APPENDIX 14.1

THE ECONOMIC IMPACT OF COMMUNITY-GENERATED FUTURE-USE SCENARIOS FOR PORTS: OPERATIONAL PHASE

The Economic Impact of Community-Generated Future-Use Scenarios for PORTS: Operational Phase

Contents

I. Introduction

The former Portsmouth Gaseous Diffusion Plant (PORTS) in Piketon, Ohio, has long been a source of employment and income for southern Ohio even as the site undergoes decontamination and decommissioning (D&D). Under the aegis of the “PORTSfuture” project, funded by the U.S. Department of Energy (DOE), Office of Environmental Management, Portsmouth/Paducah Project Office (PPPO), stakeholders residing in Pike, Jackson, Ross, and Scioto counties participated in community-based process that ultimately developed nine future-use scenarios for PORTS. These scenarios encompass a wide range of economic activities including warehousing, education, worker retraining, light manufacturing, clean energy production, nuclear power generation, metals recovery, and others. While some activities appear in multiple scenarios others do not. The purpose of this report is to provide a detailed overview of the direct and indirect economic impacts likely to flow from these scenarios, as well as explain the methodology underlying these estimates.

To conduct the economic impact analysis, we first quantified the scenarios by translating the activities into sets of concrete numbers. To do so we conducted extensive research examining data from various publically available sources such as DOE , the U.S. Census Bureau, various research institutions, trade publications, and private companies. This exercise gave us a better understanding of industry trends and standards as well as common industry practices, requirements, and regulations. In developing our estimates we constrained ourselves to calculating the least amount of jobs and other economic impacts possible under a scenario; hence our estimates are best viewed as “conservative”, or in other words “not less than”, in an economic forecasting sense.

Scenarios depicted in this report are not meant to be mutually exclusive. All or some components of one or many scenarios may coexist. It also is important to realize that the results of the economic impact analysis should not be used as the sole basis to evaluate the desirability of a given scenario. It should be remembered that the purpose of this report is an attempt to quantify each scenario and demonstrate how they produce larger ripple impacts on the local economy through the indirect and the induced effects. Two important constraints of the modeling include:

- IMPLAN analysis does not consider costs, efficiency, probability, or feasibility of the proposed activities. In order to include these variables, a complete cost-benefit analysis would need to be undertaken, which is beyond the scope of this project.
- The model does not calculate potential construction impacts of these scenarios. These scenarios are end-state visions of the site developed by community members; therefore, economic impacts were calculated based only on the end state vision and construction is a temporary phase that leads to the end state.

The estimation strategy is fairly straightforward. We began by calculating the *direct* impact of the nine scenarios on employment, earnings, and value-added in the four-county region. Then, using

IMPLAN, an economic assessment model, we computed the *indirect* and *induced* impacts associated with each of these alternatives to measure their total impact on the local economy.

IMPLAN is widely used by many government agencies, colleges and universities, non-profit organizations, private companies, and business development and community planning organizations to model economic impacts of various activities. In the analysis that follows we provide a brief summary of the existing literature on sites similar to PORTS and their effects on jobs and income. Thereafter we outline, in significant detail, the IMPLAN model used in the analysis, pointing out its strengths and limitations where necessary. We then tabulate the results of our analysis for each of the nine scenarios before concluding with a summary of our results. The Appendix provides more technical details for the interested reader.

II. Literature Review

Although this is the first economic impact study of this kind to be done for PORTS , there exists a fairly large body of literature on the subject of investment at similar sites in the United States. These studies range from surveys of public preferences on alternative site uses (Greenberg,2010), to the shutdown of a nuclear power plant (Mullin and Katval, 1997), to the historical economic impacts of DOE funding during the Cold War (Greenberg et al., 1999).

The most relevant literature are those studies that deal with regional impacts of alternative investment and cleanup strategies at nuclear facilities that are being phased out. To date, these studies have looked at a host of former nuclear industry-related processing and research plants and have made extensive use of the regional economic models (REMI). Although the REMI model is somewhat different in nature from the IMPLAN model we use[1], it is similar in its ability to study regional direct and indirect economic impacts on employment, wages and the output of various economic sectors. As such, REMI can shed some light on the present analysis.

Greenberg et al. (2002) vary DOE allocations between the defense and environmental management components of its budget and estimate the impact of this on a number of nuclear facilities around the United States. When DOE funding priorities shift from defense functions to environmental management functions, rural sites such as Hanford Washington and Savannah River benefit economically while less rural sites such as Los Alamos and Oak Ridge experience economic setbacks. The opposite occurs when the funding priorities switch from defense to environmental management. When total funding is dropped, facilities in all regions suffer economic consequences. The more rural regions, however, are affected the most because of their inability to absorb the funding losses and have “less capacity to create new jobs from (other) investments.”

Frish et al. (2001) used the REMI model and looked at a number of nuclear industry-related sites. Here, however, they look at the impact of alternative investment strategies in re-tooling these facilities.[2] These strategies included investment in infrastructure, education, and environmental on-site remediation; in this sense it is similar to PORTS. As in the Greenberg et al. (2002) study, the authors found that rural sites did not fare as well as more urbanized areas due to economic consequences caused by a lack of population and readily available capital. Furthermore, they found that in those rural areas investments dedicated to higher education and environmental remediation achieved higher employment and income levels than investments in infrastructure such as sewers, waterlines and bridges. The authors explain that the reason for this is “that the relatively small regional economies surrounding these sites are unable to supply the goods and services required for major expansions.”

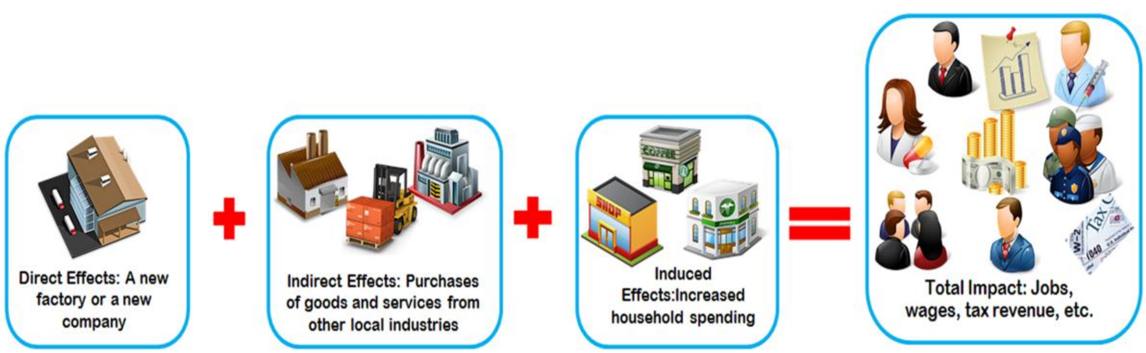
[1] Unlike IMPLAN, the REMI model is econometrically rather than input output based and runs over a set number of years.

[2] Greenberg et al. (2001) also looked at the differential impacts of various environmental waste management strategies on local economics. They found that the impact varied widely according to the strategy implemented. As in their other studies they found that there was more economic “leakage” from rural areas than from urbanized areas.

III. Methodology

Generally, economic impact analysis is based on a ripple effect, which refers to the idea that a change in one industry/activity will lead to a change in the overall economy. For example: An automotive design company in Pike County spends $1 million to open its offices. This money does not disappear; instead it becomes wages to employees, revenue to suppliers, etc. As a result, the workers will have higher disposable income. They will purchase clothes for their families at the local clothing store, generating income for the clothing store's owner. The owner saves some of this money and spends the rest, thereby providing income for another local resident. This local resident saves part of this income and spends the rest, which becomes income for a fourth person, and so forth. The sum of these effects is the total income generated in the local economy by the automotive design company. Employment functions in much the same manner, and hence employment in one industry results in additional employment in the remainder of the local economy.

To estimate the total impact of each alternative, the previously quantified scenario inputs were entered in the model and analyzed. The model estimated indirect and induced effects, which were added to initial direct inputs to get the cumulative or total impact. The total impact of a scenario thus consists of (a) direct, (b) indirect, and (c) induced effects. Direct effects refer to initial and therefore direct changes. As mentioned before, the direct effects represent initial scenarios inputs, which were based on the research. Indirect effects refer to the impact stemming from local industries buying goods and services from other local industries. Finally, induced effects represent economic benefits when workers use their newfound income to purchase further goods and services.



IMPLAN

For the impact analysis we used an economic assessment model called IMPLAN. As mentioned, IMPLAN is widely used by many public and private organizations because it is a powerful tool to efficiently model economic impacts. It is also a highly customizable tool, which can be used to examine impacts at local, regional and state levels. For our analysis, we constructed a regional economic model, which consisted of four counties: Pike, Scioto, Ross, and Jackson. IMPLAN generated the multipliers that were used to calculate the total impact of the each scenario. These multipliers are a numeric expression, which reflect indirect and induced effects. We used what is referred to as Social Accounting Matrix (SAM) types of multipliers because they most accurately model the full impact in the regional economy. Each industry has different dynamics in terms of its inputs and outputs. As a model, IMPLAN accounts for differences between industries and therefore it generated multipliers that were specific to each of the proposed scenarios. IMPLAN computes multipliers using data from publically available data sources such as U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics, and U.S. Census Bureau.

Definitions

- <u>Labor income</u> includes wages and salaries as well as payments received by self-employed individuals and business owners that are not corporations.
- <u>Employment</u> represents annual average employment both full time and part-time.
- <u>Value added</u> is the most important aspect, which reflects economic contribution of an industry, sector or a company. In addition to labor income, it includes corporate profits and indirect business taxes. As such, it is a measure of the contribution to gross domestic product (GDP) made by an individual producer, industry or sector.

Limitations

Employing a model such as IMPLAN to assess the economic impact of the various scenarios has a number of advantages. First, the model is straightforward to use and very useful to quantify the kind of economic impacts which we wish to assess. Second, IMPLAN explicitly considers the linkages between various sectors of economy. In addition, by including induced impacts IMPLAN quantifies the relationship between income and consumer spending. This is not to say, however, that models like IMPLAN are not without their drawbacks. Economic structures change over time and the indirect and induced effects that we quantify during one year may go down or up over the period of the analysis. In addition, new industry may “crowd out” existing industries and, to the extent that they do this, jobs are not “created” but merely moved around. Finally, the indirect and induced effects depend directly on the magnitude of the direct effects, and if the data for the direct effects is inaccurate, this will be reflected in the total effects as well. Hence, in our analysis we have tried to be as conservative as possible and have given the lower bounds of the anticipated direct job and salary impacts.

Cautionary Notes

The results of the economic impact analysis should not be used as the sole basis to evaluate the desirability of a given scenario. It should be remembered that the purpose of this research is an attempt to quantify each scenario and demonstrate how they produce larger impacts through indirect and induced effects. The analysis below does not consider costs, efficiency, probability or feasibility of the proposed activities. In this sense, the economic impact analysis should not be confused with a cost-benefit analysis and the difference between impacts and benefits should always be made clear.

Further, even when using a model, it is necessary to use judgment, as such, we used our best efforts to quantify each scenario given our level of expertise, knowledge and available information. However, it is important to recognize that the consensus regarding allocation of each activity in a particular scenario may vary across analysts and policymakers, and hence so will the estimated impacts. We consider this limitation as normal and encourage our readers to keep this element of the analysis in mind when reviewing the results of the analysis. To make it more transparent, where possible we include a detailed breakdown for each scenario.

IV. Scenario Results

In this section of the report we present results of the economic impact analysis. As mentioned before, for each scenario we exclude temporary construction effects from the analysis. Both labor income and value added are in 2009 dollars. This corresponds to the most recent datasets released by the MIG, Inc., owner and provider of the IMPLAN economic impact modeling system. The results show impacts for a combined four-county region of Jackson, Pike, Ross, and Scioto.

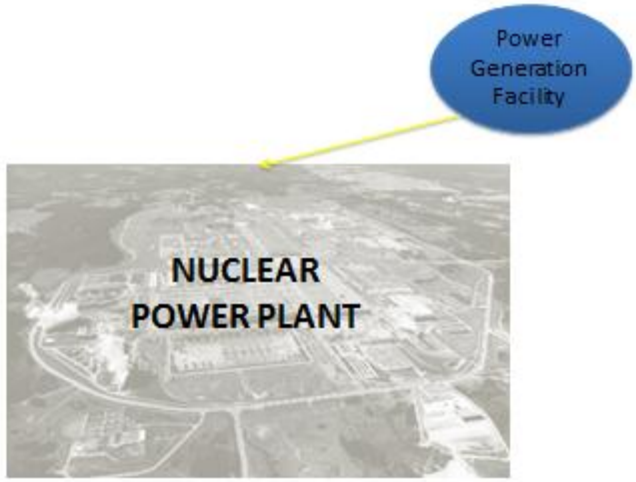
Note also that the scenarios are randomly ordered in this document. Thus, for example, whether a scenario is discussed first or last should not be viewed as any rank-ordering of scenarios. In fact, the table below reflects how the scenarios were ranked by the public and by the advisory council. While the public was able to refer to essential details of the economic impacts when expressing scenario preferences, these impacts were being estimated and hence not seen by the Advisory Group.

Comparison of Public Voting to Advisory Group Ranking

Scenario	Public	Advisory Group
Nuclear Power Plant	1	8
Green Energy Production	2	2
Industrial Park	3	1
National Research & Development	4	4
Warehousing, Distribution, and Transportation	5	7
Metals Recovery	6	9
Training and Education	7	5
Multi-Use Southern Ohio Education Center	8	3
Greenbelt	9	6

Nuclear Power Plant

This scenario because is the most straightforward in its composition and estimation. In particular, in this scenario we examine the direct, indirect, and induced economic impacts of a nuclear power plant. The size of this plant would be scaled to fit into the existing facility perimeter. In keeping with the conservative nature of our estimates – that is, we constrain ourselves to estimating the least number of jobs, labor income, and value-added likely to be generated under a given scenario -- we ignore the large economic benefits connected to the construction of the plant and instead concentrate on the longer-term economic benefits connected with plant operation. Computationally, this is the easiest scenario to simulate since it only involves a single use of the site, however, this does not necessarily mean that its economic impacts are less since the entire site would be devoted to this single use.



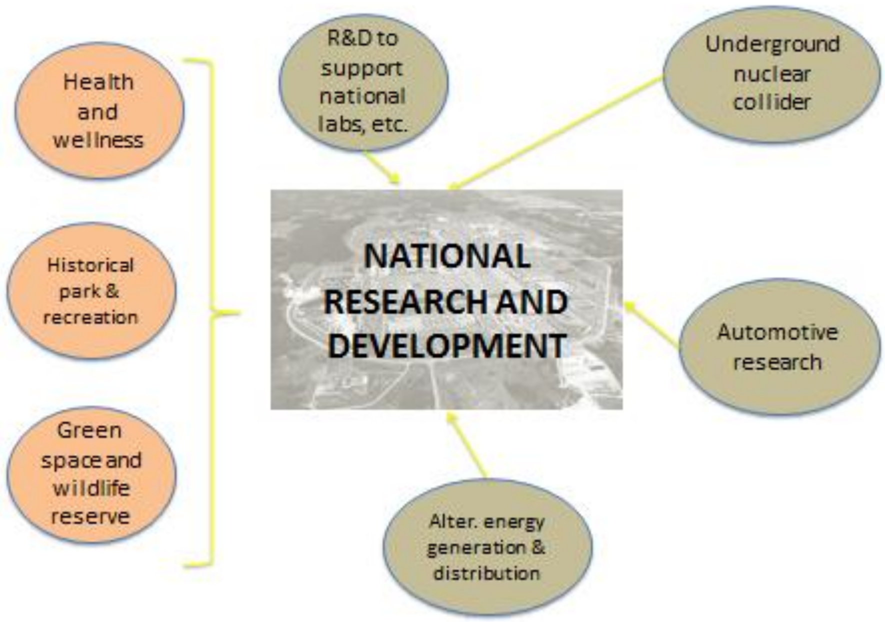
In constructing the direct impact of this scenario in the four-county region we made use of the best available sources. The input information for this scenario comes primarily from the Nuclear Energy Institute, which provides extensive data on the various aspects of the nuclear industry. These include operational, financial, and performance statistics of nuclear power plants. According to Nuclear Energy Institute, once built, a nuclear power plant is likely to employ between 400 and 700 people depending on the capacity factor of an individual power plant. To be consistent with our approach, the conservative estimate – i.e., the smallest level of employment -- of 400 jobs was used in the analysis.

As Table 1 shows, the total effect of the plant on area jobs rises by over 100 percent to 840 when the indirect and induced effects are considered. Labor income and value added, however, increase by somewhat less than 100 percent. Labor income rises from roughly 35.3 million dollars to 51.6 million dollars, while value added increases from roughly 118.9 to 145.6 million dollars. The reason that the rate of increase in labor income and value added does not match the rate of increase in jobs is because of the type of jobs created; the jobs created directly are primarily high-paying, high-skilled jobs while the jobs created indirectly are scattered across a number of sectors, including retail services, where labor incomes are low, and hence the multiplier gains are modest at best.

Table 1: Total Economic Impact of Power Plant

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	400	$ 35,291,101	$ 118,940,111
Indirect Effect	237	$ 9,266,799	$ 14,692,464
Induced Effect	203	$ 7,022,867	$ 11,928,017
Total Effect	840	$ 51,580,766	$ 145,560,592

National Research and Development Center



In this scenario, we examine the direct, indirect, and induced economic impacts of a National Research and Development center. Like the Nuclear Power Plant scenario, the research and development center would be contained within the perimeter of the former uranium enrichment facility. However, unlike the nuclear power plant, the research and development center would be a multipurpose facility. More specifically, this complex would be engaged in a host of energy and scientific development activities, possibly including:

- Support for national laboratories
- Testing of prototypes for alternative energy production
- Homeland security research
- American Centrifuge Plant research and manufacturing support, and possibly an
- Underground nuclear collider

It would also provide support for automotive research to develop more energy efficient motor vehicles, as well as examining alternative sources of energy generation such as solar panels and solar shingles. Finally, as envisioned, there would be health and wellness facilities on site, as well as a historical park and recreation center, and green areas reserved for future use.

As before, in examining the economic impacts of such a facility we made use of the best available existing data sources. More specifically, to quantify the research and development component of this scenario, we examined employment across major national laboratories and technology centers belonging to the U.S. Department of Energy. To quantify the health and wellness component we estimated the potential employment at the site by looking at the similar facilities in the area. For the recreational component, we estimated a most likely dollar amount spent by the potential visitors. The employment range was obtained from these sources and the projected smallest estimate was used as an input in the analysis.

The results of our IMPLAN computations using this data are given in Tables 2-5 below. Examining aggregate economic impact in Table 2, we observe that a national research and development center could be expected to directly produce 1,537 jobs. Furthermore, when the indirect and induced effects are added in, total jobs in the four-county region would rise to about 2,055. The direct gains in labor income and value added would come to about 71.6 and 86.3 million dollars respectively, while total gains in labor income and value added would amount to approximately 89.7 and 118.6 million dollars, respectively, to the local economy. Unlike, the Nuclear Power Plant scenario, there are fewer linkages between these types of jobs and sectors in the local economy. Hence the multiplier gains in jobs here would be more modest than in the Nuclear Power Plant. However, a number of jobs would be directly created and since these jobs are relatively high paying and high skilled, the direct labor income gains would be substantial.

Table 2: Total Economic Impact of the National Research and Development Complex

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	1,537	$ 71,614,560	$ 86,306,799
Indirect Effect	156	$ 5,561,206	$ 11,059,105
Induced Effect	362	$ 12,493,516	$ 21,243,082
Total Effect	2,055	$ 89,669,280	$ 118,608,985

Turning now to Tables 3 to 5, we disaggregate the impacts listed in Table 2 into their various components. More specifically, in these tables we look at the individual economic impacts of the historical park, green space and wildlife reserve, the health and wellness center, and the research and development components. As is readily apparent from these tables, the first two of these components have a limited impact on jobs, labor income, and value added. This occurs because of their small size and the fact that the jobs directly created by these activities are moderate-income jobs. Furthermore, when the indirect and the induced effects are included, the multiplier effects are also modest. This is because, as mentioned above, when considering this scenario as a whole the connections between these activities and other local economic sectors are not all that strong. This is not to say, however, that these components should be dismissed out of hand. First of all, heath, recreation, and wildlife can play a vital role in the wellbeing of the region, and second, these components were always envisioned to be peripheral activities designed to supplement and enhance the other potential uses of the area.

Table 3: Economic Impact of the Historical Park, Green Space and Wildlife Reserve

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	30	$ 520,706	$ 768,900
Indirect Effect	2	$ 81,806	$ 151,358
Induced Effect	3	$ 95,956	$ 163,040
Total Effect	35	$ 698,466	$ 1,086,298

Table 4: Economic Impact of Health and Wellness Component

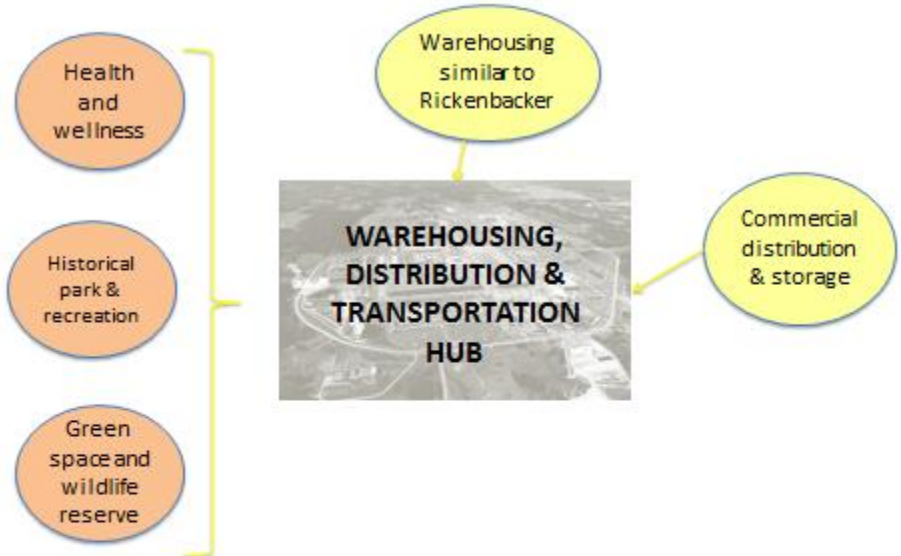
Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	7	$ 342,016	$ 373,785
Indirect Effect	1	$ 33,140	$ 70,887
Induced Effect	2	$ 58,871	$ 99,978
Total Effect	10	$ 434,027	$ 544,650

The economic impact of the National Research and Development scenario is given in Table 5 and, as expected, this is where the most significant jobs and employment impacts of this scenario are generated. To avoid confusion, it should be pointed out that the results listed in Table 5 incorporate not only the jobs, labor income and value added of the national laboratories listed in the graphic, but also the impacts of the underground nuclear collider, automotive research, and alternative energy distribution. This is because the type of research and development envisioned is multifaceted in nature. Hence, components such as automotive research, alternative energy, etc. are all jointly produced by the personnel employed in a national laboratory such as the one modeled. It should also be pointed out, as a cautionary note, that the construction of a national laboratory in the PORTS site area may face some challenging viability problems. As has been argued by Greenberg et al. (2002), it is difficult to attract the capital and specialized labor needed for such a laboratory to a rural area such as southern Ohio.

Table 5: Economic Impact of Research and Development Core Components

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	1,500	$ 70,751,838	$ 85,164,114
Indirect Effect	153	$ 5,446,260	$ 10,836,860
Induced Effect	357	$ 12,338,689	$ 20,980,064
Total Effect	2,010	$ 88,536,787	$ 116,981,037

Warehousing, Distribution and Transportation Hub



In this scenario, we examine the option where the PORTS site is transformed into a warehousing, distribution and transportation hub similar to the one presently existing at Rickenbacker Inland Port in Columbus Ohio. Ohio is uniquely located in the Midwestern U.S. and an enormous amount of goods travel through this state to their final destination. Hence, a facility of this type could potentially be a viable option for the PORTS site area where several important highway and rail lines intersect. Under this option there would be:

- A warehousing and cargo park similar to Rickenbacker
- A commercial distribution and storage facility
- Health and wellness facilities on site
- An historical park, preserve, and recreational amenities, and
- Green areas reserved for future use

The last three uses of the facility under this scenario are identical to the ones outlined in the National Research and Development scenario, hence we used the same data to calculate the direct impacts of these as we did before. The other uses of the PORTS site are somewhat different, however, and we had to incorporate some new data sources here. As suggested by visioning team members, Rickenbacker Inland Port in Columbus, Ohio was used as an example of major multi-modal transportation and logistics center. Based on the current employment at Rickenbacker we estimated the minimal number of jobs that would be created at the site. We then used this number as an input for this aspect of the scenario.

The results of our IMPLAN computations using this combined data set are then given in Tables 6-9. In Table 6 we see that the aggregate economic impact of the warehousing, distribution and transportation hub is about 512 new jobs. This number is 25 percent higher than the number of jobs directly created from the nuclear power plant. Since the type of jobs created here are, on average, lower paying than those examined in the Nuclear Power Plant Scenario, we find that the direct additions to labor income and value added are less than in the Nuclear Power Plant Scenario. Furthermore, since the economic linkages between the transportation sector and other local sectors are a bit weaker than in the Nuclear Power Plant Scenario, the total impacts in jobs, labor income and value added for the Warehousing, Distribution, and Transportation Hub is less than the Nuclear Power Plant Scenario (and indeed less than the National Research and Development Scenario). On the positive side, however, these jobs would not require as much training as in the previous two options, and labor might be easier to obtain quickly from the immediate four-county area.

Table 6: Total Economic Impact of the Warehousing, Distribution and Transportation Hub

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	512	$ 23,483,473	$ 33,091,997
Indirect Effect	123	$ 5,136,504	$ 8,560,923
Induced Effect	136	$ 4,678,471	$ 7,956,770
Total Effect	771	$ 33,298,446	$ 49,609,691

Tables 7 and 8, as all previous tables, list the employment, labor income, and value added impacts of the historical park, green space and wildlife reserve and the health and wellness component. These estimates should look similar to those obtained under the National Research and Development scenario but that is because identical inputs were used for modeling purposes. Furthermore, as in the National Research and Development scenario, they represent secondary uses of the area and they are somewhat smaller in size than the primary use of the warehousing distribution and transportation hub itself.

Table 7: Economic Impact of the Historical Park, Green Space and Wildlife Reserve

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	30	$ 520,706	$ 768,900
Indirect Effect	2	$ 81,806	$ 151,358
Induced Effect	3	$ 95,956	$ 163,040
Total Effect	35	$ 698,466	$ 1,083,298

Table 8: Economic Impact of Health and Wellness Component

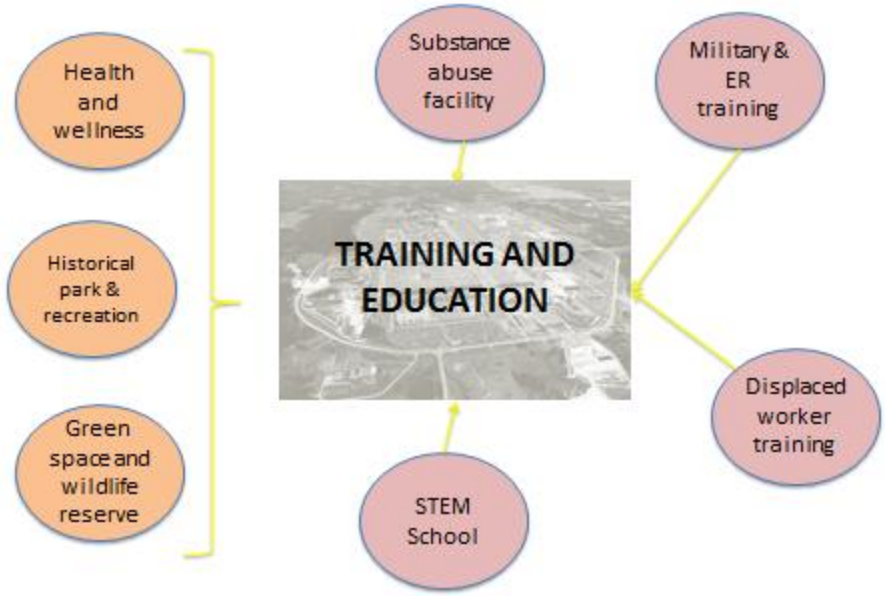
Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	7	$ 342,016	$ 373,785
Indirect Effect	1	$ 33,140	$ 70,887
Induced Effect	2	$ 58,871	$ 99,978
Total Effect	10	$ 434,027	$ 544,650

Table 9 lists the results calculated for the Warehousing, Distribution and Transportation Hub. As with the National Research and Development scenario, this kind of a facility functions as an integrated whole and the economic impacts were calculated for the entire facility rather for its individual components. Hence, there is no breakout for the warehousing and distribution and storage bubbles listed in the graphic.

Table 9: Economic Impact of Warehousing, Distribution and Transportation Core

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	475	$ 22,620,751	$ 31,949,312
Indirect Effect	120	$ 5,021,558	$ 8,338,678
Induced Effect	131	$ 4,523,644	$ 7,693,752
Total Effect	726	$ 32,165,953	$ 47,981,743

Training and Education



A fourth possible use for the PORTS facility is as a training and education center. Training and education are often mentioned as a source of economic development and growth especially in largely rural areas such as the four counties in this work. To be more specific, in this simulation, we examine the economic impacts of a scenario in which there is:

- A substance abuse/treatment facility
- A center for military training
- A school for homeland security/emergency response training
- A facility for displaced worker training
- A Science, Technology, Engineering, and Math (STEM) School
- A health and wellness facility
- An historic park/preservation/recreation
- Green areas for future development

The last three of these uses are identical for the ones estimated in the National Research and Development, and in the Warehousing, Distribution, and Transportation Hub scenarios. We therefore utilize identical inputs here as in the preceding two scenarios. To quantify educational and training component of this scenario we looked at the existing regional campuses in the area. Specifically, we considered the Southern Campus of Ohio University to be a good proxy for the educational component. We determined an employment estimate, which we scaled down to obtain a more conservative figure. We then also used this estimate as an input for other training activities in the scenario.

The aggregate results of our IMPLAN computations using this data are given in Table 10. Our data suggest that the direct impact of a training and education facility would be about 213 jobs. In addition, such a facility would directly lead to approximately 3.9 million dollars in labor income and 4.5 million dollars in value added. When the indirect and induced effects are taken into consideration the IMPLAN model estimates that 245 new jobs would be created. Furthermore, a total of 5.1 million dollars of labor income and 6.8 million dollars of value added would be added to the economy of the four-county region. These numbers are fairly modest, and indeed, they are the smallest numbers calculated in any of the scenarios reported so far. It must be remembered that the total benefits of training and education are difficult to completely quantify and they may contribute to the economic growth of a region gradually but significantly over a number of years.

Table 10: Total Economic Impact of Training and Education Scenario

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	213	$ 3,931,250	$ 4,469,954
Indirect Effect	12	$ 486,090	$ 1,119,072
Induced Effect	20	$ 700,246	$ 1,189,640
Total Effect	245	$ 5,117,584	$ 6,778,666

As in two of the preceding scenarios, the primary component of our simulation here, education, cannot be readily broken out into its constituent parts. Essentially the same facility, management personnel, and support personnel would be used for Military and ER training, displaced worker training, and the STEM school. the economic impacts of the historical park, green space, wildlife refuge are the same as previously discussed and are displayed in Table 11. The substance abuse facility, however, is fundamentally different from the other educational aspects both in the type of personnel employed and the nature of its communitywide economic impacts. Hence, this facility is combined with the health and wellness facility and the combined direct, indirect, and induced impacts of these components are listed in Table 12. What has been modeled then is a training facility of a size that most closely fits the capacity of the site and the demand of the area. This is what is modeled in Table 13.

Table 11: Economic Impact of the Historical Park, Green Space and Wildlife Reserve

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	30	$ 520,706	$ 768,900
Indirect Effect	2	$ 81,806	$ 151,358
Induced Effect	3	$ 95,956	$ 163,040
Total Effect	35	$ 698,466	$ 1,083,298

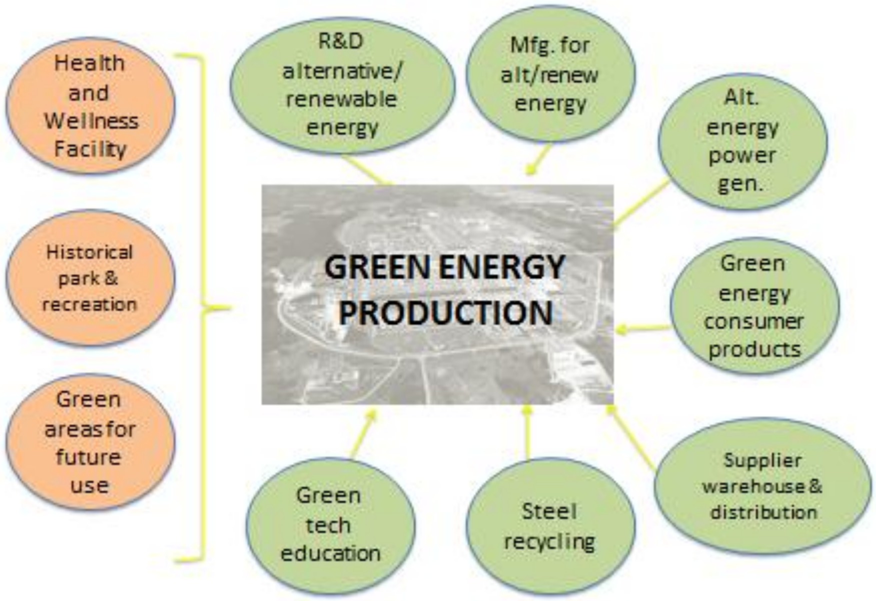
Table 12: Economic Impact of Health and Wellness Component and the Substance Abuse Facility

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	14	$ 684,032	$ 747,570
Indirect Effect	3	$ 66,280	$ 141,774
Induced Effect	3	$ 117,742	$ 199,956
Total Effect	20	$ 868,054	$ 1,089,300

Table 13: Economic Impact of the Education Core Components

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	169	$ 2,726,512	$ 2,953,484
Indirect Effect	7	$ 338,004	$ 825,940
Induced Effect	14	$ 486,548	$ 826,644
Total Effect	190	$ 3,551,064	$ 4,606,068

Green Energy Production



In this scenario we examine the possibility of re-tooling the PORTS site into a facility dedicated to the development of green energy technology and the generation of power from green energy sources. In addition to the wellness facility, historical park, and green areas computed for the last three scenarios, this option would include facilities dedicated to:

- Research and development of green energy alternatives which include
  - Alternative energy
  - Renewable harvest of resources such as switch grass
  - Biomass sustainability
  - Woodland utilization and development
  - Recycling
- Manufacturing without the use of fossil fuels which may include:
  - Wind turbines
  - Solar panels
  - Batteries
  - Recycling
- The generation of green energy from
  - Wind
  - Solar
  - Nuclear
  - Fossil and base load
- And finally, research into development of green consumer products such as
  - Home energy (e.g. wind and solar)
  - Electrical vehicles

As can be seen this scenario has a number of components and the data used for our economic impact analysis had to come from a number of sources. To quantify the energy production component, we used estimates from DOE Office of Energy Efficiency and Renewable Energy. Using their reports we measured potential employment at the energy production facility, which was then used as an input for our analysis. To quantify the health and wellness component, as before, we estimated the potential employment at the site by looking at the similar facilities in the area. Finally, for the recreational component, as before, we estimated a most likely dollar amount spent by the potential visitors. Other activities in the scenario were added and adjusted as necessary.

The results of our analysis are given below in Tables 14-23. Examining the aggregate numbers in the Table 14 it is readily apparent that both the direct and indirect economic impacts of such a facility would be substantial. This type of facility is conservatively estimated to directly lead to 861 new jobs. When the indirect and induced effects are then included we estimate that a total of 1,438 jobs would be created in the four county region. Direct labor income due to a green jobs facility would be approximately 49.69 million dollars while direct value added would come to 112.86 million dollars. Total labor income and value added come to 71.14 and 148.92 million dollars respectively. All the multipliers here are fairly robust, indicating that the facility would have strong linkages to other economic sectors within the four-county region. As a note of caution here, we should point out that these numbers could vary somewhat with the type of green energy development and production in the plant. If for example, the facility concentrated on solar energy development and generation, and this turned out to be unpopular due to high costs, inconvenience, etc., the numbers could be substantially lower than if the facility concentrated on some other energy type.

Table 14: Total Economic Impact of the Green Energy Production Scenario

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	861	$ 49,688,233	$ 112,861,666
Indirect Effect	294	$ 11,664,830	$ 19,418,857
Induced Effect	283	$ 9,790,353	$ 16,635,901
Total Effect	1,438	$ 71,143,413	$ 148,916,427

Turning now to the disaggregated results listed in Tables 15 through 24, for purposes of clarity we go through each of the tables in order. The initial tables deal with activities that have been examined in previous scenarios. In Table 15 we see that when activities such as a wildlife buffer and aquaculture are added to those encapsulated under a historical park, etc., the direct impact on jobs, labor income and value, added rises. The indirect linkages however, are still modest (i.e. only 11 additional jobs are created), because these kinds of activities are not highly connected to the other activities of the local area. Table 16 lists the impacts of the health and wellness center that was included in previous scenarios and similarly the results are small (i.e. less than 10 total jobs created). Finally, Table 17 shows the impact of a research and development center and it does have significant direct impacts due to the high paying nature of the jobs created, but there are only modest indirect impacts in keeping with the weak linkages to the local manufacturing base.

Table 15: Economic Impact of the Historical Park, Green Space, Wildlife Reserve, Wildlife Buffer, Aquaculture, and Other Related Activities

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	61	$ 1,041,412	$ 1,537,800
Indirect Effect	5	$ 163,612	$ 302,716
Induced Effect	6	$ 191,912	$ 326,080
Total Effect	72	$ 1,396,932	$ 2,166,596

Table 16: Economic Impact of Health and Wellness

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	7	$ 342,016	$ 373,785
Indirect Effect	1	$ 33,140	$ 70,887
Induced Effect	2	$ 58,871	$ 99,978
Total Effect	10	$ 434,027	$ 544,650

Table 17: Economic Impact of Research and Development Component

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	149	$ 7,075,184	$ 8,516,411
Indirect Effect	15	$ 544,626	$ 1,083,686
Induced Effect	36	$ 1,233,869	$ 2,098,006
Total Effect	200	$ 8,853,679	$ 11,698,104

The next set of tables relates largely to the various energy and renewable energy components of this alternative. In Table 18, the economic impacts of renewable energy manufacturing are shown, and we see that, although the scale of the facility is smaller than the R&D facility, the jobs created pay roughly the same amount of money. The indirect effects are more substantial than in Table 18 however, reflecting the strong connections of energy manufacturing and the local economy. Finally, in Table 19 we observe that both the direct (i.e. 250 jobs and 74.3 million dollars) and indirect (525 jobs and 90.9 million dollars) impacts of alternative energy production are high, reflecting both the high paying nature of the jobs directly created and the strong importance of energy to other economic sectors in the area.

Table 18: Economic Impact of Alternative/Renewable Energy Related Manufacturing

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	42	$ 2,630,288	$ 4,169,628
Indirect Effect	23	$ 929,094	$ 1,612,805
Induced Effect	16	$ 561,521	$ 953,587
Total Effect	81	$ 4,120,903	$ 6,736,020

Table 19: Economic Impact of Alternative Energy Production/Generation

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	250	$ 22,056,938	$ 74,337,570
Indirect Effect	148	$ 5,791,749	$ 9,182,790
Induced Effect	127	$ 4,389,292	$ 7,455,010
Total Effect	525	$ 32,237,979	$ 90,975,371

The final set of tables related to this scenario identify the economic effects of a wide assortment of components, which cannot be easily categorized. The green technology education component separated out in Table 20 generates 42 jobs in total but its indirect impacts are small both in terms of the jobs it creates and the income/value added it delivers. Jobs here, it would seem, are not that high paying and have little connection to the employment in other sectors of the economy. The numbers listed in Table 21 describe the impact of a smaller version of the warehousing and distribution center modeled in scenario 3 and the results are much as would be expected given what we saw in Table 9 above.

Table 20: Economic Impact of Green Technology Education

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	42	$ 681,628	$ 738,371
Indirect Effect	2	$ 84,501	$ 206,485
Induced Effect	4	$ 121,637	$ 206,661
Total Effect	48	$ 887,766	$ 1,151,517

Table 21: Economic Impact of Warehousing and Distribution Component

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	238	$ 11,310,376	$ 15,974,656
Indirect Effect	60	$ 2,510,779	$ 4,169,339
Induced Effect	64	$ 2,261,822	$ 3,846,876
Total Effect	362	$ 16,082,977	$ 23,990,872

The effects of developing a recycling facility are listed in Table 22, and, as can be seen there, such a facility would have small overall effects (18 jobs and 933 thousand dollars value added), but generates robust indirect and induced effects (i.e. the total multipliers are close to 2).

Table 22: Economic Impact of Steel Recycling

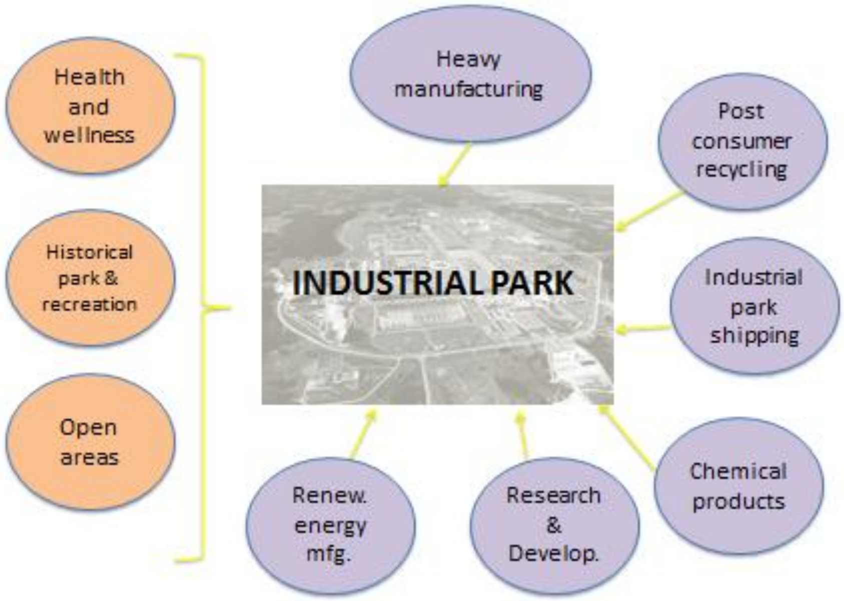
Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	9	$ 595,539	$ 944,069
Indirect Effect	5	$ 210,361	$ 365,164
Induced Effect	4	$ 127,137	$ 215,907
Total Effect	18	$ 933,037	$ 1,525,141

Finally, in Table 23 we see that the production of green energy consumer products accounts for a moderate direct increase in both jobs and income. It also reflects sizeable multipliers and produces about an equal number of indirect jobs, labor income, and value added in the local community.

Table 23: Economic Impact of Green Energy Consumer Products

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	63	$ 3,954,853	$ 6,269,376
Indirect Effect	35	$ 1,396,968	$ 2,424,985
Induced Effect	24	$ 844,292	$ 1,433,796
Total Effect	122	$ 6,196,114	$ 10,128,157

Industrial Park



In this scenario, we examined the possibility that PORTS could be converted to an industrial park. This park would contain facilities for a host of activities, including:

- The production of steel forging turbines -manufacture and operate turbines to generate power
- The production of post-consumer recycling-plastics, glass, and other materials
- General manufacturing, such as
  - Auto parts, and plane parts
- An industrial park shipping facility
- Chemical production for industrial use
- A pharmaceutical manufacturing plant which could be dedicated to
  - Drug research and development
  - Manufacturing distribution
  - Center for Disease Control Satellite Office
- Research and Development in
  - Medical research
  - Communicable disease research
  - Radioisotope research for medical use
  - Renewable energy source and biomass
  - Comprehensive industrial energy
  - Nuclear energy
- Renewable energy manufacturing such as
  - Solar panels, solar shingles, wind, turbine, and batteries
- Health and wellness facilities on site
- An historical park, preserve, and recreational amenities including

    - A museum and cultural center-Southern Ohio Educational Enrichment Center
    - Earthworks restoration
    - A recreational park
    - A nature center and visitor's center
- Green areas reserved for future use

A number of these uses were estimated in previous scenarios (e.g. wellness facility and research and development) and therefore to estimate the impact of these activities we relied upon previously utilized inputs. The manufacturing activities encapsulated by this scenario were estimated using data from Annual Survey of Manufactures by the U.S. Census Bureau. The survey provides data for all types of manufacturing and includes statistics such as employment, payroll, and labor cost. For each type of type of manufacturing, we estimated an average production capacity (output), which we used as an input for the model. Other activities in the Industrial Park scenario were then scaled accordingly and added to the manufacturing component.

The aggregate economic impacts of are listed in Table 24 (see below). Under this scenario, 725 jobs would be directly added by the industrial park, and a total of 1,274 jobs would be added via the multiplier. Direct addition of labor income would total about 45.3 million dollars, while direct addition of value added would come to almost 107.8 million dollars. Total labor income to the four-county region would top 65.71 million dollars and total value added to the area would be about 142.15 million dollars. In terms of its impact, this scenario is similar to the Green Energy Production scenario described earlier in this report. This is because some activities overlap the scenarios, and because green energy and manufacturing both have strong linkages to the other economic sectors of the region.

Table 24: Total Economic Impact of the Industrial Park

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	725	$ 45,307,858	$ 107,795,606
Indirect Effect	289	$ 11,410,263	$ 19,073,109
Induced Effect	260	$ 8,993,692	$ 15,278,305
Total Effect	1,274	$ 65,711,809	$ 142,147,020

Tables 25 through 32 give the jobs, labor income, and value added impacts from the various components of this scenario. Tables 25, 30, and 31, record the effects of wellness and fitness, research and development, and metals recycling respectively. Hence, they are identical to Tables 16, 17 and 22 above and, to avoid repetition, the reader is directed to our description and evaluation of those tables in the green energy section write-up.

Table 25: Economic Impact of Wellness and Fitness Component

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	7	$ 342,016	$ 373,785
Indirect Effect	1	$ 33,140	$ 70,887
Induced Effect	2	$ 58,871	$ 99,978
Total Effect	10	$ 434,027	$ 544,650

Tables 26, 27, and 28, however, are new, and they list the impacts of various types of manufacturing production. In general, manufacturing has strong ties to many sectors in the local economic base and this fact is attested to by the fairly large multipliers calculated for these activities. In Table 26, for instance, we see that the direct employment impact of chemical and pharmaceutical manufacturing at the facility would result in at least 129 direct and 250 total jobs. The jobs directly produced from this type of manufacturing activity are well paying and tend to be higher paying than the (largely) service jobs that are indirectly created. Similar effects are seen in Tables 27 and 28, where the results of heavy manufacturing and renewable energy manufacturing activities are listed.

Table 26: Economic Impact of Chemical Products and Pharmaceuticals

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	129	$ 8,133,722	$ 12,893,870
Indirect Effect	71	$ 2,873,066	$ 4,987,328
Induced Effect	50	$ 1,736,408	$ 2,948,808
Total Effect	250	$ 12,743,197	$ 20,830,007

Table 27: Economic Impact of Heavy Manufacturing

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	24	$ 1,505,870	$ 2,387,160
Indirect Effect	13	$ 531,917	$ 923,350
Induced Effect	9	$ 321,477	$ 545,940
Total Effect	46	$ 2,359,264	$ 3,856,449

Table 28: Economic Impact of Renewable Energy Manufacturing (includes Energy Generation and Manufacturing)

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	282	$ 24,091,687	$ 77,563,129
Indirect Effect	166	$ 6,510,482	$ 10,430,431
Induced Effect	139	$ 4,823,676	$ 8,192,690
Total Effect	587	$ 35,425,845	$ 96,186,250

In Table 29 we calculate the consequences of Industrial Park shipping. The jobs directly created here pay fairly well on average. It bears noting, however, that they are not as high paying as the manufacturing jobs listed on the previous three tables. Furthermore, this kind of economic activity is not as well integrated into the other sectors of the local economy and hence the multipliers are also less than those calculated when we examined manufacturing and energy production (in Tables 26 through 28.

Table 29: Economic Impact of Industrial Park Shipping

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	48	$ 2,262,075	$ 3,194,931
Indirect Effect	12	$ 502,156	$ 833,868
Induced Effect	13	$ 452,364	$ 769,375
Total Effect	73	$ 3,216,595	$ 4,798,174

Table 30: Economic Impact of Research and Development

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	150	$ 7,075,184	$ 8,516,411
Indirect Effect	15	$ 544,626	$ 1,083,686
Induced Effect	36	$ 1,233,869	$ 2,098,006
Total Effect	201	$ 8,853,679	$ 11,698,104

Table 31: Economic Impact of Consumer Recycling

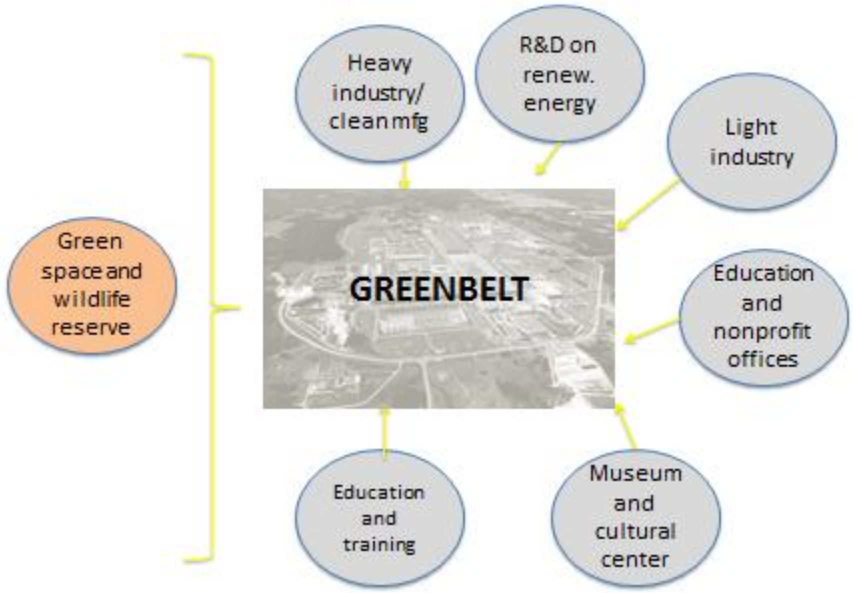
Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	9	$ 595,539	$ 944,069
Indirect Effect	5	$ 210,361	$ 365,164
Induced Effect	4	$ 127,137	$ 215,907
Total Effect	18	$ 933,037	$ 1,525,141

Finally, in Table 32 we report the direct, indirect and induced effects of recreation, parks, a museum, a cultural center, earthworks and other related activities. In keeping with our previous results on these kinds of activities, both the size of the multipliers and the amount of labor income produced are not large.

Table 32: Economic Impact of Recreation, Parks, Museum, Cultural Center, Earthworks, and Other Related Activities.

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	76	$ 1,301,765	$ 1,922,250
Indirect Effect	6	$ 204,515	$ 378,395
Induced Effect	7	$ 239,890	$ 407,600
Total Effect	89	$ 1,746,165	$ 2,708,245

Greenbelt



In this scenario, we examined the economic consequences of turning the former uranium enrichment facility into a so-called "Greenbelt." In this context the term "Greenbelt" refers to an area where all of the uses relate in some fashion to green jobs or the enjoyment and expansion of the natural environment. Thus, in this scenario we would have:

- A heavy industry/clean manufacturing component which contains, for example:
  - Post-consumer recycling
  - Solar cell and solar panel manufacturing
  - Wind turbine manufacturing
- Light industry
- Research and development
  - Federal renewable energy
- Education and training
- A wildlife reserve which could involve the creation of a new State Park
- Educational and nonprofit office space
- A museum complex may include natural history, living history, cultural center, logging museum, conservatory, arboretum, canal town recreation, local artists
- Earthworks restoration and ecotourism involving perhaps an archeological park

As stated above, the theme of this scenario is that it is completely made up of components that would likely lead to the least environmental impacts. All of these components, however, have been looked at separately in one of the proceeding scenarios, hence, to estimate inputs for this scenario, we combined information from various activities in other scenarios. To get a more exact idea of the data used here, readers are advised to refer to the previous scenarios. The aggregate economic effects of a greenbelt on the four adjacent counties are given in Table 33.

This scenario reveals a conservative estimate (that is, the least number of jobs likely) of about 884 total jobs directly created at the site. This is a large number of jobs and, with the exception of the National Research and Development Center scenario, these are more direct jobs than any scenario examined so far. The number of jobs here is slightly higher than that created in the Green Energy Production scenario when we calculated the impact of a Green Energy Production facility at the site. Two things, however, should be pointed out about our results. First, the jobs created here are lower paying than in the Green Energy Production scenario and hence lead to smaller gains in direct labor income and direct value added. Second, the linkages between the jobs created at the site and the other economic sectors in the four adjacent counties are weaker than in the Green Energy Production scenario. Hence, the total jobs created in the Greenbelt scenario is smaller than in than in the Green Energy Production scenario.

Table 33: Total Economic Impact of the Greenbelt Scenario

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	884	$ 39,738,974	$ 49,071,546
Indirect Effect	107	$ 3,954,834	$ 7,630,362
Induced Effect	204	$ 7,054,094	$ 11,992,756
Total Effect	1,195	$ 50,747,899	$ 68,694,663

The economic impacts of the various components of this simulation are listed in Tables 34 through 38. Table 34 lists the economic impact of the museum, cultural center, green space and wildlife reserve. These results are qualitatively very similar to those given for the recreational and wildlife component in the last scenario (in Table 32). The total size of the impacts, however, is a bit smaller since fewer activities are envisioned here than in the previous scenario.

Table 34: Economic Impact of the Museum, Cultural Center, Green Space and Wildlife Reserve

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	46	$ 781,059	$ 1,153,350
Indirect Effect	4	$ 122,709	$ 227,037
Induced Effect	4	$ 143,934	$ 244,560
Total Effect	54	$ 1,047,699	$ 1,624,947

Tables 35 and 38 are computed for the impact of a heavy manufacturing facility, and an education and training facility, respectively. These computations are the same ones generated in Tables 20 and 27, and we will not repeat the explanation of those results given earlier. Suffice it to say that the linkages of manufacturing to the local economy tend to be stronger (at least in the short run) than those for education and training.

Table 35: Economic Impact of Heavy Manufacturing

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	24	$ 1,505,870	$ 2,387,160
Indirect Effect	13	$ 531,917	$ 923,350
Induced Effect	9	$ 321,477	$ 545,940
Total Effect	46	$ 2,359,264	$ 3,856,449

Table 36 gives the impacts of the light manufacturing components. As with other kinds of manufacturing activities, both the wage bill and the multipliers are substantial. About 22 jobs are directly produced (due to the size of facility envisioned) and this number rises to almost 42 when the indirect and induced effects are also considered.

Table 36: Economic Impact of Light Manufacturing

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	22	$ 1,394,498	$ 2,210,608
Indirect Effect	12	$ 492,577	$ 855,060
Induced Effect	9	$ 297,701	$ 505,563
Total Effect	43	$ 2,184,776	$ 3,571,231

Finally, in Table 37 we compute the impact of the research and development aspect of this scenario. The size of the national laboratory is a little less than half the size of that modeled in the National Research and Development scenario. The laboratory here is smaller since this scenario incorporates a larger number of components than that earlier scenario, and all of these components have to fit the both the capacity of the PORTS site and the size of the local community.

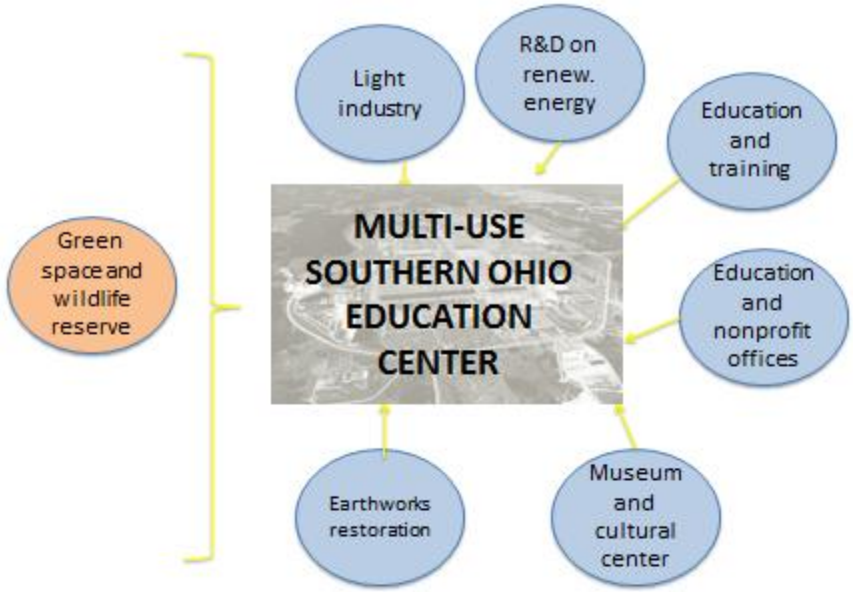
Table 37: Economic Impact of Research and Development

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	750	$ 35,375,919	$ 42,582,057
Indirect Effect	76	$ 2,723,130	$ 5,418,430
Induced Effect	178	$ 6,169,345	$ 10,490,032
Total Effect	1,004	$ 44,268,394	$ 58,490,519

Table 38: Economic Impact of Education and Training (includes educational/nonprofit office spaces)

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	42	$ 681,628	$ 738,371
Indirect Effect	2	$ 84,501	$ 206,485
Induced Effect	4	$ 121,637	$ 206,661
Total Effect	48	$ 887,766	$ 1,151,517

Multi-use Southern Ohio Education Center



In this scenario we calculate the economic effects of a multi-use Southern Ohio Educational Center. As noted above, education is often seen as a pathway to development in less affluent rural regions and the idea of this scenario is to combine educational facilities with light industry and renewable energy production on the site. More specifically in completing the economic analysis for this scenario we consider the impacts of:

- Light industry
- Research and development including research on federal renewable energy
- Education and training
- Green space, recreation, and wildlife reserve
    - Appended to Wayne National Forest
- Educational and nonprofit office space
- A museum and cultural center-Southern Ohio Educational Enrichment Center
- Earthworks restoration
- Industrial/Nature Center/Recreational Park with a Visitor Center

As in the previous scenario, this is a multiple use option and essentially re-combines uses that we have looked at in previous scenarios. Thus, to estimate inputs for this scenario, we combined information from various activities in other scenarios and used the same data sources as previously. The interested reader should refer to the sources from those other scenarios for a more detailed data description.

Our calculations of the economic effects of a multi-use southern Ohio educational center are given below in Table 39. There we see that the direct impact on jobs is slightly higher than the educational option that we discussed previously in the Training and Education scenario. The direct jobs created in the Training and Education scenario were 212 while in this case it is about 275. Furthermore, because the emphasis here is on both education and production the average wages attached to these jobs are higher. Hence, the direct labor income under this option is about 10.19 million dollars and the value added is about 13 million dollars. These numbers are more than twice as much as in the Training and Education scenario. Furthermore, since manufacturing and power generation are included here there are stronger linkages to other sectors of the economy and the multipliers here are greater than in the Training and Education scenario.

Table 39: Total Economic Impact of the Multi-Use Southern Ohio Education Center

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	275	$ 10,192,722	$ 13,003,190
Indirect Effect	34	$ 1,285,316	$ 2,447,947
Induced Effect	54	$ 1,845,119	$ 3,136,310
Total Effect	363	$ 13,323,153	$ 18,587,448

The disaggregated components for this scenario are given below in Tables 40 through 43. Tables 40, 41 and 42 correspond to Tables 20, 30, and 36described earlier in our discussion of the previous scenarios. Table 43 lists the economic impact of a museum, cultural center, earthworks restoration, green space, and wildlife reserve. Except for its size, it is very similar in concept to various components described in other scenarios (e.g. Table 34) and the nature of its economic impacts can be found there.

Table 40: Economic Impact of Light Industry Manufacturing

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	22	$ 1,394,498	$ 2,210,608
Indirect Effect	12	$ 492,577	$ 855,060
Induced Effect	9	$ 297,701	$ 505,563
Total Effect	43	$ 2,184,776	$ 3,571,231

Table 41: Economic Impact of Renewable Energy Research and Development

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	150	$ 7,075,184	$ 8,516,411
Indirect Effect	15	$ 544,626	$ 1,083,686
Induced Effect	36	$ 1,233,869	$ 2,098,006
Total Effect	201	$ 8,853,679	$ 11,698,104

Table 42: Economic Impact of Education and Education Training (Includes education and nonprofit office spaces)

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	42	$ 681,628	$ 738,371
Indirect Effect	2	$ 84,501	$ 206,485
Induced Effect	4	$ 121,637	$ 206,661
Total Effect	48	$ 887,766	$ 1,151,517

Table 43: Economic Impact of the Museum, Cultural Center, Earthwork Restoration, Green Space and Wildlife Reserve, Other Related Activities

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	61	$ 1,041,412	$ 1,537,800
Indirect Effect	5	$ 163,612	$ 302,716
Induced Effect	5	$ 191,912	$ 326,080
Total Effect	71	$ 1,396,932	$ 2,166,596

Metal Recovery

In our final scenario, we look at the economic impact of the production and recycling of metals. Plant activities could include:

- Recovering contaminated metals from the old facility creating a U.S. Strategic Metal Revitalization Complex
    - Initiating a process for their storage
    - Recycling clean metals for reuse
- Recycling contaminated metals
- Research and development
    - Metal processing such as melter/smelter and/or a
    - Smelter to create steel ingots (using steel from the process buildings on site) for future industrial use

In computing the direct impact of these activities on jobs, wages and value added we used data from the Statistical Abstract of the United States, the Annual Survey of Manufacturers, and other information such as was available. The R&D numbers were scaled and calculated in the same manner as that in the other scenarios.

The aggregate results of our IMPLAN calculations are given below in Table 44. As a direct impact of this scenario, about 759 jobs would be created. This, in turn would lead to 35.97 million dollars in labor income and 43.54 million dollars in value added. Thus the jobs created would have average salaries greater than in education but lower than in manufacturing, power production and national research and development. Total employment created in the region would be approximately 1,023 jobs, while total labor income and value added would amount to roughly 45.2 and 60 million dollars respectively. Hence, the multipliers here would be about the average for all the scenarios run in this analysis.

Table 44: Total Economic Impact of the Metal Recovery Scenario

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	759	$ 35,971,458	$ 43,526,126
Indirect Effect	81	$ 2,933,491	$ 5,783,594
Induced Effect	183	$ 6,296,482	$ 10,705,939
Total Effect	1,023	$ 45,201,431	$ 60,015,660

Turning now to the individual components of our analysis we look first at the economic impact of recycling and metal recovery shown in Table 45. This component serves essentially the same purpose as that described above in Table 22, except that it is about three times the scale of the plant envisioned there. This component would create over 28 jobs directly and almost 55 jobs when the indirect and induced effects are taken into account. Both the direct and indirectly created jobs would be moderate paying and the total value added would come to over 4.5 million dollars.

Table 45: Economic Impact of Recycling and Metal Recovering

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	28	$ 1,786,616	$ 2,832,208
Indirect Effect	16	$ 631,084	$ 1,095,494
Induced Effect	11	$ 381,411	$ 647,721
Total Effect	55	$ 2,799,112	$ 4,575,423

By far the largest component of this simulation is the research and development (including metals processing and smelter) component described in Table 46. The direct impact of such a facility on jobs is quite significant with over 731 jobs being created. Furthermore, as mentioned above (when discussing the aggregate results) both the salaries of directly created jobs and the multiplier effects would be moderate in size.

Table 46: Economic Impact of Research and Development (includes metals processing and smelter)

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	731	$ 34,184,842	$ 40,693,918
Indirect Effect	66	$ 2,302,407	$ 4,688,100
Induced Effect	171	$ 5,915,071	$ 10,058,218
Total Effect	968	$ 42,402,319	$ 55,440,237

V. Conclusion

The nine scenarios developed in the outreach process encompass a wide range of future-use options for PORTS. The scenarios include activities that run the gamut -- from power generation, research and development, health and wellness, manufacturing, and warehousing to education, and environmental restoration. Both single- and multi-use scenarios were considered and the direct, indirect, and induced impacts of each scenario quantified using a variety of data sources and the IMPLAN software package. As might be expected, the economic impacts vary across the nine scenarios. This variation stems from a number of causes – (a) the direct impacts were far from uniform across scenarios, and (b) due to the strength of the linkages involved, the size of the multipliers differed across scenarios as well[3].

In every case considered we have limited ourselves to estimating the least amount of jobs likely to flow from any given scenario; an approach that generates what we consistently refer to as conservative estimates. This constraint was self-imposed for several reasons. First, as pointed out in the methodology Section III of this report, "new jobs created" could "crowd out existing jobs in the area and we wanted to err on the side of being too cautious when considering jobs, salaries, and the resulting value added gains. Second, as emphasized in the brief literature review (Section II), past studies have found economic "leakages" from similar efforts to refurbish terminated nuclear facilities to be the largest in thinly populated rural areas such as in and around Pike, Jackson, Ross, and Scioto counties, and we prefer to implicitly account for potential leakages rather than ignore leakages outright.[4]

[3] For a detailed look at the linkages between the direct and indirect effects, and how this affects the size of the multipliers see the appendix below.

[4] When we look at the state as a whole, we find that the multipliers are somewhat higher. For an example of this see the appendix below.

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Appendix A: Detailed Input-Output Effects

In the text, we give the direct, indirect and induced effects for each alternative on jobs, labor income, and value added for the four counties under consideration. These are the most important numbers to be aware of for a comparative analysis such as ours. It is, however, instructive to see how these aggregate numbers are derived from the computations of our IMPLAN model. In our model, the economy of the region is divided into some 20 sectors. Each of these sectors, in turn is linked to the other sectors via input-output linkages. The raw inputs from agriculture and mining serve as inputs for manufacturing. Some of the outputs from manufacturing (e.g. tractors and drilling equipment), however can be used as inputs for agriculture and mining. Thus all of the sectors are linked. The strength of these linkages can vary however. Thus when there are strong linkages between the sector that is included our direct impacts and a number of other sectors we can have large "multiplier effects" and when there are weak linkages between the sector that is included in our direct impacts we can have small "multiplier effects".

An example of this is given in Table A1 where we look at the ripple effects of a nuclear power plant in the PORTS site area on the various other economic sectors in the four counties. There we see that when 400 jobs are created in the power sector 65 new derivative jobs are created in transportation and warehousing. This is because transportation and warehousing are critical inputs to nuclear power and new jobs are needed in transportation and warehousing to facilitate the operation of the plant. There are however, no strong input-output linkages between nuclear power and agriculture, and hence the plant is only responsible for .3 new jobs in that sector.

Table A1: Economic Impact of the Power Plant (Detailed)

		Employment				Labor Income				Value Added			
Sector	Description	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
0	Total	400	237.1	203	840.1	$35,291,101	$9,266,799	$7,022,867	$51,580,766	$118,940,111	$14,692,464	$11,928,017	$145,560,592
1	11 Ag, Forestry, Fish & Hunting	0	0.3	0.9	1.2	$0	$3,063	$8,720	$11,783	$0	$5,746	$16,359	$22,105
20	21 Mining	0	1.2	0	1.2	$0	$58,368	$292	$58,660	$0	$113,337	$567	$113,904
33	22 Utilities	400	0.9	1.1	402	$35,291,101	$82,344	$94,662	$35,468,106	$118,940,111	$277,521	$319,034	$119,536,666
34	23 Construction	0	12.7	0.4	13.1	$0	$595,893	$19,131	$615,024	$0	$699,336	$22,452	$721,788
41	31-33 Manufacturing	0	3	1.2	4.1	$0	$187,208	$72,810	$260,018	$0	$296,769	$115,422	$412,191
319	42 Wholesale Trade	0	3.4	2.5	5.8	$0	$167,418	$122,381	$289,799	$0	$288,119	$210,611	$498,730
320	44-45 Retail trade	0	2.8	52.4	55.3	$0	$79,202	$1,464,335	$1,543,537	$0	$125,263	$2,315,950	$2,441,213
332	48-49 Transportation & Warehousing	0	65.6	3.4	69	$0	$3,126,114	$162,010	$3,288,123	$0	$4,415,290	$228,821	$4,644,111
341	51 Information	0	4.6	2.1	6.7	$0	$250,248	$112,716	$362,964	$0	$658,070	$296,406	$954,477
354	52 Finance & insurance	0	21.4	11.9	33.3	$0	$861,953	$477,863	$1,339,816	$0	$1,792,601	$993,809	$2,786,410
360	53 Real estate & rental	0	3	5.9	8.9	$0	$61,298	$117,741	$179,039	$0	$1,222,822	$2,348,784	$3,571,605
367	54 Professional- scientific & tech svcs	0	28.3	2.9	31.2	$0	$1,336,712	$136,069	$1,472,781	$0	$1,609,003	$163,787	$1,772,790
381	55 Management of companies	0	0.4	0.3	0.7	$0	$24,908	$17,383	$42,291	$0	$30,347	$21,178	$51,525
382	56 Administrative & waste services	0	12.3	3	15.3	$0	$475,105	$116,779	$591,884	$0	$694,924	$170,810	$865,734
391	61 Educational svcs	0	1.2	3.7	4.9	$0	$20,281	$60,001	$80,282	$0	$21,969	$64,996	$86,965
394	62 Health & social services	0	0	54.2	54.2	$0	$189	$2,649,499	$2,649,688	$0	$207	$2,895,606	$2,895,813
402	71 Arts- entertainment & recreation	0	1.2	3.2	4.5	$0	$17,947	$46,886	$64,834	$0	$28,096	$73,399	$101,495
411	72 Accomodation & food services	0	49.1	31.7	80.8	$0	$829,704	$536,857	$1,366,561	$0	$1,205,982	$780,326	$1,986,308
414	81 Other services	0	9.5	13.3	22.8	$0	$234,154	$326,624	$560,777	$0	$254,028	$354,346	$608,374
427	92 Government & non NAICs	0	16	9	24.9	$0	$854,688	$480,108	$1,334,796	$0	$953,035	$535,353	$1,488,388

Appendix B: Statewide Impacts

In the analysis contained in the text we emphasized the impact of the proposed new uses of the PORTS facility on the adjacent four-county region. The primary beneficiaries of these projects are the residents of those four counties. As noted in section two and the conclusion however there is some "leakage" from these four counties. This occurs because the inputs and outputs to the new facilities may come from sources outside of these counties. Similarly, the workers may spend their money outside of the local region. Hence the multipliers will, in all likelihood, be stronger if we consider all of Ohio rather than just the four-county region. This can be seen when we look at Table A2. There we calculate the statewide direct, indirect, and induced effects of a nuclear power plant on jobs, labor income, and value added. We find there that total jobs grow from 400 to 1438 statewide when we look at the indirect and induced effects. In Table 1 in the text, by contrast, the total jobs only grow from 400 to 840 when just the four county impacts are considered. Similar differences between the two tables can be found when we look at the total labor income and the total value added numbers.

Table A2: Economic Impact of Nuclear Power Plant

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	400	$45,573,026	$160,266,198
Indirect Effect	509	$24,126,579	$38,153,697
Induced Effect	529	$20,333,016	$35,703,395
Total Effect	1,438	$90,032,621	$234,123,290

APPENDIX 14.2

THE ECONOMIC IMPACT OF COMMUNITY-GENERATED FUTURE-USE SCENARIOS FOR PORTS: CONSTRUCTION PHASE

Appendix 14.2

The Economic Impact of Community-Generated Future-Use Scenarios for PORTS: Construction Phase

Contents

I. Introduction

As part of the "PORTSfuture" project, in the spring of 2011 community visioning teams created a series of possible future-use scenarios at the PORTS site as a means of creating local jobs and promoting economic growth in the four-county region surrounding PORTS. In the preceding analysis, we measured both the direct and indirect impacts of these scenarios to determine their long-term economic viability. There, the emphasis was strictly on determining the economic impacts flowing from the operation of each scenario as envisioned by the community. Here we supplement the preceding economic impacts with the direct, indirect, and induced number of jobs, labor income, and value added likely to be generated from the construction of each scenario.

II. Methodology

We do so by relying upon the estimates of direct jobs calculated for the operational phase of each scenario, and supplementing this data input with information derived from other data sources to calculate the size of the facility that must be constructed to effectively host these employees. The size of the facility to be constructed will, of course, vary according to the type of activity that is envisaged under the scenario. For example, an administrative office may require a certain amount of space per employee to host 100 employees but the same number of employees will clearly need a much larger space per employee if the facility in question is a manufacturing unit.

This estimate of mean square footage per worker of different types of buildings was largely sourced from the U.S. Census[1]. If this information is unavailable for a particular type of building, further research was conducted to estimate mean square footage per worker. This research published material, real-world examples, and information provided by construction companies. Multiplying the direct employment by mean square footage per worker yielded the total square footage under roof per scenario.

We then turned to RSMeans Inc., a leading source of construction data that provided cost estimates linked to the construction of different types of buildings. These cost estimates not only include things such as furnishings, fixtures, lightning, plumbing, roofing, etc. but also take into account variance in costs according to the geographic area.

In sum, we rely upon three pieces of information – (a) the number of direct jobs calculated for the operational phase of a scenario, (b) the typical mean square footage per worker, and (c) the cost per square foot. These three elements are then combined to calculate the cost of constructing each scenario, with the total cost given by:

$$Construction\ Cost = Direct\ employment \times Mean\ Sq.Ft.per\ worker \times Cost\ per\ Sq.Ft. \ldots \quad (1)$$

[1] U.S. Census Bureau Statistical Abstract of the United States: 2012; Table 1006. Commercial Buildings - Summary:2003

To better illustrate how construction costs are estimated we use the Warehousing, Distribution, and Transportation Hub scenario (see Table 1 below).

Table 1: An Illustrative Example of How Construction Costs are Estimated

Cost Components	Direct Employment	Mean Sq. Ft. per worker[1]	Estimated Size (Sq. Ft.)	Estimated Size (Sq. Acres)	Cost/Sq. Ft.	Total Construction Cost
(a) Warehousing, distribution and transportation facilities	475.0	2,306.0	1,095,350.0	25.1	$82.65	$ 90,530,678
(b) Health & Wellness facility	7.0	857.14	6,000.0	0.1	$ 133.34	$ 800,040
(c) Historical Park, Green Space and Wildlife Reserve facilities	30.4	Not Applicable	Not Applicable	Not Applicable	Not Applicable	$ 1,600,000
Component Total (d) = (a) + (b) + (c)	512.4	----	----	----	----	**$ 92,930,718**
Other Costs						
(e) Support Infrastructure	----	----	----	----	----	$ 3,069,583
(f) Site Development	----	----	----	----	----	$ 3,358,424
(g) Site Utilities	----	----	----	----	----	$ 1,182,543
(h) Total						**$ 100,541,268**

[1] *Source:* U.S. Census Bureau Statistical Abstract of the United States: 2012; Table 1006. Commercial Buildings -Summary:2003; Victoria Transportation Policy Institute and National Parking Association Estimates; RSMeans Reed Construction Data Inc.

The various cost components and calculations underlying the total construction costs estimated for the warehousing, distribution, and transportation hub scenario are shown in the table above. Components (a), (b), and (c) are core facilities of the warehousing, distribution, and transportation hub scenario. The formula specified in equation (1) is applied to component (a) as follows

$$Construction\ Cost = Direct\ employment \times Mean\ Sq.Ft.per\ worker \times Cost\ per\ Sq.Ft.$$

The total estimated costs for component (a) are: $475 \times 2{,}306 \times 82.65 = \ \$90{,}530{,}678$. A similar calculation follows for component (b). For component (c) however, we focus on the potential number of visitors rather than on square footage to compute the potential value of construction necessary to support a given number of visitors. Adding the first three components (a), (b), and (c) yields a sub-total of $92,930,718. Other costs such as support infrastructure (e), site development (f), and site utilities (g) are then added to obtain the total costs of $100,541,268 likely to be incurred during construction of the warehousing, distribution, and transportation hub scenario.[2]

[2] Support infrastructure refers to the estimated cost of parking facilities for employees and visitors, calculated as $Number\ of\ parking\ slots\ (564) \times Cost\ per\ Slot\ (\$5{,}446) \cong \$3{,}069{,}583$. Site development and site utilities are estimated using ratios from the examples of construction projects found in the literature.

This cost estimation process was undertaken for eight scenarios; costs for the ninth and final scenario (the nuclear power plant) were calculated via more direct means. To be sure, in some cases the methodology described above had to be modified depending upon the amount of public available data. This was especially true for energy generating activities because the construction, for example, of nuclear energy production facilities is vastly different from the construction, say, of an industrial park or a health and wellness facility. We assumed a six-year construction period for the nuclear power plant, and a three-year construction period for all other scenarios. We also assumed a flat ten percent fee[3] for architectural, engineering, legal and other professional services associated with the construction.

Given the scope and level of construction for each scenario, it is unlikely that all of the construction expenditures will occur within the four-county study area. Rather, some of the money spent in construction most likely will flow to other counties in the state, and maybe even to other states (for example, if some materials are not available locally). In economic impact modeling this feature is referred to as the Local Purchasing Percentage (LPP), with LPP equal to 100% if everything is spent locally and LPP equal to 0% indicating nothing is spent locally. Thus, for example, a project with total costs of $100 Million but with an LPP of 35% will see no more than $35 Million being spent locally while the rest of the expenditures flow outside the local economy. In deciding the LPP for each scenario we consulted Ohio University Design & Construct experts who provide main campus and five regional campuses with design and constructions management services, and hence have a good understanding of what construction on the scale of these scenarios would entail. The resulting LPPs were applied to all calculations and hence the economic impact estimates we report below refer strictly to the impacts for the four-county region.[4]

Note that the construction impacts are presented for entire scenario without disaggregating it into its components. For example, if the scenario contains warehousing, educational facilities, and a wellness center, it is assumed that the construction of all components will be planned, built, and completed simultaneously. Furthermore, all scenario development costs and infrastructure improvements will serve all components of the scenario. The reason for this simplifying assumption is that construction is completed in phases with different crews concentrating on certain things (e.g., plumbing or drywall) while other crews are responsible for a different aspect of each building's construction. Hence, to disaggregate the employment and revenue impacts of individual components (as we did earlier when talking about the operational phase) would be unrealistic and is not undertaken here. Note also that all construction estimates are on an annual basis, in 2009 dollars. To scale a construction impact over the entire period, one can simply multiply the labor income and value added by the number of years. This however does not apply to employment, as it remains constant over the construction period.

[3] From our research, we know that the fee will likely vary between 7 and 12 percent.

[4] LPP only applies to direct impact values. It does not affect and therefore, should not be confused with Regional Purchasing Coefficients (RPC) estimated for indirect and induced effects. Also, the LPP varies by industries.

III. Scenario Results for Construction Impacts

In this section of the report, we present the results of the economic impact analysis dealing with construction impacts. Here we apply the methodology described above to each of the nine different scenarios and quantify the annual impacts of this construction activity on the four-county region. As in our discussion of the operational impacts of these same scenarios (see Appendix 14.1), we employ the IMPLAN economic impact modeling system. This allows us, in turn, to determine the indirect and induced effects of this construction activity on employment, labor income, and total value added. Construction will be a multi-year activity and hence we report annualized estimates by taking our total construction numbers and dividing them by the number of years the construction will take. In all except the Nuclear Power Plant scenario we estimate that construction will last a total of three years. In the case of the Nuclear Power Plant, however, total construction will have to encompass a number of large and complicated components, and is estimated to take six years.

To review more detailed description of each scenario and what each of them includes, please refer to Appendix 14.1. The results below are presented in order of increasing complexity.

Warehousing, Distribution & Transportation Hub

In Table 1 we show the annual construction costs associated with building the warehousing, distribution and transportation hub scenario. These numbers were derived in a manner consistent with the methodology described above and represent the annualized impact of a three year construction period.

The warehousing, distribution and transportation hub option consists of a number of components. First and foremost, it includes a warehousing component similar to that presently located at Rickenbacker airport in Columbus. Additionally, there are facilities for commercial distribution and storage, a health and wellness facility, a historical park and recreation component along with green space with a wildlife reserve. Taken together, the total construction costs of this scenario sum to about $100.5 million.

To compute the economic impact of constructing this scenario we began by annualizing these costs -- the total of $100.5 million were divided by three to obtain annualized construction costs of approximately $33.5 million. We then applied a Local Purchasing Percentage (LPP) to these annualized construction costs.[5] IMPLAN estimates that approximately 34.4 percent of all construction costs are paid to business and labor within the four counties while the remainder will flow outside the four-county region. This leads to roughly one-third of the direct impact estimates calculated via IMPLAN to be located in Jackson, Pike, Ross, and Scioto; these are the estimates reported below for employment, labor income, and value added in the four-county region.

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[5] In general, it has to be remembered that much of the capital, labor, and materials needed to construct this project have to come from outside of the four-county region under study. This four-county region is, by and large, a rural area with a relatively small population. Hence, many of the workers and firms contracted to build such a facility will most likely come from outside the area. Likewise, many of the materials (e.g., concrete, etc.) used in construction are likely to come from outside businesses.

As we can see from Table 2, a total of about 96 jobs are directly created in the four-county region each year due to the implementation of this project. Furthermore, another 15 local jobs are created in other economic sectors due to their input-output linkages to the construction sector. An additional 24 jobs are created when the newly employed spend their income on services such as insurance and real estate within the region. Thus, we calculate that the creation of a warehousing, distribution, and transportation hub would result in annual employment of about 134 people during scenario construction. This would result in labor income of $5.8 million per year and value added of almost $7.6 million per year.

Table 2: Annual Construction Impacts of Warehousing, Distribution & Transportation Hub

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	96	$4,523,597	$5,322,132
Indirect Effect	15	$516,223	$893,104
Induced Effect	24	$809,939	$1,376,706
Total Effect	134	$5,849,758	$7,591,941

National Research and Development Center

In Table 2 we examine the employment, income and value added impacts of a national research and development center (R&D). As with the warehousing, distribution and transportation hub, construction on this facility is assumed to last three years.

Table 3: Construction Impacts of National Research and Development Center

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	162	$7,606,656	$8,949,111
Indirect Effect	25	$868,493	$1,502,322
Induced Effect	39	$1,362,008	$2,315,092
Total Effect	226	$9,837,157	$12,766,525

The facility itself, however, differs substantially from the previous scenario both in terms of its total size and the type of structures constructed on the site. As before, there is a health and wellness component to the facility along with an historical park green space and wildlife preserve. The core component of this scenario, however, is more diversified in terms of the buildings that may need to be constructed given the multifaceted nature of research and development use. More specifically, in addition to warehousing structures, medical buildings, offices, food service facilities, and a host of other service buildings are expected to build on the site. The total construction cost of this scenario is estimated at $169.58 million[6] with core component covering about 1.6 million square feet.

As with the previous scenario, the total direct costs are divided by three since we are seeking to quantify the annual costs of construction. Similarly, only 34.4 percent of all labor, capital, and materials costs are assumed to be spent in the four-county region with the remainder going to workers, contractors and builders outside of this region.[7]

Taking all of these factors into consideration, we can see that the construction of an R&D facility of this size leads directly to the hiring of 162 people during each of the three years that the building takes place. Additionally, 25 workers are hired locally in industries with indirect links to the construction activity at the site and over 39 workers are employed as a result of the resulting increase in local spending. In total, 226 workers are employed annually as a result of the construction of a research and development facility at PORTS.

Because, as with the warehousing and transportation hub scenario, most jobs created in this scenario are (either directly or indirectly) connected to the construction sector, the labor income and value added numbers in Table 2 correspond closely to those reported in Table 1. More specifically, we see that under the warehousing and transportation hub scenario about 96 jobs are created directly, resulting in an addition of about $4.5 million in labor income and $5.3 million in value added. In the national R&D scenario, the labor numbers are higher and 162 jobs are created. Correspondingly, about $7.6 million in labor income and $8.9 million in value added are generated resulting in about the same value per job added. This same correspondence holds for the indirect and induced effects as well. Taken as a whole, the construction of an R&D center on this site can be expected to add about $9.8 million to local payrolls and $12.76 million to total value added in the four-county region.

Nuclear Power Plant

To quantify construction for the nuclear power plant, we used the following methodology. First, we used estimates from the Nuclear Energy Institute. According to their findings[8] the average capacity of a nuclear power plant typically ranges from 1,100 MW to 1,400 MW. To be consistent with our approach to err on the side of caution we settle upon the smallest power generation capacity reported by the Nuclear Energy Institute – 1,100 MW. Further, the U.S. Energy Information Administration provides capital cost estimates ($/kW) for electricity generation plants, which includes nuclear power plants. These cost estimates are based on the overnight costs which is essentially the cost at “which a

[6] As before, site development and site utilities costs are included. The total on these costs is commensurate with size of the total facility constructed on the site.

[7] As with previous case, the LPP for construction is based on estimates calculated from IMPLAN. Similarly, in the case of the architectural and professional services component, only 23.9 percent of all costs were assumed to stay in the four-county region.

[8] For more information, please visit http://www.nei.org/

plant could be constructed[9].” So multiplying the estimated power generation capacity by the overnight cost yields the total cost of constructing a nuclear power plant: Approximately $5.8 billion[10].

As should be evident from the preceding description of our approach for this scenario, the calculations here differ in three important ways from the two scenarios discussed previously and the six that follow the Nuclear Power Plant. First, unlike the warehousing hub and R&D scenarios, the literature here suggests that it would take four to six years to complete the construction on a nuclear power plant. Hence, our total cost estimates are initially divided by six rather than three to obtain annual estimates. Second, the nuclear power plant scenario was written up by the visioning team as a stand-alone facility; hence no other component (for example, a health and wellness center, etc.) are included in our calculations. Finally, and perhaps most importantly, the total construction costs are calculated differently here than for all other scenarios. In particular, rather than calculating costs from the number of workers employed in the facility times the mean square footage per worker times the cost per square foot, the calculations of construction costs are taken directly from estimates in the literature, and then the IMPLAN software computes the number of workers involved in that construction.

There are several reasons for doing this. First, given that there exist reliable, published sources of the construction costs associated with nuclear power plants there is no need to calculate these costs via any other method. Second, the construction costs associated with a nuclear power plant are rather sizable and to miscalculate this by only a small fraction would lead to large changes in levels of estimated employment, labor income and value added.

Table 4 below gives the local employment, labor income and value added estimates entailed with building a nuclear power plant at the Piketon site. As in Tables 2 and 3, employment, labor income, and value added are all reported on annual basis, and, as before, direct, indirect and induced impacts are provided along with the totals. Furthermore, as before LPP adjustments were made to the numbers to reflect the fact that most of the direct employment, labor and value added impacts are likely to occur outside of the four-county region.

Table 4: Construction Impacts of Nuclear Power Plant

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	2,777	$129,698,446	$155,277,440
Indirect Effect	418	$14,890,325	$26,032,393
Induced Effect	671	$23,191,758	$39,417,541
Total Effect	3,866	$167,780,528	$220,727,374

Given the sizable construction costs associated with a nuclear power plant generating 1,100 MW, the direct impacts of constructing a nuclear power plant far outstrip the impacts of all other scenarios considered thus far. Indeed, the local employment generated under this scenario sum to

[9] For more information, please visit
http://www.eia.gov/oiaf/beck_plantcosts/pdf/updatedplantcosts.pdf
[10] This cost excludes any charges (i.e. interest and fees) associated with financing the construction phase.

almost 2,777 for each of the six years needed to finish the project. The indirect and induced impacts on employment alone sum to over 1,000 people, and thus the total annual local employment adds up to about 3,866 jobs. The direct labor income is almost $129.7 million and direct value added is approximately $155.3 million. The total effect in total labor income and total value added are about $167.8 million and $220.7 million, respectively.

Training and Education

As reported in section II, development in the four-county region under consideration in this analysis is highly dependent on higher education to facilitate development and growth in the area. Consequently, an oft-cited alternative use for the site being considered at Piketon is to turn it into a training and educational facility for the local population. The economic impacts of an educational facility operating in Piketon are detailed in Appendix 14.1, and as stated there, while the short term benefits of such a facility may be smaller than those of some of the alternative suggestions explored, education and training has potential long term effects that cannot be easily measured via IMPLAN. Nevertheless our focus in this section is on direct, indirect, and induced effect of construction of such a facility on the four-county region being analyzed. These results are all given in Table 5 below.

Table 5: Construction Impacts of Training and Education Scenario

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	23	$1,085,201	$1,276,768
Indirect Effect	4	$123,841	$214,254
Induced Effect	6	$194,303	$330,269
Total Effect	32	$1,403,345	$1,821,290

The methodology employed here is exactly the same as in the first two scenarios considered in this section. Using the sources discussed at the beginning of this Appendix 14.2, the cost of an educational facility, along with a health and wellness facility, a substance abuse center, and an historical park, green space, wildlife, and recreational amenities are considered and calculated in our analysis. A three-year construction timeline is assumed, all costs are annualized, and only those costs accruing to individuals and businesses within the four-county region area are reported.

Table 5 shows that the construction of an educational center along with all of the other specified facilities under this scenario results in 23 directly created jobs. Given this, the annualized labor and value added components sum to over $1.08 million and $1.276 million respectively. The indirect and induced effects of these direct impacts follow a pattern similar to our first three scenarios[11] yielding a total of over 32 new jobs, over $1.4 million annually in new labor income and over $1.8 million in annual value added. As with the operation impacts, the construction impacts of a facility at the

[11] See our earlier discussion as to why all of the calculated construction components are similar proportionally.

PORTS site see much smaller in comparison to the other eight scenarios. This is to be expected as educational facilities are neither as big, nor employ the number of workers necessitated by other uses. It is a fact, however, that the employees of such a facility would be easier to obtain and the long term impacts of education may be higher than other, more short-sighted goals.

Multi-Use Southern Ohio Education Center

This scenario envisions multiple uses including a center for light manufacturing, research and development on new sources of renewable energy, and an education and training center (which would include office space, a museum, and earthwork restoration) as well as construction aimed at preserving green space and wildlife in the area. A facility such as this would include various kinds of structures with space being dedicated to offices, warehousing, manufacturing facilities, and museum(s) in addition to outdoor facilities, parking infrastructure, site preparation, etc. In quantifying the cost of these facilities, a number of calculations were involved because of the different kinds of buildings that would need to be constructed on the site. As before, architectural, engineering and other professional fees were included as well as utility costs and all calculations were based upon the general methodology described earlier in this Appendix. Construction again was assumed to take a total of three years, the costs were annualized and only those direct costs which stayed in the four-county area were included.

Table 6: Construction Impacts of Multi-Use Southern Education Center

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	29	$1,351,819	$1,590,451
Indirect Effect	4	$154,267	$266,893
Induced Effect	7	$242,040	$411,411
Total Effect	40	$1,748,125	$2,268,754

The results of our IMPLAN calculations are reported in Table 6 above. Here we see that the construction of this multi-use facility would directly result in about 29 jobs annually during the three years of construction activity at the site. When the indirect and induced impacts are then accounted for this total rises to over 40 jobs. The labor income directly related to hiring here would come to $1.35 million and the direct value added would be about $1.59 million. As in all other scenarios, the labor and value added would rise due to indirect and induced effects. Total labor and value added sum to approximately $1.75 million and $2.27 million respectively; again similar but slightly higher than those of the previous scenario.

Green Belt

Under this scenario, there would be facilities for eco-friendly light manufacturing, heavy manufacturing, research and development, education and training, a museum and cultural center, green space, and a wildlife reserve. Again, as with the multi-use education facility discussed above, this option would entail the construction of a number of buildings with space allocated to offices, warehousing, manufacturing facilities, and museum(s) in addition to outdoor facilities, parking infrastructure, site preparation, etc. An annualized three-year construction horizon is envisioned in our calculations, and architectural, site preparation, and infrastructure costs are explicitly quantified in the data entered into the IMPLAN software package.

Table 7: Construction Impacts of Greenbelt Scenario

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	91	$4,267,418	$5,020,730
Indirect Effect	14	$486,988	$842,526
Induced Effect	22	$764,070	$1,298,740
Total Effect	127	$5,518,476	$7,161,996

The economic impacts are given in Table 7. In each of the projected three years of its construction, the green belt option would directly generate 91 jobs for the four-county region examined. This would lead to annual labor income of over $4.2 million and annual value added of over $5 million. When the indirect and imputed effects are then accounted for, annual local employment rises to about 127 jobs, labor income by $5.5 million and value added increases by over $7.1 million.[12]

Metal Recovery

The next scenario is metal recovery and processing. Under this option the large amount of metal (iron, copper, nickel, etc.) from the former gaseous diffusion site along with other metal recycled from waste in the surrounding region would be decontaminated, re-processed and shipped for commercial use elsewhere in the construction and manufacturing sectors of the economy. The amount of metal presently available at the site is quite substantial making this a natural choice for profit making activity in the area. In addition to recycling and metal recovery research and development would also be included under this scenario.

Table 8: Construction Impacts of Metal Recovery Scenario

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	85	$4,009,176	$4,716,901
Indirect Effect	13	$457,518	$791,540
Induced Effect	21	$717,833	$1,220,147
Total Effect	119	$5,184,526	$6,728,588

The economic impacts of construction of such a metal recovery facility are given in Table 8 above. The planned construction activity (as under most other scenarios) would last for three years after which the facility would come online. Here, the buildings housing the research and development, smelter, and

[12] It is interesting to note that here as well as in the other scenarios, the number of jobs rises significantly higher than labor income when the indirect and induced effects are accounted for. This is because these jobs are created, by and large, in sectors other than construction, and construction jobs tend to be higher paying than other jobs in the local economy.

metals processing would be the major facilities constructed while the recycling buildings would constitute a somewhat smaller area. As in all other scenarios considered here, our estimates include the direct construction costs of the buildings as well as architectural and other professional costs, site development, utilities and infrastructure.

According to our estimates, during each year of the construction phase of the operation, local employment related directly to building expenditures would go up by slightly more than 85 jobs. This total would then rise to about 119 jobs when the indirect and induced impacts are accounted for. This is very much in line with the estimates of many of the other scenarios considered and almost the same as the green belt scenario described in the last section. Direct annual expenditures for labor and value added would sum to $4 million and $4.7 million respectively, and these numbers would climb to about $5.2 million and $ 6.7 million when indirect and induced effects are added in.

Industrial Park

In our eighth construction cost scenario, we simulate the economic impacts of building an industrial park. Of all of our different scenarios, this one involves the largest number of individual components, and hence, in our calculations we employ data on a number of buildings of various types (e.g., warehousing, offices, etc.) and sizes. All told, there are eleven components to this use of the PORTS site: a wellness and fitness center, chemical products and pharmaceutical production facilities, heavy manufacturing facilities, renewable energy manufacturing facilities, industrial park shipping, research and development facilities, consumer recycling facilities, a museum, a cultural center, earthworks, and parks and recreation facilities.

The economic impacts of this industrial park are given in Table 9. Here again we assume that all construction would be completed over three years. Employment when completed would be shared among the various uses with the most workers employed in renewable energy manufacturing and R&D (as pointed out in the companion report). As before, our numbers include expenses for architecture, site development, and infrastructure.

Table 9: Construction Impacts of Industrial Park

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	66	$3,103,086	$3,650,862
Indirect Effect	10	$354,117	$612,649
Induced Effect	16	$555,600	$944,389
Total Effect	92	$4,012,802	$5,207,900

Simulating the construction impacts of this scenario in IMPLAN, we find that for each of the three years that construction takes place about 66 local jobs are directly created. The associated labor and value added impacts are about $3.1 million and $3.65 million respectively. When all indirect and induced impacts are taken into account IMPLAN calculates that local employment will rise to a total of 92 jobs. This, in turn will lead to labor income increases of about $4 million and value added gains of approximately $ 5.2 million.

Green Energy Production

In the ninth and final construction cost scenario, we consider the option of a “green energy” park at the Piketon site. Although the term “green energy” may at first conjure up notions of turning the site strictly into a center where renewable power is generated, we envision a much more multifaceted site which creates consumer items that require lower energy as well as facilities for the actual production of renewable electricity. To be more specific, what is planned under this scenario is: (1) a wildlife reserve buffer with options for other types of facilities including aquaculture, (2) a health and wellness center (3) a research and development component, (4) a renewable manufacturing facility, (5) alternative energy production/generation, (6) a green technology education site, (7) a warehousing and distribution center, (8) a steel recycling facility, and (9) a center to produce green energy consumer products.

Table 10: Construction Impacts of Green Energy Production Scenario

Impact Type	Annual Employment	Annual Labor Income	Annual Value Added
Direct Effect	1,388	$64,187,329	$77,049,263
Indirect Effect	208	$7,387,468	$12,850,454
Induced Effect	333	$11,485,100	$19,520,803
Total Effect	1,928	$83,059,898	$109,420,519

Our IMPLAN results for the green energy production scenario are given in Table 10. Here the costs of housing all nine components of this scenario are combined with architectural fees and site infrastructure to produce the data used by IMPLAN. As before only local effects are considered and the numbers given represent employment and annual costs over a projected three year construction period. As with other multifaceted use scenarios, the basic components are scaled to fit appropriately in the existing site with adequate infrastructure. Construction costs are, of course, divided among the different components, but it bears mentioning that by far the largest facility construction will be the facility housing the alternative energy generation plant.

The results of our IMPLAN calculations are reported in Table 10. Here we see that the construction of the green energy production facility would directly result in added employment of over 1,388 jobs on average during the three years of construction activity at the site. When the indirect and induced impacts are then accounted for this total rises to over 1,928 jobs. This is a large number and, indeed, this is the largest job impact number associated with any alternative except the nuclear power plant. The labor income directly related to employment would come to around $64.2 million and the direct value added would be about $77 million. As in all other scenarios, the labor and value added would rise due to indirect and induced effects, and the IMPLAN results reported in Table 10 above. Total labor and value added components sum to approximately $83 million and $109.4 million, respectively; again, higher than any option with the exception of the nuclear power plant.

IV. Conclusion

As noted at the beginning, each of the nine scenarios examined in this Appendix, in the preceding Appendix 14.1, and in the Public Outreach report will add jobs and income to the four-county region both during their operational phase and during the construction phase. In this report, we focused strictly on the economic impacts of construction and found that each of the scenarios are associated with substantial direct, indirect, and induced effects leading to gains in jobs, labor income and value added. This, despite our emphasis on being cautious and estimating employment, labor income, and value added on the lower end of the possibility scale rather (for example, that the nuclear power plant would produce 1,100 MW rather than 1,400MW). Of all the scenarios considered here, the one that had the greatest impact, by far, was the nuclear power plant. Under this scenario, IMPLAN estimates that about 3,866 jobs and $155 million would be added to the local area during each of the six years of the construction phase. The second greatest economic impact was associated with the green energy option. Here we found that local employment would rise by 1,928 jobs during the three years of the construction phase while, value added in the four-county region would go up by about $77 million in each of these years. The impacts of the other six projects would be much more modest with job gains ranging from 32 to 225 new jobs depending on the scenario considered.

Finally, in concluding, a few important points should be made. First, as mentioned, we have deliberately tried to make our estimates as conservative as possible so as not to inflate expectations. Second, while many of the benefits will accrue to the four-county region, over 60 percent of the direct economic impacts of construction are generated outside of the region. Finally, the construction phase by its very nature is finite, and the jobs, labor income, and value added described here will only last for about six years for the nuclear power plant and three years for the other eight scenarios drafted by the community members participating in the visioning teams and on the advisory group. Once construction is complete, jobs, labor income, and value added tied to any specific scenario will flow from that scenario's operation.

Table 11: Summary Table of Annual Construction and Operational Impacts of the Nine Scenarios

	Construction			Operation		
Scenario	**Employment**	**Labor Income**	**Value Added**	**Employment**	**Labor Income**	**Value Added**
Nuclear Power Plant	3,866	$167,780,528	$220,727,374	840	$51,580,766	$145,560,592
Green Energy Production	1,928	$83,059,898	$109,420,519	1,438	$71,143,413	$148,916,427
Industrial Park	92	$4,012,802	$5,207,900	1,274	$65,711,809	$142,147,020
National Research & Development	226	$9,837,157	$12,766,525	2,055	$89,669,280	$118,608,985
Warehousing, Distribution, and Transportation	134	$5,849,758	$7,591,941	771	$33,298,446	$49,609,691
Metals Recovery	119	$5,184,526	$6,728,588	1,023	$45,201,431	$60,015,660
Training and Education	32	$1,403,345	$1,821,290	245	$5,117,584	$6,778,666
Multi-Use Southern Ohio Education Center	40	$1,748,125	$2,268,754	363	$13,323,153	$18,587,448
Greenbelt	127	$5,518,476	$7,161,996	1,195	$50,747,899	$68,694,663

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