOE-OREM-related expenditures created a significant amount of state and local sales tax revenue in FY2014, highlighted in Table 12. Nearly \$16.9 million was paid in Tennessee sales taxes as a result of DOE-OREM-related expenditures. Directly, \$9.3 million in revenues were generated from direct expenditures. This is the same for the three-county region. Indirect and multiplier effects produced \$7.7 million (or 45.3 percent of the total) for the state of Tennessee, a total 13.4 percent larger than that for only Anderson, Roane, and Knox Counties.

Table 12: FY14 DOE-OREM Sales Tax Revenue Impact in Tennessee

Direct Payments	
State	\$6,998,215
Local	\$2,270,944
Indirect/Multiplier	
State	\$5,704,795
Local	\$1,964,079
Total Sales Tax Revenue Impact	\$16,938,033

Additional DOE-OREM Contributions

In addition to the economic impacts examined above, there are ancillary impacts associated with DOE-OREM-related activities in Tennessee. DOE-OREM supports a variety of programs that encourage community engagement, technology partnerships, and contributions to the Tennessee educational system.

DOE-OREM'S contractors and employees donated money to a variety of community-related charities, schools, and other organizations in FY2014. Nearly \$510.9 thousand was donated by DOE-OREM contractors and their employees in FY2014. While these monetary contributions play a key role in the local economy, there are various activities related to

community involvement that are not captured in this study – suggesting that these numbers understate the overall impact that accrue to the state from DOE-OREM-related programs.

V. Conclusion

DOE-OREM programs in the state of Tennessee impart significant economic impacts to residents, more specifically in Anderson, Roane, and Knox Counties. The analysis presented above displays impacts measured by output, personal income, sales and use tax revenue, and employment.

Direct expenditures in Tennessee paid by DOE-OREM and its contractors totaled approximately \$305.4 million. Once these funds circulate through the state economy, they generate \$545.3 million in output, \$316.6 million in personal income, and \$16.9 million in tax revenues. A total of 6,164 individuals are employed from DOE-OREM related operations in Tennessee. Focusing on Anderson, Roane, and Knox Counties, where operations are housed, DOE-OREM and its contractors generate \$422.3 million in output, \$277.9 million in personal income, and \$14.9 million in tax revenue. In the three-county region, a total of 4,756 individuals were employed in FY2014 due to DOE-OREM and its contractors.

VI. Appendix

The new RIMS II output, income, and employment multipliers used in this analysis are specific to Tennessee and are calculated by the Bureau of Economic Analysis (BEA). The multipliers represent the most recent regional multipliers available. The multipliers are calculated from industries of the North American Industry Classification System (NAICS).

The study aggregates 59 industries into three (output, income, and employment) multipliers based on NAICS. The multipliers differ depending on the region of interest. RIMS II multipliers for Tennessee are not the same as the multipliers for an aggregate of Anderson, Roane, and Knox Counties. Output multipliers represent the total dollar change in output that occurs in all industries for each additional dollar of output delivered to final demand by industry. For example, the average output multiplier for all industries in Tennessee for 2014 is 2.12, while the average multiplier for 2014 in Anderson, Roane, and Knox Counties is 1.69. The income multiplier represents the total dollar change in household earnings for each additional dollar of output delivered to final demand. The income multiplier for 2014 in the state of Tennessee is 0.56 and for the three-county region is 0.42. The employment multipliers, which represent the total change in the number of jobs that occur in all industries for each additional one million dollars of output delivered to final demand by industry, averaged 14.9 in 2014 for the entire state and averaged 11.3 for Anderson, Roane, and Knox Counties.

The main purpose of this study is to analyze the economic impact of DOE-OREM operations in Tennessee. The economic impact accruing to the state is defined by the increase in production of goods and services as measured by state Gross Domestic Product, the number of jobs created, and the amount of personal income generated for residents. The main fiscal benefit identified in this study is the additional sales tax revenue generated for state and local governments due to the increase in economic activity of DOE-OREM. Sales tax impacts are generated from business-to-business transactions as well as sales to final consumers.

The economic impact measures are further broken down into direct, indirect, and multiplier effects. Direct effects are those specifically associated with DOE-OREM. Workers employed by DOE-OREM and its contractors represent the direct employment benefit of the DOE-OREM. Likewise, the expenditures by DOE-OREM on wages and salaries are the direct income effect. Direct fiscal effects arise through a range of taxes on businesses such as property and sales taxes from the investment in real and personal property and purchases of sales taxable items. Additionally, DOE-OREM and its contractors provide payments-in-lieu-of-taxes and other fees that contribute to the facility's direct fiscal benefit. In the analysis, fiscal impacts are confined to sales taxes paid to the state and to local governments across Tennessee.

Indirect effects arise from DOE-OREM's procurement of raw materials, services, supplies, and other operating services that support jobs in regional businesses as well as expenditures by visitors to the facilities supported by DOE-OREM. Among these effects are the business services utilized by DOE-OREM that are purchased from Tennessee firms. The economic effects of DOE-OREM increase correspondingly as the share of raw materials and other inputs acquired within the region increase. Only the portion of expenditures actually retained by an in-state vendor can be used in the calculation of the firm's indirect income benefit

to the state economy. For example, if new computers are purchased from a supplier in Middle Tennessee but the computers were actually manufactured outside the state, only the mark-up of the machines above cost would be the source of new income in the state. State and local governments gain impact due to the taxes on these sales, but this impact is counted separately. Therefore, the size of DOE-OREM's indirect impact on regional jobs and income depends primarily on the dollar value of regionally-purchased goods and services and whether these same goods and services are produced within the region or imported into the community.

Finally, multiplier effects are created as the additional income generated by the direct and indirect effects is spent and re-spent within the local economy. For example, part of the wages received by DOE-OREM employees will be spent on retail sales. If employees go shopping in Nashville, part of the sales receipts will be used to pay local employees of the retail establishments. These employees will in turn spend a portion of their income in the state on groceries, housing, clothing, etc., thereby adding to the amount of statewide personal income directly attributed to DOE-OREM's activities. During each of these subsequent rounds of spending, a portion of the income generated leaks out of Tennessee's economy through taxes, savings, and spending outside the state, thereby diminishing the increment to total state income attributable to these firms.

Total economic impacts attributed to increased business activity are computed as the sum of the direct, indirect, and multiplier effects. The model used in this report was developed by the Howard H. Baker Jr. Center for Public Policy at the University of Tennessee and relies on RIMS II multipliers to calculate economic impacts as noted above. Using the expenditure and employment data provided by DOE-OREM, the model allows calculation of the output, income, employment, and sales tax revenue impacts accruing in the state of Tennessee.