# Collaborative Efforts to Inform DOE EM Cleanup, End State Configuration and Accelerated Property Transfer at the PORTS facility in Piketon, Ohio

## 3161-Funded Site Repurposing Task and Outreach Subtask: PORTSfuture follow-up with the public at large in the four county area

## *Combined Tasks Report*

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*The PORTSfuture project is funded by a grant from the U.S. Department of Energy Office of Environmental Management Portsmouth/Paducah Project Office*

**PORTSFUTURE**
IMAGINING THE OPPORTUNITIES, GATHERING YOUR IDEAS
THE FACILITY AT PIKETON, OHIO

**Ohio University (OU) Voinovich School of Leadership and Public Affairs**
**U.S. Department of Energy Office of Environmental Management (DOE EM) Educational Assistance Grant**

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## Combined Tasks Report

### Purpose and approach

The ***3161-Funded Site Repurposing Task and the Outreach Subtask: PORTSfuture follow-up with the public at large in the four county area*** served the DOE EM cleanup mission in several ways. These tasks expanded data utilization with site stakeholders at PORTS and in the region to enhance information-based decision making when determining viable future-use options for the site and site assets, so that cost savings/cost avoidance may be realized by DOE as cleanup efforts continue. These tasks contributed to the end-state configuration for the site and may expedite property transfer for reindustrialization, thus supporting DOE's efforts to reduce the EM footprint at PORTS.

Ohio University's role in the site repurposing and ongoing outreach activities was to serve the public interest by acting as an independent, credentialed broker of data and other information; by convening, facilitating, and assisting collaborative partners and interested parties with information sharing and partnership building; and, along with the collaborative Site Repurposing Group (SRG), by employing data-driven decision processes to ensure efficacious planning for site future-use endeavors.
The task efforts were responsive to the stated future-use preferences of the public-at-large in the four county region near the site as identified during various DOE and Ohio University public engagement efforts.

**All site repurposing and ongoing outreach activities were carried out in the form of a collaborative effort among Ohio University (OU), DOE, the local community reuse organization known as the Southern Ohio Diversification Initiative (SODI), site contractors, national laboratories, and national experts. The tasks were carried out by the SRG with consultation of the Site Specific Advisory Board (SSAB) and numerous regional site stakeholders including local, state, and federal elected officials; county, regional, and state-level economic development professionals; private sector interests; and national experts.**

The work was part of the Ohio University PORTSfuture grant that focuses activities in the areas of public engagement, training, outreach, and STEM education; ecology, hydrology, site environment field work; and economic modeling/economic impact analysis. All grant activities create public value and serve the public interest in one or more of the following ways: informing site cleanup and future use planning; facilitating the transfer of property; leveraging public assets of the PORTS site and the region to create regional economic stability; and providing STEM education opportunities related to the site. See Appendix 1 for a graphic depiction of the grant.

### Task background

The U.S. Department of Energy former Portsmouth Gaseous Diffusion Plant (PORTS) near Piketon, Ohio has been an important economic player in the Pike, Scioto, Ross, and Jackson County region for

many decades. This fact has likely impacted the region's socio-economic profile. As the decommissioning and decontamination process continues at the PORTS site, it is expected that this transition period will lead to further changes in the region's socio-economic profile including the creation of socio-economic stressors as well as growth opportunities. The extent to which decision-makers can minimize transitional stress and maximize the economic prospects for the region hinges greatly upon the cleanup and transfer of the PORTS site and site assets for other economic use.

This task builds upon findings from Ohio University's public outreach task completed in 2011. The public outreach task was funded by DOE through a grant from the DOE Office of Environmental Management Portsmouth/Paducah Project Office. Under the outreach task, Ohio University conducted a 15 month, broad-based, grass-roots, public participation process in Pike, Scioto, Ross, and Jackson Counties to identify the community's future-use preferences for PORTS. Community participants in outreach activities included residents, economic development entities, environmental groups, nonprofits, businesses, governmental interests, and many other stakeholders in the four counties near the plant.

To inform the design of the outreach project, OU conducted qualitative research which included interviewing key site stakeholders, conducting four focus groups for the public-at-large, and administering a regional telephone survey in order to gain information about residents' opinions on major problems facing local communities, their awareness/knowledge of the site and current cleanup efforts, and their preferences for possible site future uses. Results from this qualitative research were used to design Community Visioning Teams which further broadened opportunities for public involvement at a more in-depth and focused level. Future-use scenarios were developed by community participants in County Visioning Teams and voted on by the public-at-large at numerous public events and online. County Visioning Teams were provided summary findings from the qualitative research, data on the site and site assets, cleanup plans, and reports that detailed environmental conditions on the site. Throughout the visioning process, participants reviewed and discussed the data and used this input in creating their future use scenarios. To view the full outreach report please visit: http://www.portsfuture.com/Default.aspx
Summary details on the Visioning Teams follows:

- County Visioning Teams
  - A widespread media and public speaking campaign was employed, culminating in two kick off meetings held in the region to recruit Visioning Team members
  - One visioning team per county was created via the public recruitment process. Each county visioning team held two planning meetings to create their preferred future use scenarios
  - Each county refined their own scenarios to reduce duplication and each county put forth their top choices
  - A total of 19 refined scenarios for all 4 counties were submitted to be considered by an Advisory Group

- Advisory Group (comprised of 3 members from each county visioning team and 2 alternates)
  - Combined the 19 scenarios into 9 scenarios to reduce duplication
  - The Advisory group rated all 9 scenarios for viability
  - The final 9 scenarios were then put forth for public voting

- Economic impact analysis was conducted on all 9 scenarios and these data were made available to voters

- Public voting occurred online and in-person at public events in the region from July 15, 2011-September 30, 2011. A total of 1,141 people voted on the nine scenarios. Each person could select 1-3 scenarios as preferred options for future use consideration for PORTS. Results of the multiple choice voting, with the top four scenarios highlighted in red font, are as follows:

| Scenario Name | Total Votes |
|---|---|
| **Nuclear power plant** | **495** |
| **Green energy production** | **475** |
| **Industrial park** | **421** |
| **National research and development** | **418** |
| Warehousing, distribution, and transportation hub | 179 |
| Training and education facility | 160 |
| Metal recovery facility | 152 |
| Multi-use southern Ohio education center | 143 |
| Greenbelt | 131 |

Scenario preferences obtained through the public voting activities were reported to site stakeholders and the final outreach task report was submitted to the U.S. Department of Energy, Office of Environmental Management, Portsmouth/Paducah Project Office, DOE PORTS site officials, and the PORTS-SSAB for their consideration in informing cleanup and risk reduction decisions about the site. For additional information on community visioning teams, see Appendix 2. These results served to inform the activities of the site repurposing task.

## Site repurposing task collaborative process

The site repurposing group (SRG) engaged in activities to begin to develop a strategy focused on employing a multi-disciplinary cluster approach for regional development utilizing the PORTS campus as one element of this regional strategy. This approach was used based on the notion that clusters develop across a geographic area and businesses provide synergy across/among each other which enhances cluster growth. This cluster approach was consistent with stated public preferences for site reuse. The DOE PORTS site is widely viewed as a major regional asset that can greatly enhance efforts to develop several regional clusters and thus enhance the economic viability of the region.

Beginning in the spring of 2013, the SRG met regularly to achieve the collaborative goals of informing DOE EM cleanup, end state configuration and accelerated property transfer at PORTS. The SRG developed a work plan to guide collaborative efforts and activities, identified data needs, and defined desired outcomes for the groups' work. The SRG process is depicted in figure 1, "PORTS Site Repurposing Preparation Process Used", shown below.

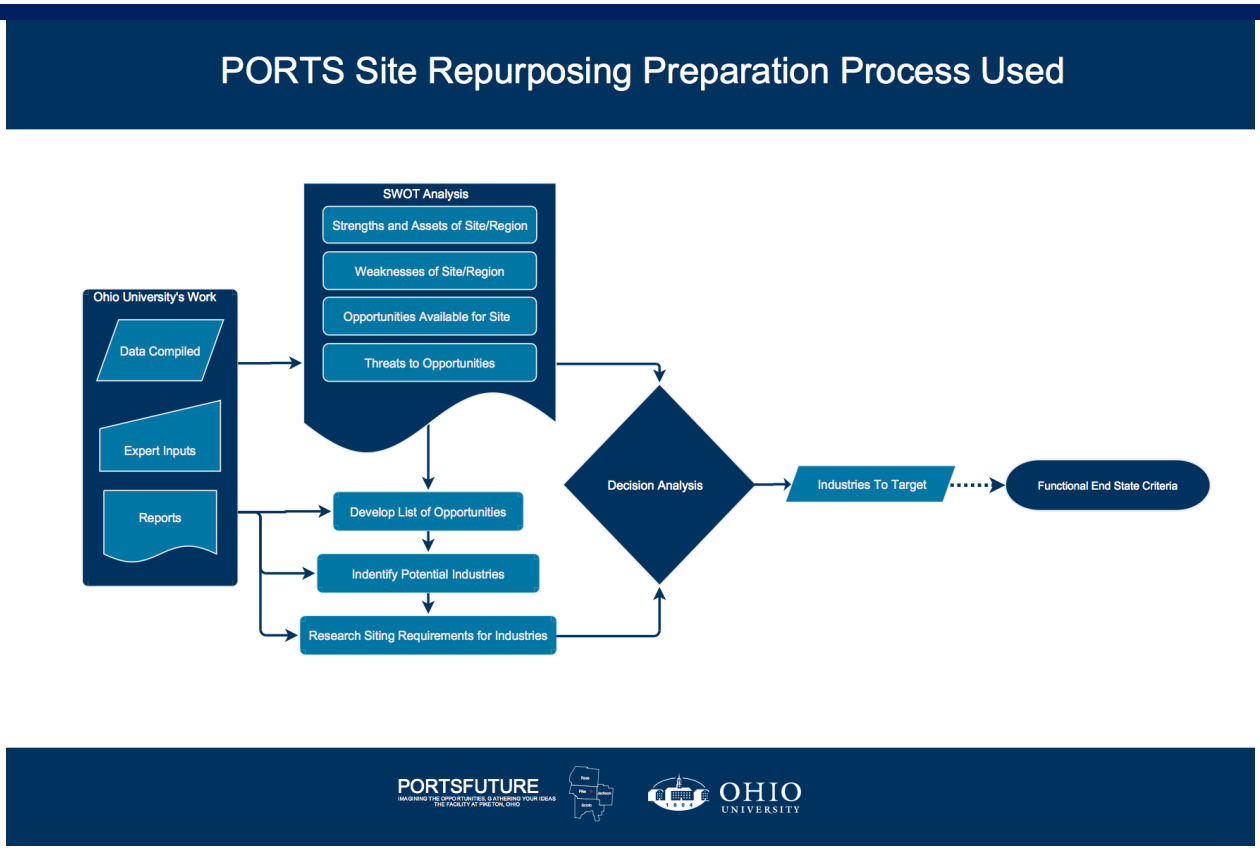



Figure 1 PORTS Site Repurposing Preparation Process Used

## Stakeholder involvement

### Convening state and national level stakeholders

In the spring of 2013 as the site repurposing task was launching, at the request of the DOE PORTS Site Director and DOE PORTS Federal Coordinator, OU co-convened a roundtable of state-level and national dignitaries assembled by OU's Voinovich School of Leadership and Public Affairs.

The roundtable was attended by a retired U.S. Senator who is also a former Ohio Governor, the President and CEO of the International Economic Development Council, the President of Woodland Ventures a venture investment firm, the OU Vice President of Finance and Administration, the OU Vice President for Research and Creative Activity, the OU Director of Engagement and Real Estate Management, the OU Assistant Professor for Rural Economic Development at the Voinovich School, the Executive Director of TechGROWTH Ohio, a representative from the Office of Ohio Governor John Kasich, the CEO of the Appalachian Partnership for Economic Growth (APEG)/JobsOhio, the Executive Director of the Ohio Valley Regional Development Commission (OVRDC), a representative from the Office of U.S. Senator Rob Portman, and a representative from the Office of U.S. Senator Sherrod Brown.

The purpose of the roundtable was to illustrate how the PORTS site could be used as a job creation/job growth asset for the region and to seek input on future use planning activities from these participants. The discussion focused on site assets that include but are not limited to low-cost electricity at the site, tax deferments, trained regional labor force, and the existence of natural resources on and near the PORTS campus.

Participants provided their advice/input/counsel for the future of the site based on their professional affiliations, expertise, and experiences in large scale redevelopment and in entrepreneurship and technology commercialization. The discussion served to inform DOE and OU on key areas to address when moving forward on site repurposing activities. The most critical area to address cited by attendees was related to developing an expeditious property transfer process that will enable property transfer to occur continually throughout the cleanup timeframe. This will support the desire to begin site

reindustrialization as soon as practicable and while cleanup is being conducted. Attendees expressed their ongoing availability to DOE and OU for other consultation as needed as activities progress with site cleanup and reindustrialization.

Convening state and regional economic development stakeholders

During February of 2014, the SRG convened a one day session with state and regional economic development professionals for the purpose of discussing how the PORTS site could be used as a job creation/job growth asset for the region and to seek input on future use planning activities. The session was facilitated by OU and attended by Economic Development Directors from Jackson, Ross, Pike and Scioto Counties, Ohio Valley Regional Development Commission (OVRDC), Appalachian Partnership for Economic Growth (APEG)/JobsOhio, a SODI board member, SODI Executive Director, DOE, DUF6 contractor, and site cleanup contractors. The one day session provided a forum to:

- Provide an overview of collaborative site repurposing efforts
- Discuss data-driven processes being utilized in the work and seek their input on the following:
  - Industry trends and other data that are factors for identifying targeted industries
  - Suitable and feasible options for future use of the PORTS reservation
  - Economic development opportunities that can be leveraged
- Demonstrate data deliverables produced for utilization by stakeholders
- Discuss the status of site clean-up at PORTS

Participants provided their advice/input/counsel for the future of the site based on their professional affiliations, expertise and experiences in regional economic development. The discussion served to inform on areas of concern and areas of opportunity when moving forward on site repurposing activities.

Important areas to address that were cited by attendees included pursuing regional development/cluster development to leverage the regional assets and existing local economies and to develop an expeditious property transfer process that will enable property transfer to occur throughout the cleanup timeframe. Timely property transfer will enable economic development professionals to capitalize on promising opportunities to commence site reindustrialization as soon as practicable while cleanup is being conducted. Attendees expressed their ongoing availability for other consultation as needed as things progress with site cleanup and reindustrialization.

PORTS site and regional engagement throughout the process

Ohio University was committed to ensuring that site stakeholders remained informed and were afforded opportunities to provide input/feedback/insights to site repurposing activities throughout the SRG process. Information on briefings to key stakeholders and on collaborative work group meetings follows below:

| **Briefings To Key Stakeholders On SRG Activities March 2013-June 2015** | **#** |
|---|---|
| DOE | 7 |
| SODI | 8 |
| SSAB | 4 |
| Site contractors | 4 |
| State and regional economic development professionals | 9 |
| OU/DOE Quarterly Project Status Meetings open to site stakeholders | 6 |

| **Work Group Meetings March 2013-June 2015** | |
|---|---|
| Site Repurposing Group-work meetings in person and via teleconference | 25 |
| Consultations with national experts-meetings in person and via teleconference | 16 |

National experts and thought leaders

Ohio University leveraged University resources and relationships to engage well-respected national experts and thought leaders throughout the SRG process. These august individuals provided valuable guidance and feedback to the SRG and raised the visibility of efforts to repurpose the facility. In addition to the dignitaries cited above in the convening state and national level stakeholder section, the following served in an ongoing and/or in-depth consultative capacity to the work on this task:

- Jeff Finkle-President and CEO-International Economic Development Council (IEDC)
- Tracy Kitts-Chief Administrative Officer with IEDC and former Chief Operating Officer-National Business Incubation Association
- Mike Zimmer-Attorney/International Energy Business Development expert
- Dr. Ben Cross-Senior Advisor, Clean Energy Directorate-Savannah River National Laboratory

Additionally, through DOE's grant relationship with Ohio University, the PORTS DOE Site Director became a member of the Ohio University Voinovich School Strategic Partners Group. This group of State of Ohio and national-level leaders from a variety of substantive areas is assembled biannually. Members are invited to join the Partners Group based on their substantive focus, professional expertise/credentials, and on their collaborations with the Voinovich School focused on solving problems in the region, the State of Ohio, and beyond.

The Partners Group is a critically valuable network for DOE PORTS to leverage as cleanup and property transfer efforts move forward because many of the partners' professional pursuits intersect with DOE EM cleanup and property transfer efforts. See Appendix 3, Voinovich School Partners Group Organized by Vocational Focus, for a full listing of 2014 members.

## Data applications

As stated earlier, the purpose of the two tasks summarized in this report was to serve the DOE EM cleanup mission by expanding data utilization with site stakeholders at PORTS and in the region to enhance information-based decision making when determining viable future-use options for the site and site assets, so that cost savings/cost avoidance may be realized by DOE as cleanup efforts continue.

Preliminary data analysis and other information gathering to inform the SRG planning process was conducted by OU under the site repurposing task and in conjunction with the 3161-funded *Site Analysis and Economic Suitability Study for PORTS* and involved the following:

- The creation of a database of redeveloped/repurposed brownfield sites in the U.S. including findings from web-based research. Information included original site use and repurpose, ownership, marketing strategies deployed, site infrastructure, size and location as well as other unique conditions/assets. OU identified potential criteria to determine applicability/suitability of the experience of other redeveloped sites to the PORTS facility and alignment with the public future use scenarios. This data base can be viewed at: http://www.portsfuture.com/siterepurposing.aspx

- Collection of quantitative and qualitative data to employ in this strategy resulted in the creation of a prototypical web-based data dashboard for interactive data analysis related to site repurposing task activities. The data dashboard, shown in the screenshot in figure 2 below, visually displays relevant regional demographics of workforce-aged residents useful for future site use decision-making. It allows users to quickly access data on the four county region for various datasets including:
  - Population - Total population and percent change in population over time.
  - Demographics - The breakdown of total population by age groups and educational attainment.
  - Detailed Demographics - The distribution of educational attainment by specific age categories.
  - Student Enrollment - Student enrollment by sector and admission area.
  - Migration - In-migration, out-migration, and net migration flows for the four county region.
  - Employment by Industry - Total employment by industry sector in the four county region.
  - Employment by Occupation - Total employment by major occupational categories in the four county region.

  This dashboard can be viewed at: http://app.voinovichschool.ohio.edu/datateam/portsdata/

- Development of regional asset maps. A sample map is shown in the screenshot in figure 3 below. These asset maps visually display relevant regional assets useful for future site use decision-making such as highways, hazmat routes, rail, airports, navigable waterways, accredited education institutions, and metro centers and population that can be reached within various drive times from the site. These maps can be viewed at: http://app.voinovichschool.ohio.edu/datateam/portsmap/

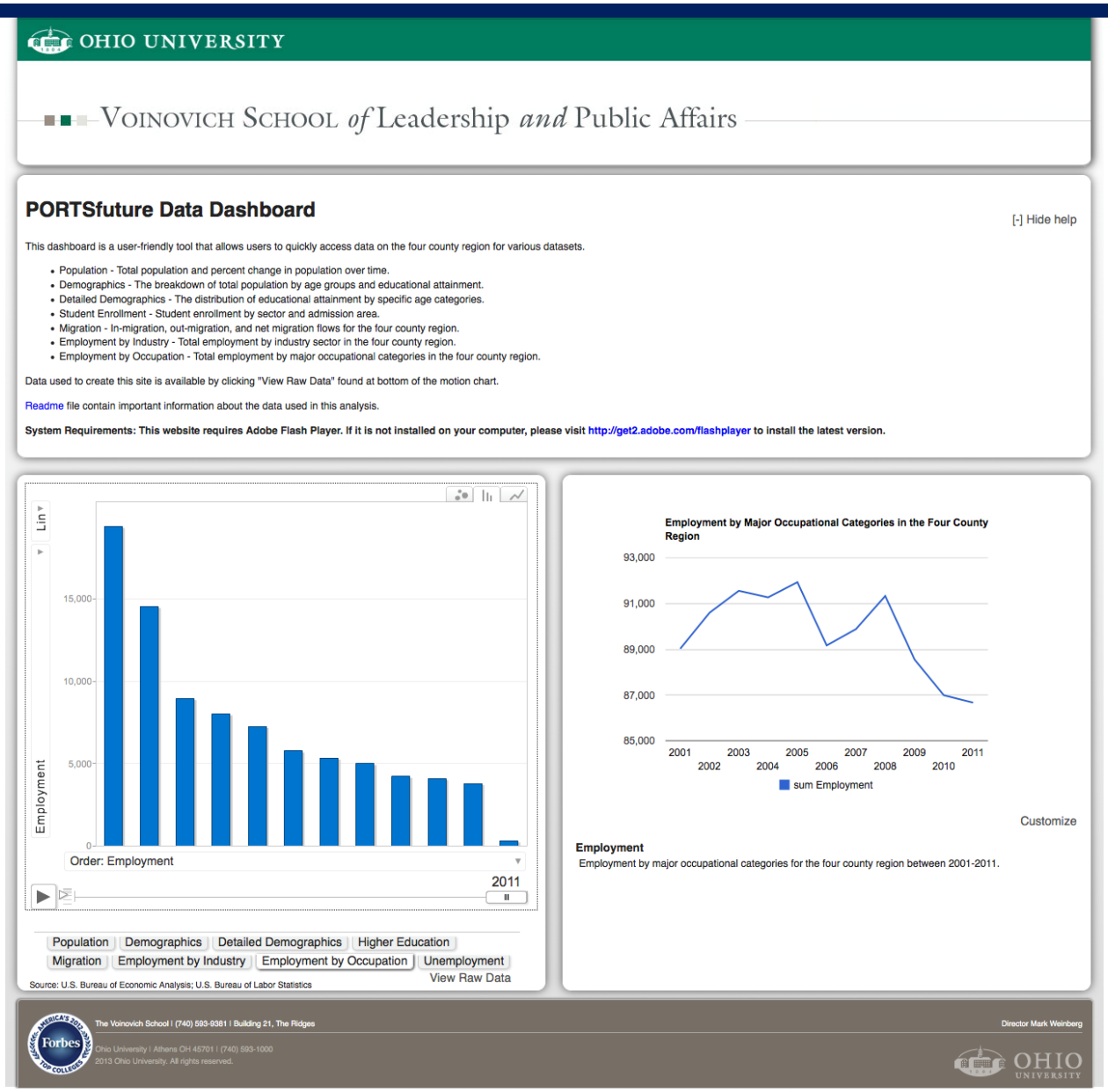



Figure 2 Data Dashboard screenshot. This dashboard can be viewed at: http://app.voinovichschool.ohio.edu/datateam/portsdata/

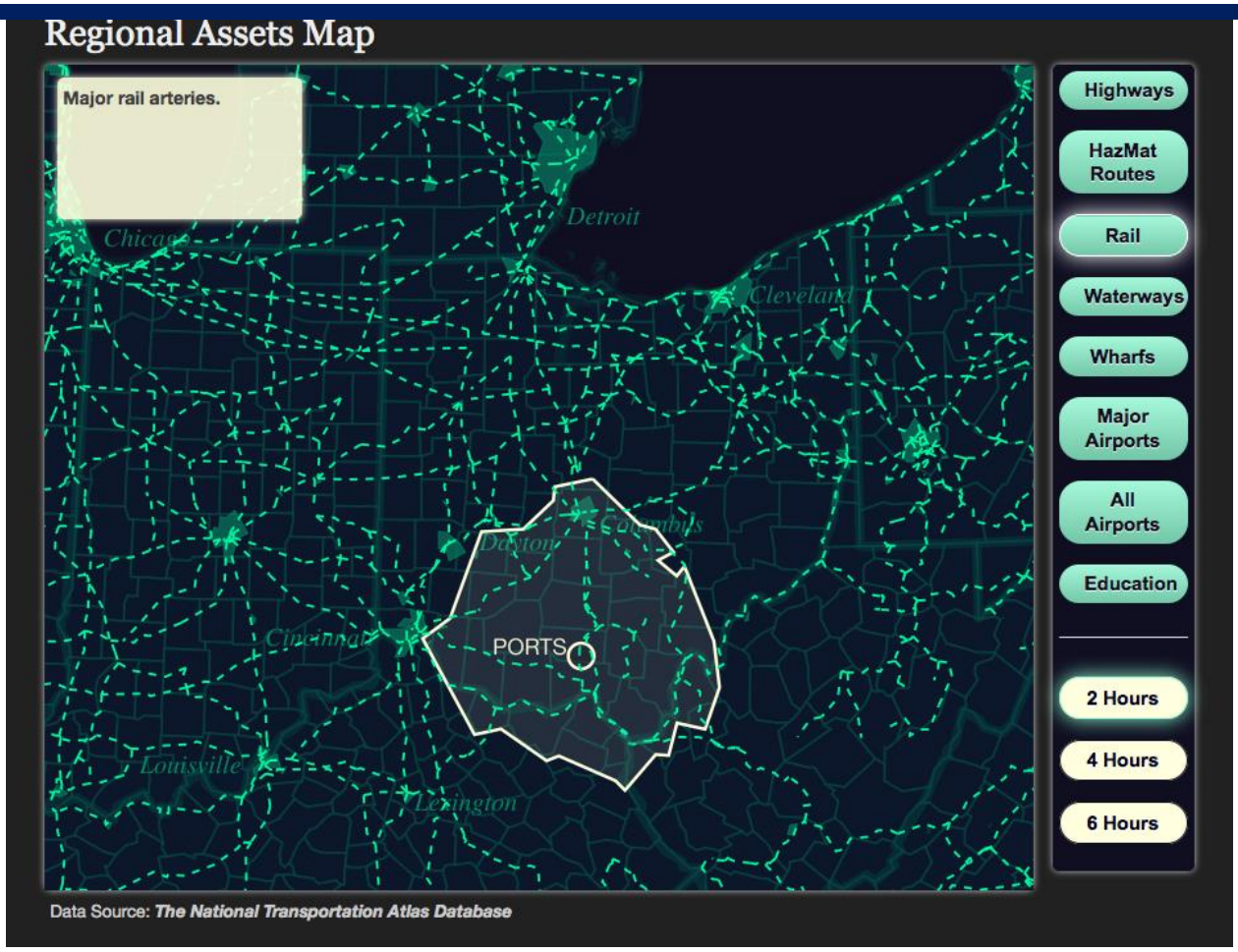



Figure 3 Regional Asset Map screen shot. Regional asset maps can be viewed at: http://app.voinovichschool.ohio.edu/datateam/portsmap/

Other data utilized to inform the SRG process included maps and data on PORTS site infrastructure assets, emerging industry trends, business incubation pre-feasibility study conducted by the National Business Incubation Association for Ohio University, and consultations with national experts who have been involved in the repurposing of industrial sites. All tools created by Ohio University are available to the public at www.portsfuture.com under the site repurposing link.

The Collaborative Site Repurposing Group Graphic (Howe 2014) in figure 4 below depicts the group's approach. The SRG utilized data and information cited above to analyze and apply to decision-making processes to refine the PORTS future use possibilities. Viable clusters for future development that were identified included energy, advanced manufacturing, and transportation/logistics. Tactical planning identified specific industries within the energy cluster and determinations were made of those industries' needs for expansion into the region and/or at the PORTS campus. SRG planning activities partnered with and utilized the existing economic development structures within the region including county, regional, and state level economic development professionals, national laboratories, national economic development and business development experts, and private industry. The SRG identified and continues to identify industries and related industry needs supporting expansion in the region and/or at the PORTS site, in the advanced manufacturing and transportation logistics clusters.

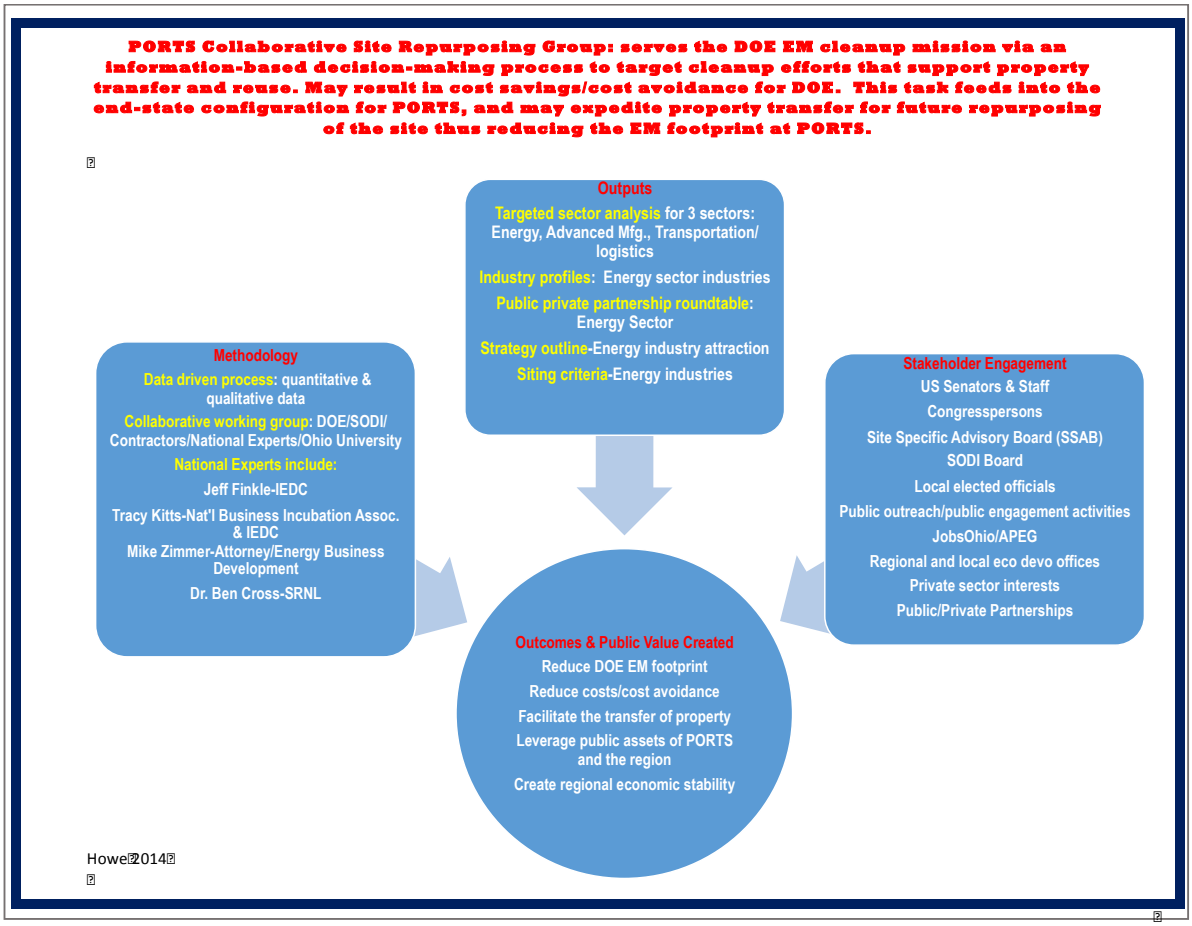



Figure 4 Collaborative Site Repurposing Group Graphic

## Energy Sector Analysis

The Energy Sector was vetted in-depth and the potential to attract energy-related businesses to locate at the site appears to be favorable. Due to Southern Ohio's long-standing ties to energy industries, the ability to develop/strengthen an energy cluster in the region will be enhanced with the site cleanup, transfer, and reuse. Local and State of Ohio entities can assist in regional economic development in this area by committing attention and resources to developing this cluster utilizing the PORTS site as a regional asset.

During April 2014, the President and CEO of the International Economic Development Council (IEDC) met with the site repurposing collaborative group to discuss strategies for site reindustrialization in the top three identified sectors. The meeting focused on:

- Discussion of strengths and weaknesses of the region and the PORTS site
- Identifying national and international trends in core sectors
- Discussion of industries for future consideration
- Preparing for the energy sector roundtable
- Identifying industry-specific experts to approach for future roundtables

In order to gather meaningful input from energy industry leaders and state and regional economic development professionals, the SRG held a regional energy sector roundtable to further inform site reuse planning in this area. Ohio University designed the roundtable concept in conjunction with national experts and in consultation with several energy industry leaders who were interviewed by telephone.

This information resulted in a concept paper that guided the materials developed for the session, the participant recruitment, and the facilitation design for the roundtable.

During May of 2014, an Energy Sector Roundtable was convened and the discussion focused on identifying opportunities to develop energy sector businesses at the PORTS site in the form of Public-Private Partnerships (P3s). See Appendix 4 to review the Energy Sector Roundtable Concept Paper. The roundtable was well-attended including representation from private industry, economic development, government, national level consultants, PORTS-SSAB, DOE, SODI, and site contractors. The roundtable is further described below in the "Outreach Subtask: PORTSfuture follow-up with the public at large in the four county area" section. See Appendix 5 for summary notes from the energy sector roundtable discussion.

Following the May 2014 Energy Sector Roundtable, the SRG incorporated results from the roundtable into the ongoing work group process and determined five industries specific to the energy sector that were the most feasible to pursue. The SRG utilized the process shown in figure 5, PORTS Eco-Industrial Park SRG Vetting Components, below. The top five industries included:

- Biofuels
- Bio-chemicals (Polymers, plastics, other)
- Waste recycling/waste transformation (waste heat, municipal waste, anaerobic digestion, methane combustion, other)
- Energy storage and microgrids
- Coal alternatives (clean coal, coal to liquids, RD&D, other) emphasizing 'E3 approach' of harmonizing utilization of environmental resources to develop energy and provide economic benefit

The energy roundtable results support and/or are relevant to several of the subcomponents of the stated public preferences for site future use. These public preferences were mentioned in the public outreach summary and can be viewed in detail in Appendix 2. The various energy-related subcomponents of the public preferences for possible site future use scenarios include post-consumer recycling, chemical products, renewable energy research and development, renewable energy manufacturing, alternative energy research and development, green technology, green energy consumer products, and alternative energy power generation and distribution.

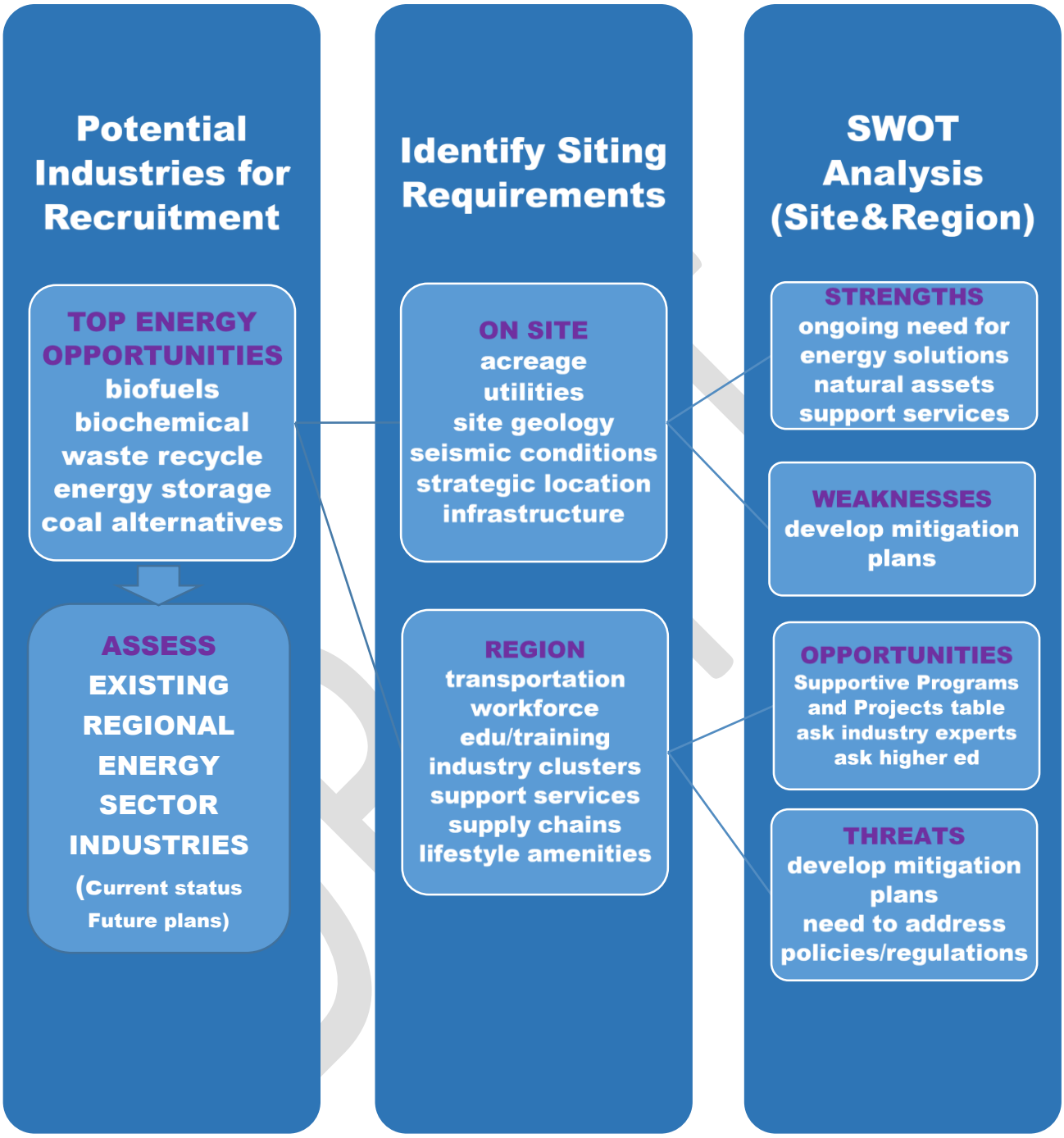



Figure 5 PORTS Eco-Industrial Park

Energy industry vetting activities resulted in the following SRG activities:

- During the spring of 2014, a Summary of Potential Energy Related and Supportive Programs and Projects was developed by Dr. Ben Cross at Savannah River National Laboratory to inform SRG activities. See Appendix 6 for the summary.
- During the summer of 2014, the SRG developed a "strategy outline" for an energy industry attraction plan to be used by SODI in site redevelopment efforts.
- Siting criteria were developed by site contractors during the fall of 2014 to clearly identify energy industry infrastructure and other needs to locate at a particular venue and/or to locate at PORTS.
- During the winter of 2014/2015, an industry profile paper was created to discuss top energy sector industries viable for siting at PORTS. See Appendix 7.

## NGNP Industry Alliance and NC2I Opportunity

A new collaborative opportunity was introduced to the SRG in the winter of 2015 related to exploring an international public private partnership collaboration focused on constructing an Integrated Energy System (IES) at the PORTS campus. SODI enacted a Memorandum of Understanding to collaborate with the Next Generation Nuclear Plant Industry Alliance (NGNP) to pursue an unique, environmentally sound approach that incorporates a base load energy generating concept with other engineering technologies to leverage assets of the region and create business growth opportunities in the energy sector. The fundamental driver of this IES would involve constructing and operating a versatile next generation nuclear power technology known as a High Temperature Gas Cooled Reactor (HTGR). This technology is described to be inherently safe due to the contained manner in which it operates and the state-of-the-art safety features it employs. The high temperature heat from the HTGR could enable the co-location of energy-intensive heat and power-using industrial end-users who are seeking zero carbon, environmentally friendly energy sources in their production processes.

The NGNP Industry Alliance is partnering with the European Union (EU) based Nuclear Cogeneration Industrial Initiative (NC2I) on a trans-Atlantic development of HTGR technology and this partnership is known as the GEMINI Initiative (http://gemini-initiative.com ). SODI and the NGNP Industry Alliance hosted NC2I representatives at Piketon in April, 2015 where shared interest in pursuing a partnership were solidified. Ohio University prepared data and GIS products to be presented by SODI at the meeting when framing the discussion. OU data and GIS information included results from the OU public engagement task on community future-use preferences and related economic analysis; locations of large energy companies and large fertilizer companies in Ohio; types and numbers of businesses in Ohio, Kentucky, West Virginia, and Pennsylvania that could purchase byproducts from the HTGR process to utilize in their own production processes; types and numbers of businesses in Ohio, Kentucky, West Virginia, and Pennsylvania that are potential high-quantity electricity users who could purchase electricity generated by an HTGR; numbers of advanced energy companies and advanced energy employees in Ohio; and regional asset maps. Members of the SRG working group attended this meeting and participated in discussions because this trans-Atlantic initiative would impact site repurposing efforts.

A partnership such as this could greatly enhance and bolster international relations between the US and EU, save on design costs for an IES at PORTS, and increase the overall market for HTGR technology. Equally as vital, this endeavor may assist EU countries in shoring up their industrial base while reducing their dependence on foreign energy supplies that are increasingly becoming unstable due to the political realities in Eastern Europe. One of the greatest benefits of this project could be found in developing an energy generation method that provides for enormous reductions in industrial carbon emissions.

This SODI/NGNP/NC2I project continues to be vetted and pursued. In June of 2015, SODI, NGNP, and an OU representative met with numerous government and DOE officials in Washington D.C. to discuss this opportunity. Such an initiative will need the buy-in and backing of both US and EU select government officials and industry leaders in order to develop a committed partnership. Key concerns that must be addressed include mitigating the immense up-front cost to construct the reactors both here in the US and in the EU and resolving regulatory issues associated with the design and federal licensing of this new reactor technology so that it can be constructed at the Piketon site. SODI and the NGNP plan to continue to working closely with potential key collaborators in

industry, government, the U.S. Department of Energy and others with the goal of effectively fostering this partnership. See Appendix 8 for an illustration of the plan for IES complex deployment at PORTS created by the SRG.

During April of 2015 following the SODI/NGNP/NC2I session, members of the SRG met with the President and CEO of the International Economic Development Council (IEDC) to brief IEDC on the trans-Atlantic opportunity and discuss strategies for site repurposing related to the NGNP and NC2I Initiative. IEDC provided valuable suggestions and contact information of energy industry leaders for the SRG to contact to engage in discussions on the trans-Atlantic initiative.

Outreach Subtask: PORTSfuture follow-up with the public at large in the four county area

This task was created to integrate the results of the public preference voting with the overall plan for the future of the site. These activities were coordinated with DOE, SSAB, SODI, site contractors, and all site repurposing initiatives that OU executed in relation to the DOE grant. Based on suggestions from key stakeholders this task was rolled out in tandem with the 3161-funded site repurposing task to leverage and compliment those efforts.

Under this task, OU developed activities that assisted in defining infrastructure and site characteristics needed to support pursuing implementation of community-preferred future-use scenarios. Stakeholders suggested that this task should focus on holding facilitated panel discussions, roundtables, and/or consultations with subject matter experts (SMEs) who could inform site repurposing efforts in the areas identified as the top four preferred future use options under the outreach task.

Consultations with SMEs and national experts March 2013-June 2015

OU sought out experts on various topics related to the site repurposing efforts including consulting with persons working at Idaho National Laboratory (INL), Savannah River National Laboratory (SRNL), Oak Ridge National Laboratory (ORNL), National Business Incubation Association (NBIA), International Economic Development Council (IEDC), private industry subject matter experts and energy business development consultants who operate at the national and international level. Sixteen consultations were held throughout the execution of the task and insights obtained from these consultations were woven into site repurposing efforts and informed the work of the SRG collaborative group.

Roundtable Request March 2013

In March of 2013, a specific request was made at an SSAB Executive Committee meeting asking OU to seek approval from their DOE Contract Officer Representative (COR) to convene a public discussion on small modular reactors. It was also suggested that the COR might recommend an SME to facilitate this discussion. The DOE COR determined that the topic of Small Modular Reactors (SMRs) did not appear to be a good-fit for the OU public panel discussions/roundtable tasks because: (a) The SMEs in this subject area would be extremely expensive in terms of covering their time and travel and would thus be cost prohibitive for what these discussions had been envisioned and (b) there are private-sector SMEs and/or industry groups that could speak to this topic area. If a private company did a “pitch” for SMRs it would not be appropriate for OU to use DOE grant dollars to sponsor the event. It was suggested that DOE PORTS could sponsor a panel discussion with a private-sector company/industry group. Also DOE PORTS could work with DOE National Planning to see if the national office could put together a panel on this topic area specific to PORTS. This determination by the DOE COR was communicated to the DOE PORTS Federal Coordinator.

Roundtable April 2013

As mentioned in the stakeholder involvement section above, in the spring of 2013 as the site repurposing task was launching, at the request of the DOE PORTS Site Director and DOE PORTS Federal Coordinator, OU co-convened a roundtable of state-level and national dignitaries assembled by OU's Voinovich School of Leadership and Public Affairs. The purpose of the roundtable was to illustrate how the PORTS site could be used as a job creation/job growth asset for the region and to seek input on future use planning activities. The discussion focused on site assets that include but are not limited to low-cost electricity at the site, tax deferments, trained regional labor force, and the existence of natural resources on and near the PORTS campus.

Roundtable May 2014

As the work of the SRG progressed around energy sector business opportunities that could be sited at PORTS, an Energy Sector Roundtable was developed and held on May 29, 2014 at the Endeavor Center in Piketon, Ohio. The session was facilitated by OU and the discussion was led by DOE PORTS, Savannah River National Laboratory, and a private sector attorney who specializes in energy company development and public/private partnerships. The discussion focused on identifying opportunities to develop energy sector businesses at the PORTS site in the form of Public-Private Partnerships (P3s). SODI, site contractors, DOE and OU collaborated on the development and execution of this event with the consultation of the SSAB. Thirty-eight people attended the roundtable including representation from DOE, SODI, PORTS Site Specific Advisory Board (SSAB) members, site contractors, private sector businesses, energy companies, public-sector entities, local, regional, and state level economic development professionals, elected officials, national laboratories, academic researchers, and national consultants. This session served to provide further direction to SRG work. Important highlights of the roundtable can be viewed in Appendix 5.

## Summary and next steps

Ohio University is honored to have been a part of, and to have added value to, the DOE, SODI, and site contractor collaborative efforts on informing end-state configuration to support viable site repurposing, ultimately resulting in reducing the EM footprint at PORTS.

The activities executed under the ***3161-Funded Site Repurposing Task and the Outreach Subtask: PORTSfuture follow-up with the public at large in the four county area*** created public value and served the public interest by informing site cleanup and future use planning while being mindful of leveraging the existing public assets of the PORTS site and the region to create regional economic stability.

**It is important to stress that these activities were carried out in a manner that was responsive to the stated future-use preferences of the public-at-large in the four county region near the site as identified during various DOE and Ohio University public engagement efforts and with the involvement of numerous site stakeholders including SODI; Site Specific Advisory Board (SSAB); community-at-large; local, state, and federal elected officials; county, regional, and state level economic development officials; private sector interests; and national experts.**

Ohio University remains committed to building on the momentum gained to continue these vital activities with DOE, SODI, the SSAB, and site contractors. The collaborative group has identified the following areas in which they believe Ohio University can continue to add value. Proposed future activities may include:

- Convene roundtables focused on Developing Public Private Partnerships for Advanced Manufacturing and Transportation/Logistics Sectors.
- Develop industry profiles for advanced manufacturing and transportation/logistics sector industries that are well-suited for locating at PORTS.

- Developing a strategy outline for advanced manufacturing and transportation/logistics industry attraction.
- Developing siting criteria for advanced manufacturing and transportation/logistics industries to identify what would be needed for locating at PORTS.
- Continue to inform and update key regional and political stakeholders on activities and progress.
- Conduct targeted industry site infrastructure analysis to inform sequencing for D&D including conducting a comparison of current site conditions versus conditions needed to support commercial use in specific targeted industry sectors to inform DOE decisions on what is in the best interest of the government regarding property transfer. Provide useful data points on how much a transferee or CRO might need to invest to make use of an asset that might otherwise be disposed. Identify siting requirements such as utilities and other assets to be left in place resulting in cost avoidance for DOE. Utilize GIS to display information when appropriate.
- Create reuse attributes index to identify/summarize recreational, green space and conservation attributes. Create index/matrix of infrastructure requirements for targeted industries (e.g. water, gas, electric, security, other). This could serve to identify assets to preserve rather than demolish resulting in potential for DOE cost avoidance in this effort. Incorporate the management of site ecological assets/natural capital assets management as appropriate.
- Identify areas for selected sampling at depth related to targeted industry infrastructure analysis Analyze existing as-built drawings for infrastructure configuration to recommend targeted areas for deeper sampling to ensure that site soil clean-up will be to the depth needed to support transfer for reuse by targeted industries.
- Conduct analysis of transportation networks of presumed industrial users' demands on road, rail and barge. This assessment will inform an aspect of NEPA analysis regarding how transportation and how the proposed action – site reuse – would impact transportation networks.
- Develop and assist with the execution of a site repurposing implementation plan as requested/as appropriate and incorporate Federal Programs as appropriate.
- Produce data needed to support these efforts (e.g. this may include maintaining existing data dashboards, creating profiles of regional economies and/or other data to be determined).
- Continue to identify and engage external and/or private sector resources that could be interested in utilizing site assets for future business development and job creation in the region.
- Leverage other funding opportunities where possible and especially pursue opportunities to bring private sector dollars and/or public private sector partnerships to the PORTS site,
    - This includes building upon current initiatives with entities such as:
        - commercial partners interested in exploring bio-energy opportunities at the site
        - university partners interested in conducting RD & D in advanced energy/renewable energy endeavors at the site, and
        - technology commercialization experts, private sector venture capitalists and pre-seed fund resources interested in investing in Southern Ohio companies.

Funding for proposed future activities may be available through a new financial assistance award from DOE. At the current time, a proposal for this award is being technically evaluated by DOE-PPPO.

Other OU PORTSfuture reports from previous tasks that tie-in and could inform future site repurposing efforts include:

The Habitat Mapping of the Land and Vicinity of the United State Department of Energy (DOE) Portsmouth Gaseous Diffusion Plant (PORTS) Pike County, Ohio-Under this 2-year task, OU compiled a fully georeferenced database from DOE, State, and public sources; completed a data gap analysis of the georeferenced data; and created a detailed land cover map of the PORTS site, including a 1-mile buffer around the site. Report available at: http://www.portsfuture.com/HabitatandLandUse.aspx

Wetland and Primary Headwater Streams Mitigation Conceptual Design Plan-The task resulted in the preparation of a mitigation conceptual design plan, including a wetland mitigation bank proposal, which could be used by PORTS to compensate for potential unavoidable losses to waters of the United States (Clean Water Act Section 404 jurisdictional wetlands and headwater streams as regulated by Ohio EPA). This task applied to only the approximately 3,000 acres of federally-owned lands outside of the central high security zone and to such other proximate lands that may be identified as potential locations for headwater stream mitigation. Wetland mitigation analysis and planning was limited to federal lands outside the central high security area. Report available at: http://www.portsfuture.com/HabitatandLandUse.aspx

Deliverables

Tools/templates related to the Site Repurposing task include the following and are available at http://www.portsfuture.com/siterepurposing.aspx:

- PORTS Collaborative Site Repurposing Flow chart
- Materials presented at meeting with Regional Economic Development Professionals
- Data base of brownfield comparisons
- Summary of Potential Energy Related Programs/Projects at PORTS Campus
- Public Private Partnerships (P3s) in the US
- Industry Analysis Template
- The Road To Energy Production at PORTS
- Site Repurposing Group Graphic
- PORTSfuture Energy Sector PORTS Campus White Paper
- Site Repurposing Group Next Steps Graphic
- PORTS Collaborative Site Repurposing Reindustrialization Flow Chart
- Data Dashboard
- Regional Assets Maps
- Strategy outline for energy industry attraction for SODI available upon approval from SODI
- Industry data related to HTGR created by OU for SODI available upon approval from SODI

**Appendix 1**

## Ohio University Voinovich School of Leadership & Public Affairs
## US Department of Energy Office of Environmental Management Grant for the PORTS Facility PORTSfuture Program 2010-present

## Appendix 2

# PORTSFUTURE

IMAGINING THE OPPORTUNITIES, GATHERING YOUR IDEAS
THE FACILITY AT PIKETON, OHIO


### Ohio University Voinovich School of Leadership and Public Affairs
### Public outreach for the site of the former Portsmouth Gaseous Diffusion Plant (PORTS) near Piketon, Ohio

FUNDED BY A FINANCIAL ASSISTANCE GRANT FROM THE U.S. DEPARTMENT OF ENERGY OFFICE OF ENVIRONMENTAL MANAGEMENT PORTSMOUTH/PADUCAH PROJECT OFFICE

Through a grant provided by the U.S. Department of Energy, Ohio University conducted a 15 month, broad-based public participation process in Pike, Scioto, Ross, and Jackson Counties to identify the community's future-use preferences for the U.S. Department of Energy's PORTS site located near Piketon, Ohio.

Community participants included residents, economic development entities, environmental groups, nonprofits, and many other stakeholders in the four counties near the plant.

Future-use scenarios were developed by community members via County Visioning Teams & voted on by the public-at-large at numerous public events and via the Internet.

**County Visioning Teams**
- One visioning team per county. Each held two planning meetings.
- All 4 counties drafted a total of 76 scenarios.
- Each county refined their own scenarios.
- A total of 19 refined scenarios were submitted to be considered by the Advisory Group.

**Advisory Group** *(comprised of 3 members from each county team and 2 alternates)*
- Combined 19 scenarios into 9.
- Rated all 9 scenarios.
- Put the 9 scenarios forth for public voting.

Economic impact analysis was conducted on all 9 scenarios and available to voters.

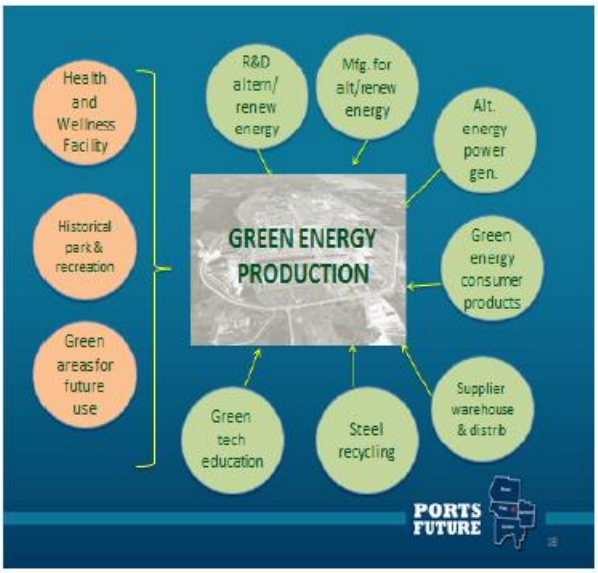
Public voting occurred on-line and in-person at events in the region from July 15, 2011-September 30, 2011. A total of 1,141 people voted on the nine scenarios and the total votes were:

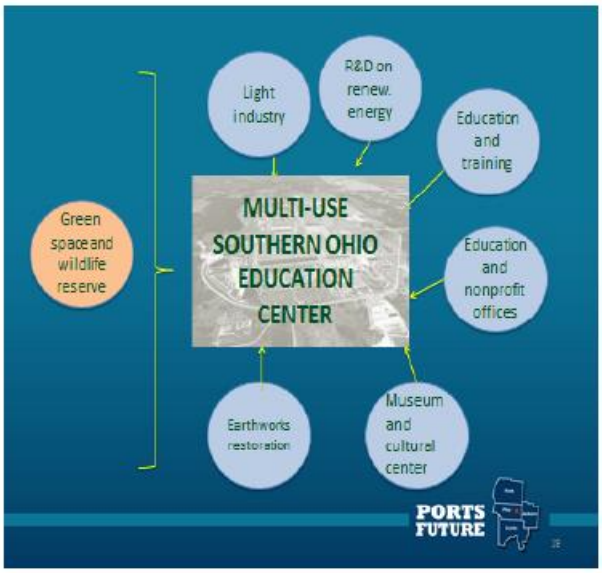
| Scenario Name | Total Votes |
|---|---|
| Industrial park | 421 |
| Green energy production | 475 |
| Multi-use southern Ohio education center | 143 |
| National research and development | 418 |
| Training and education facility | 160 |
| Greenbelt | 131 |
| Warehousing, distribution, and transportation hub | 179 |
| Nuclear power plant | 495 |
| Metal recovery facility | 152 |

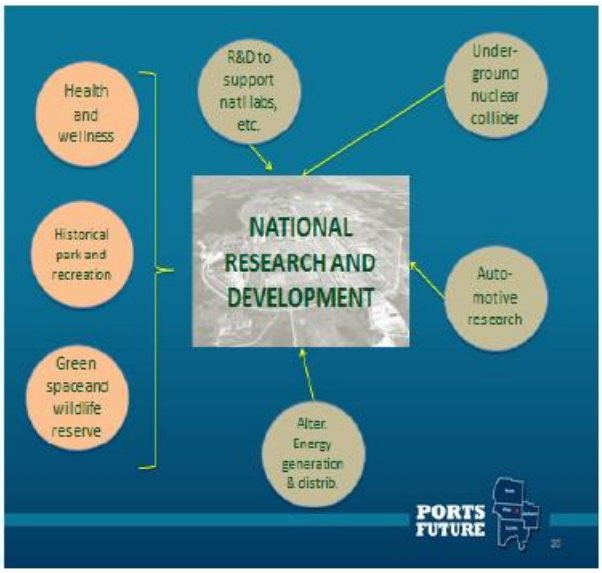
Scenario preferences obtained through the public voting activities were reported to key stakeholders and the final report was submitted to the U.S. Department of Energy, Office of Environmental Management, Portsmouth/Paducah Project Office for their consideration as they make cleanup and risk reduction decisions about the site.

*Final report released Winter 2012 and is available to the public at our website.*
*For more information, contact Stephanie Howe at Ohio University howe@ohio.edu, 740.593.9900 and visit www.portsfuture.com*

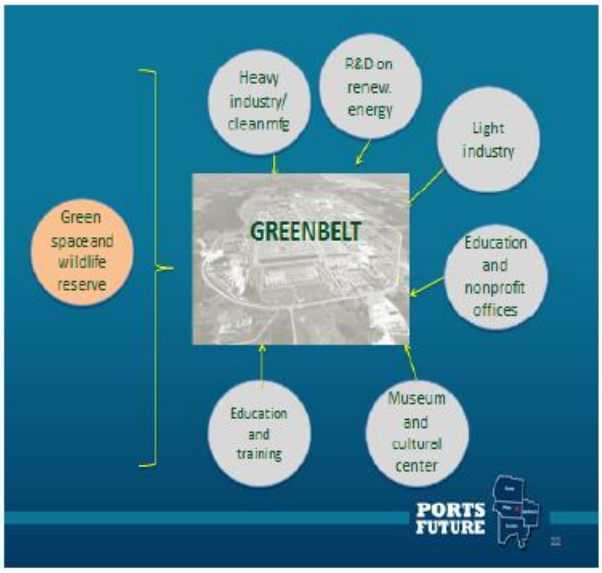

Health and wellness
Historical park and recreation
Open areas
Heavy mfg.
Post consumer recycling
INDUSTRIAL PARK
Industrial park shipping
Renew. energy mfg.
Research and Development
Chemical products
PORTS FUTURE


Health and Wellness Facility
Historical park & recreation
Green areas for future use
R&D altern/ renew energy
Mfg. for alt/renew energy
GREEN ENERGY PRODUCTION
Alt. energy power gen.
Green energy consumer products
Green tech education
Steel recycling
Supplier warehouse & distrib
PORTS FUTURE

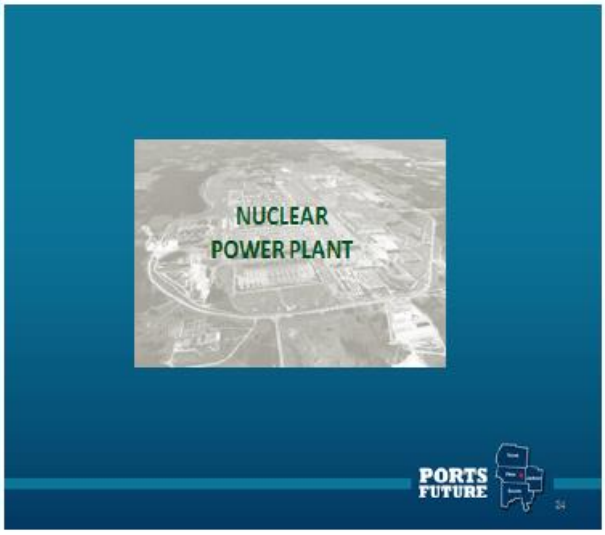

Green space and wildlife reserve
Light industry
R&D on renew. energy
MULTI-USE SOUTHERN OHIO EDUCATION CENTER
Education and training
Education and nonprofit offices
Earthworks restoration
Museum and cultural center
PORTS FUTURE

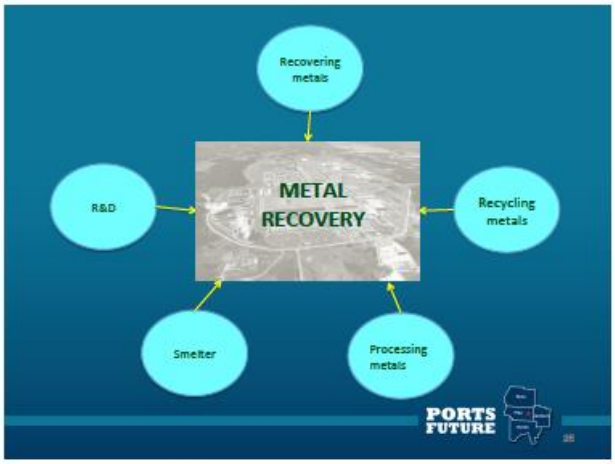

Health and wellness
Historical park and recreation
Green space and wildlife reserve
R&D to support natl labs, etc.
Under-ground nuclear collider
NATIONAL RESEARCH AND DEVELOPMENT
Auto-motive research
Alter. Energy generation & distrib.
PORTS FUTURE


Health and wellness
Historical park and recreation
Green space and wildlife reserve
Substance abuse facility
Military & ER training
TRAINING AND EDUCATION
Displaced worker training
STEM School
PORTS FUTURE


Green space and wildlife reserve
Heavy industry/ clean mfg
R&D on renew. energy
GREENBELT
Light industry
Education and nonprofit offices
Education and training
Museum and cultural center
PORTS FUTURE


Health and wellness
Historical park and recreation
Green space and wildlife reserve
Warehousing similar to Rickenbacker
WAREHOUSING, DISTRIBUTION & TRANSPORTATION HUB
Commercial distribution & storage
PORTS FUTURE


NUCLEAR POWER PLANT
PORTS FUTURE


Recovering metals
R&D
METAL RECOVERY
Recycling metals
Smelter
Processing metals
PORTS FUTURE


Value-Added
(In Millions $)
160
140
120
100
80
60
40
20
0
Green energy
Nuclear power
Ind Park
Natl R&D
Greenbelt
Metals Rec
Transport hub
Educ Center
Training & ed
PORTS FUTURE
37

## Appendix 3

### Voinovich School Partners Group Organized by Vocational Focus

- This group is assembled based on the participants' substantive focus and expertise and on their collaborations with the Voinovich School focused on solving problems in the region, the State of Ohio, and beyond.

- **The Partners Group is a critically valuable network for DOE PORTS to leverage as cleanup and property transfer efforts move forward as many of their professional pursuits intersect with DOE EM cleanup and property transfer efforts**. (see Partners Group roster):

OU Partners Group members in **private industry**:

- **Pablo Vegas,** President, AEP Ohio
- **Eric Burkland,** President, Ohio Manufacturer's Association
- **Joe Hamrock, Executive** Vice President and Group CEO for Gas Distribution, NiSource, Inc
- **Neill Lane**-CEO, Global Cooling

OU Partners Group members in **foundations/private funding/equity investments:**

- **David Wilhelm,** Founder and Partner, Woodland Ventures
- **Mel Carter,** Credit Suisse
- **James R. Klein,** Chief Executive Officer, Finance Fund
- **Cara Dingus Brook,** President and CEO, The Foundation for Appalachian Ohio
- **Mary Anne Flournoy,** Sugar Bush Foundation
- **Joe Flynn,** Vice President, Community Development, WesBanco

OU Partners Group members in **technology commercialization and economic development:**

- **Jeff Finkle,** President/CEO, International Economic Development Council
- **Norm Chagnon,** Deputy Chief of Technology and Innovation Division, Ohio Development Services Agency
- **Larry Triplet,** Muskingum County Business Incubator
- **John Molinaro,** President and CEO, Appalachian Partnership for Economic Growth

OU Partners Group members in **policy/political consulting:**

- 
- **Greg Browning,** President, Capital Partners
- **Gayle Channing Tenenbaum,** Director, Legislative Affairs, PCSAO

OU Partners Group members in **federal and state agencies:**

- **Vince Adams,** Site Director, Portsmouth, U.S. Department of Energy
- **Lisa Hamler-Fugitt,** Executive Director, Ohio Association of Second Harvest Foodbanks
- **Ben McCament,** Natural Resource Administrator III, Acid Mine Drainage and Forfeiture Programs, Ohio Department of Natural Resources, Division of Mineral Resource Management
- **Heather Reed,** Chief, Bureau of Community Health Services and Patient-Centered Primary Care, Ohio Department of Health

OU Partners Group members with **interests in education**:

- **Jim Mahoney,** Executive Director, Battelle for Kids

- **Laurel McFarland,** Executive Director, National Association of Schools of Public Affairs and Administration
- **Michael Smith,** Dean, The University of North Carolina Chapel Hill School of Government
- **Reggie Wilkinson,** President and CEO, Ohio College Access Network

Partners Group leadership and members in **Ohio University executive leadership**:

- **The Honorable George V. Voinovich,** Retired U.S. Senator
- **Dr. Roderick McDavis,** President
- **Dr. Mark Weinberg,** Founding Dean, The Voinovich School of Leadership and Public Affairs
- **Dr. Pam Benoit,** Executive Vice President and Provost
- **Stephen Golding,** Vice President for Finance and Administration
- **Dr. Joe Shields,** Vice President for Research and Dean of the Graduate College
- **Eric Burchard,** Director, Government Relations

**Appendix 4**

**Ohio University DOE Educational Assistance Grant**
**Site Repurposing Group (SRG)**
**Energy Sector Roundtable Concept Paper**

**Roundtable is an invitation only event and is being jointly executed by OU, DOE, SODI, and FBP**

**May 29, 2014**

## Purpose

The U.S. Department of Energy (DOE) former Portsmouth Gaseous Diffusion Plant (PORTS) near Piketon, Ohio has been an important economic player in the Pike, Scioto, Ross, and Jackson County area for many years and has thus impacted the region's socio-economic well-being. As the PORTS site undergoes decontamination and decommissioning (D&D), the site will present potential economic growth opportunities for the four-county area. PORTS provides numerous assets to leverage in repurposing efforts to attract industries to utilize the site to build businesses and create jobs.

Based upon the Ohio University PORTSfuture outreach project in 2010 and ongoing efforts, community preferences for possible future-uses of the site overwhelming favored reindustrialization. The community specifically cited as a priority pursuing energy sector activities as part of the site reuse. This roundtable discussion will convene regional economic development professionals, national experts in energy sector business creation, and other interested stakeholders to dialogue on possibilities and strategies for growing energy sector jobs utilizing PORTS, site assets, and regional assets that would support such efforts. A specific focus will be on pursuing Public-Private Partnerships (P3) to attract energy businesses.

This roundtable is being jointly executed by Ohio University's Voinovich School of Leadership and Public Affairs, DOE, the Southern Ohio Diversification Initiative (SODI), and the prime contractor conducting site cleanup, Fluor-BW Portsmouth (FBP).

## Substantive Focus

Roundtable topics to be addressed may include, but not be limited to:

- Short-term and long-term development opportunities that can occur in coordination with the D&D activities
- Regional assets
- Comparative advantage of low-cost property for industries
- Unique assets that exist at PORTS including:
    - Access to wholesale power market
    - On-site/local access to major highway/rail systems
    - Accessibility to excellent water resources
    - Central location in United States
    - Geological stability
- Leveraging funding opportunities where possible and especially pursuing opportunities to bring private sector dollars to the PORTS site. This may include:
    - Foundation funded research in advanced/renewable energy generation
    - Commercial partners interested in exploring advanced energy/renewable energy opportunities at the site
    - Private companies working in remediation services, and others
- Pursuing Public-Private Partnerships (P3) to attract energy businesses
- Other relevant topics to be covered as well.

## Participants

The discussants will include national experts in the fields of advanced/renewable energy generation, economic development, and public-private partnership (P3) building. Regional experts will include economic development professionals, business experts, and other interested stakeholders. The invitation list will be developed by the collaborative planning team (i.e. OU/DOE/SODI/FBP).

The discussion will be led by:

- Greg Simonton-DOE EM PORTS Strategic Planner
- Dr. Ben Cross-Savannah River National Laboratory-Senior Advisor-Clean Energy Directorate
- Mike Zimmer- Mike Zimmer-J.D.-Practice is focused on energy project development and regulation, climate change, energy project acquisitions and finance transactions. He is also an executive in residence at the OU Voinovich School and at the OU Russ College of Engineering specializing in issues related to Energy, Economics, and the Environment.

Additional invited discussants include:

- Steve Csonka-Executive Director of CAAFI (the Commercial Aviation Alternative Fuels Initiative) Steve leads this Public-Private Partnership working toward the advancement and commercialization of renewable jet fuel.
- Tim Wells-Manager, Economic & Business Development, American Electric Power
- Bill Franz-Senior Project Manager, Babcock and Wilcox

Invited guests

- County economic development directors from Pike, Jackson, Ross, and Scioto.
- OVRDC
  JobsOhio and APEG
- DUF6
- Local entrepreneurs in the environmental remediation and/or energy sector
- Senator Portman's Office
- Senator Brown's Office
- Governor Kasich's Office

## Logistics

- The roundtable will be held on **Thursday, May 29, 2014 at the OSU Endeavor Center in Piketon, Ohio. The three hour event will occur 10:00 a.m. – 2:00 p.m. with lunch served on site.** General background data and other information to support the discussion will be available on site.

For more information please contact: Stephanie Howe at 740.593.9900

## Appendix 5

**US Department of Energy PORTS Site Repurposing**
**Energy Sector Roundtable**
**Endeavor Center-Piketon, Ohio**
**May 29, 2014**
**Flip Chart Summary Notes**

### Ideas to explore

- Jet fuels/biofuels/biofeedstock
- Testing novelty feedstocks (RD&D)
- Biorefinery/bioenergy production hub/biomass production and processing
- Battery manufacturing
- Energy storage/battery storage
- Clean tech manufacturing
- Municipal solid waste
- Hybrid use
- Coal to liquids conversion
- Shale gas processing
- Polymers
- Microgrids
- AmmoNGNP/fertilizer
- Solar energy generation
- Solar energy industry manufacturing
- Solar energy RD&D
- Capture and reuse of waste generated in energy generation
- Addressing US and State of Ohio carbon relief goals
- Industrial waste stream recycling

### Approaches for Success

- Develop a site repurposing master plan:
    - Site reuse as part of regional portfolio
    - Milestones for success
    - Siting requirements for targeted industries
    - Land availability schedule
    - Lowering risks for private capital
        - Cleanup liabilities
        - Small parcels first
        - Regulatory clearances
        - Site characterization
- Develop political strategy after master plan developed
    - Need for continued funding for cleanup efforts
- Business creation assistance:
    - Ohio's Third Frontier program

- Venture capital and angel investor networks
- Operational assistance to assist entrepreneurs and start-up tech companies
  - Commercialization/Intellectual Property assistance
- RD&D at the site to pursue ideas of entrepreneurs/universities etc…

**To be addressed in a site reuse master plan**

- SODI is the Community Reuse Organization and is the lead entity.
  - What assistance is needed? Identify leaders/champions of collaborative efforts to reindustrialize site?
- Part of regional strategy so that when attracting businesses, other nearby sites can be considered as well if PORTS does not suit a businesses' needs. What are the other shovel-ready sites in the region?
- Clarify outstanding questions/what-if scenarios/issues about reusing the site
- Site limitations
- Leverage site assets (e.g. access to transportation corridors, energy transmission capacity, flat land, pipeline etc…)
- Develop specific/targeted project list to pursue
- Siting requirements for select/targeted industries
- Workforce training programs to align with targeted industries
- Explore land use outside of Perimeter Road
- Remove risks for businesses to entice business location at the site
- Define regional assets
- JEDISO targeted industry list
- Leverage the regional assets including lifelong learning resources
- Cluster opportunities built on core assets
- Define geography of the region (e.g. multi-county? Multi-state?)
- Supply chain mapping in the region
- Accelerate testing and transitioning of the 100 acre airstrip
- Develop political strategy after master plan developed
- How easily can natural gas be transported to the site for energy generation activities?
- Template for making land transfer occur expeditiously

## Appendix 6



# Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| Advanced Biofuels and Biomass products<br><br>(Federal & National Lab) | **Technology Demonstration and Deployment**<br>The Bioenergy Technologies Office's (BETO) demonstration and deployment activities focus on integrated biorefinery (IBR) applications and biofuel distribution infrastructure and end use. IBR activities address problems encountered in the so-called "Valley of Death" between pilot-scale and commercial-scale deployment.<br><br>**National Bioenergy Center (NBC)**<br><br>Headquartered at NREL, this center unifies DOE's efforts to advance technology for producing renewable transportation fuels from biomass. NBC's mission is to foster capability to catalyze the replacement of petroleum with transportation fuels from biomass by delivering innovative, cost-effective biofuels solutions.<br><br>**Energy Systems Integration (ESI)**<br><br>Headquartered at NREL, this program focuses on a unique system-of-systems concept to energy systems integration. This approach considers the relationships among electricity, thermal, and fuel systems and data and information networks to ensure optimal integration and interoperability across the entire energy system spectrum. | DOE-Energy Efficiency & Renewable Energy (EERE) and National Renewable Energy Laboratory (NREL)<br><br>Dr. Jonathan Male<br>Director<br>Bioenergy Technology Office (BETO)<br>202-586-5188<br>jonathan.male@ee.doe.gov<br><br>James J. (Jim) Spaeth<br>Program Manager-Demonstration and Deployment<br>Bioenergy Technology Office<br>720-356-1784<br>jim.spaeth@go.doe.gov<br><br>Richard (Rich) Bolin<br>NBC's Partnerships and Business Development<br>303-384-7716<br>richard.bolin@nrel.gov<br><br>Dr. Martha Symko-Davies<br>Director of Partnerships for Energy Systems Integration (ESI)<br>303-384-6528<br>Martha.Symko.Davies@nrel.gov | BETO Mission: Develop and transform our renewable biomass resources into commercially viable, high-performance biofuels, bioproducts, and biopower through targeted research, development, demonstration, and deployment.<br>BETO works closely with USDA, the Environmental Protection Agency, the Department of Defense, the Department of Transportation's Federal Aviation Administration, and other departments and agencies to accelerate deployment and commercialization of biomass technologies.<br><br>NREL is DOE-EERE's principal national lab and it helps administer many of EERE's programs. |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| Advanced Biofuels and Biomass products<br><br>(Federal) | **The Biorefinery Assistance Program** provides loan guarantees for the development, construction, and retrofitting of commercial-scale biorefineries. Read more<br>**The Repowering Assistance Program** provides payments to eligible biorefineries to replace fossil fuels used to produce heat or power to operate the biorefineries with renewable biomass. Read more<br><br>**The Advanced Biofuel Payment Program** provides payments to producers to support and expand production of advanced biofuels refined from sources other than corn kernel starch. Read more<br><br>**The Rural Energy for America Program** provides assistance to agricultural producers and rural small businesses to complete a variety of projects, including renewable energy systems, energy efficiency improvements, renewable energy development, energy audits, and feasibility studies. Read more<br><br>The **Biomass Crop Assistance Program** (BCAP) provides financial assistance to owners and operators of agricultural and non-industrial private forest land who wish to establish, produce, and deliver biomass feedstocks. BCAP provides two categories of assistance:<br>• Matching payments may be available for the delivery of eligible material to qualified biomass conversion facilities by eligible | U.S. Department of Agriculture (USDA)<br><br>Randy Monhemius<br>USDA Rural Development<br>Federal Building, Room 507<br>200 North High Street<br>Columbus, OH 43215-2418<br>(614) 255-2424<br>Randy.Monhemius@oh.usda.gov<br><br>Website:<br>http://www.rurdev.usda.gov/oh | USDA can assist in many different areas dealing with forest and agriculture. They can work with County Extension Offices to help educate farmers on biomass production and help establish co-ops to harvest and transport biomass products to processing facilities. |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| | material owners. Qualified biomass conversion facilities produce heat, power, biobased products, or advanced biofuels from biomass feedstocks.<br>• Establishment and annual payments may be available to certain producers who enter into contracts with the Commodity Credit Corporation (CCC) to produce eligible biomass crops on contract acres within BCAP project areas. Learn More<br><br>**Feedstock Flexibility Program for Bioenergy Producers,** encourages the domestic production of biofuels from surplus sugar. Learn More<br><br>**Rural Development Loan Assistance,** forges partnerships with rural communities, funding projects that bring housing, community facilities, business guarantees, utilities and other services to rural America. USDA provides technical assistance and financial backing for rural businesses and cooperatives to create quality jobs in rural areas. Rural Development promotes the President's National Energy Policy and ultimately the nation's energy security by engaging the entrepreneurial spirit of rural America in the development of renewable energy and energy efficiency improvements. Rural Development works with low-income individuals, State, local and Indian tribal governments, as well as private and nonprofit organizations and user-owned cooperatives. | | |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| Advanced Biofuels and Biomass products<br><br>(Federal) | **Farm-to-Fleet**, a joint USDA and Navy venture to make biofuel blends part of regular, operational fuel purchase and use by the military. The program allows for the acquisition of biofuel blends into regular Department of Defense (DOD) domestic solicitations for jet engine and marine diesel fuels. | USDA and Navy | The Navy seeks to purchase JP-5 and F-76 advanced drop-in biofuels blended from 10 to 50 percent with conventional fuels. Funds from USDA's Commodity Credit Corporation (CCC) are available for Farm-to-Fleet projects. |
| Advanced Biofuels and Biomass products<br><br>(Federal & National Lab) | **BioEnergy Science Center** (BESC) is a multi-institutional (18 partner), multidisciplinary research (biological, chemical, physical and computational sciences, mathematics and engineering) organization focused on the fundamental understanding and elimination of biomass recalcitrance. BESC's approach to improve accessibility to the sugars within biomass involves 1) designing plant cell walls for rapid deconstruction and 2) developing multitalented microbes for converting plant biomass into biofuels in a single step (consolidated bioprocessing. | ORNL/BESC<br>Dr. Paul Gilna<br>Director<br>865-576-0567<br>gilnap@ornl.gov<br><br>Website: bioenergycenter.org<br><br>Dr. Renae Speck<br>Director of Technology Transfer and Partnership<br>865-576-4680<br>speckrr@ornl.gov | BESC is one of three Bioenergy Research Centers established by DOE's Office of Science in 2007 to accelerate research toward the development of cost-effective advanced biofuels. |
| Advanced Biofuels and Biomass products<br><br>(Industry Group) | Industry group promoting the use of biofuels | Advanced Biofuels Association (ABFA)<br><br>Michael McAdams<br>President<br>202-469-5140<br><br>Website:<br>www.advancedbiofuelsassociation.com | ABFA represents over 40 member companies who produce advanced and cellulosic biofuels, as well as renewable feedstocks. |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| Advanced Biofuels and Biomass products<br><br>(Industry Group) | Educational programs for a wide range of interests in the renewable energy community, focusing on technology, finance, policy and market development. ACORE has three primary areas of focus: National Defense & Security, Power Generation and Infrastructure, and Transportation. | American Council on Renewable Energy (ACORE)<br><br>Michael R. Brower<br>President & CEO<br>202-393-0001 (ACORE Office)<br><br>Website: www.acore.org | ACORE, a 501(c)(3) non-profit membership organization, is dedicated to building a secure and prosperous America with clean, renewable energy. ACORE convenes thought leadership forums, regional roundtables, and creates energy industry partnerships to communicate the economic, security and environmental benefits of renewable energy, including biofuels and biomass products. |
| Advanced Biofuels and Biomass products<br><br>(Industry Group) | Industry group focuses alternative jet fuels for aviation | Commercial Alternative Aviation Fuel Initiative (CAAFI)<br><br>Steve Csonka<br>Executive Director<br>513-800-7980<br>Csonka.CAAFI.ED@gmail.com<br><br>Website: www.caafi.org | CAAFI is a coalition that focuses the efforts of commercial aviation to engage the emerging alternative fuels industry. It enables its diverse participants - representing all the leading stakeholders in the field of aviation - to build relationships, share and collect data, identify resources, and direct research, development and deployment of alternative jet fuels |
| Advanced Biofuels and Biomass | Private sector biofuels producer that uses patented microbes and processes to produce renewable chemical and fuels. | Aemetis, INC<br>20400 Stevens Creek Boulevard<br>Suite 700<br>Cupertino, CA 95014 | Aemetis, Inc. is an industrial biotechnology company producing renewable chemicals and fuels using patented |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| products<br><br>(Industry) | | Eric McAfee<br>CEO<br><br>Andy Foster<br>President of Aemetis Advanced Fuels<br>408-213-0940 (Aemetis Office)<br><br>Website: www.aemetis.com | microbes and processes. The Z-Microbe is a patented organism that converts a variety of renewable feedstocks such as sugar, starch and cellulose directly into renewable chemicals and fuels. The Z-Microbe technology utilizes consolidated bio processing (CBP) technology to convert multiple feedstocks into chemicals and fuels in one, low-cost process. Aemetis is a company owned by venture capitalists. |
| Advanced Biofuels and Biomass products<br><br>(Industry) | Actively support regional programs and projects that are focused on providing alternative and biofuels to the aviation industry. | Boeing<br><br>Timothy J. Vinopal<br>Boeing Defense, Space & Security<br>Director - EH&S Engineering<br>206-406-2277<br>timothy.j.vinopal@boeing.com<br><br>Stephen Emmert<br>stephen.k.emmert@boeing.com | Boeing will support, with personnel and funding, regional aviation fuel initiatives that are started and lead by others. |
| Advanced Biofuels and Biomass products | Private sector biofuels producer | Cool Planet Energy Systems<br><br>Howard Janzen<br>President & CEO<br><br>Vital Aelion | Cool Planet strategic investors include BP, Google Ventures, Energy Technology Ventures (GE, ConocoPhillips, NRG Energy), and the Constellation division of Exelon. Cool Planet |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| (Industry) | | VP of Strategic Planning, Assistant to the CEO<br><br>303-221-2029 (Cool Planet Office) | started construction on its first commercial facility in Alexandria, LA in February 2014. |
| Advanced Biofuels and Biomass products<br><br>(Industry) | Private sector focused on the logistics biomass feedstock logistics and improving biomass supply chain efficiencies. | FDC Enterprises, INC (FDCE) based in Springfield, OH<br><br>Fred Circle<br>President & CEO<br>866-270-4833 (FDC Office)<br>fred@fdcenterprises.com<br><br>Tom Schwartz<br>Vice President of Marketing<br>217-725-7550<br>tom@fdcenterprises.com | FDCE, , has been awarded 2 US Department of Energy (DOE) grants to develop industrial scale methods for efficiently collecting, harvesting, storing and transporting feedstock to be used for biofuels and bioproducts. They are currently involved in 4 major dedicated energy crop projects and 6 direct-fire biofeedstock projects across the nation. |
| Advanced Biofuels, Biomass products, Waste-to-Energy<br><br>(Industry) | Private sector biofuels producer | Frontline BioEnergy<br><br>Jerod Smeenk<br>Director of Project Engineering<br>jsmeek@frontlinebioenergy.com<br><br>Dr. T. J. Paskach<br>Director of Technology<br><br>515 292-1200 (Frontline Office)<br><br>Website:<br>www.frontlinebioenergy.com | Frontline BioEnergy develops innovative gasification solutions for renewable energy, renewable fuels, and renewable products. In 2013, the U.S. Department of Energy (DOE) announced it would invest $4.2 million through its Integrated Biorefinery Program in Frontline's TarFreeGas® gasification technology and SGC Energia US's Fischer-Tropsch technology to produce drop-in biofuels for military use. Beginning in 2014, this project |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| | | | will be constructed and operated in Texas in partnership with SGC Energia US. |
| Advanced Biofuels and Biomass products<br><br>(Industry) | Private sector biofuels producer that utilizes woody biomass as feedstock to produce drop-in fuels. | KiOR<br><br>Fred Cannon<br>President & CEO<br><br>John Kasbaum<br>Senior Vice President of Commercial<br><br>281-694-8700 (KiOR Office)<br><br>Website: www.kior.com | KiOR had technical challenges and severe financial losses in 2103. KiOR is a next-generation renewable fuels company that has developed a proprietary technology platform to convert biomass into renewable crude oil that is processed into gasoline, diesel and fuel oil blendstocks. The company built the first commercial scale cellulosic fuel facility in Columbus, MS, which started production in 2012. |
| Advanced Biofuels and Biomass products<br><br>(Industry) | Private sector biofuels technology developer responsible for developing and implementing some of the most useful, original technologies in the world. UOP, through its joint venture Envergent Technologies, provides technology that converts biomass into a liquid biofuels. | UOP LLC, (A Honeywell Company) headquartered in Des Plaines, Illinois<br><br>Jim Rekoske<br>Vice President and General Manager of UOP's Renewable Energy and Chemicals<br>847-375-7187<br>James.Rekoske@uop.com | UOP is a leading international supplier and licensor of technologies for the petroleum refining, gas processing, petrochemical production and biomass industry. |
| Advanced Biofuels and Biomass | Private sector biofuels producer, who uses patented catalytic chemistry, to convert soluble biomass-derived sugars into products molecularly identical to those made with petroleum, including gasoline, | Virent Energy Systems<br><br>Lee Edwards<br>President | Virent has key strategic relationships in place with Royal Dutch Shell, Cargill and Honda to add vital resources |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| products<br><br>(Industry) | diesel, jet fuel, and chemicals used for plastics and fibers | 608-663-0228 (Virent Office)<br><br>Website: www.virent.com | and expertise required to accelerate commercialization of its technology. |
| Coal Conversion<br><br>(Federal & National Lab) | ADVANCED ENERGY SYSTEMS PROGRAM<br>NETL's Advanced Energy Systems Office conceives, analyzes, and develops energy technologies that can minimize the environmental impact of fossil fuel use and optimize the use of our domestic energy resources and infrastructure. Below are links to focus areas:<br>Gasification Systems \| Advanced Combustion \| Coal & Coal/Biomass to Liquids \| Solid Oxide Fuel Cells \| Turbines<br><br>**Air Force Coal-derived Jet Fuel**, DOE is funding (~20M) projects that will lead to a jet fuel with lifecycle greenhouse gas emissions less than or equal to conventional petroleum-based jet fuel production, while remaining cost-competitive.<br>Award recipients will share in the costs of the project, providing at least 20 percent of the funds. Areas of interest for the jet fuel projects are —<br>• Hybrid coal-to-liquids processes for jet fuel production.<br>• Process intensification for coal conversion for jet fuel production.<br>• Innovative non-traditional coal conversion processes for jet fuel production. | DOE-Fossil Energy and National Energy Technology Laboratory (NETL)<br><br>Sean Plasynski<br>Director: Strategic Center for Coal<br>412-386-4867<br>Sean.Plasynski@netl.doe.gov<br><br>Heather Quedenfeld<br>Division Director: Advanced Energy Systems Division<br>412-386-5781<br>heather.quedenfeld@netl.doe.gov<br><br>Michael Knaggs<br>Director: Office of Major Demonstration<br>304-285-4926<br>mnagg@netl.doe.gov | NETL is DOE-FE's principal national lab and has offices and research facilities in Pittsburgh, PA and Morgantown, WV<br><br>Need to follow-up with entities receiving funding to see if there is a possibility of having pilots or demonstrations in the region. Also, need to investigate if regional universities are involved as R&D partners. |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| | • Commercialization analysis for construction of a site specific coal-to-liquids facility | | |
| Coal Conversion<br><br>(Industry) | Anaerobic bioconversion of coal to useful products: natural (methane) gas, liquid fuels, humic/fulvic acid fertilizer, and chemicals | Arctech and Humaxx<br><br>Dr. Daman Walia<br>571-338-5005<br><br>Websites: www.arctech.com<br>www.humaxx.com | ARCTECH and Humaxx are spin-off company from the Atlantic Research Corporation's Environmental Science and Technology division. |
| Economic Develop-ment | A government formed regional economic development agency that represents a partnership of federal, state, and local government. ARC funds projects that address the four goals identified in the Commission's strategic plan:<br>1. Increase job opportunities and per capita income in Appalachia to reach parity with the nation.<br>2. Strengthen the capacity of the people of Appalachia to compete in the global economy.<br>3. Develop and improve Appalachia's infrastructure to make the Region economically competitive.<br>4. Build the Appalachian Development Highway System to reduce Appalachia's isolation. | The Appalachian Regional Commission (ARC)<br>1666 Connecticut Avenue, NW<br>Suite 700<br>Washington, DC 20009-1068<br><br>Charles S. Howard<br>Interim Executive Director, General Counsel<br>202.884.7700<br>choward@arc.gov<br><br>Karen Fabiano<br>Program Manager<br>Governor's Office of Appalachia<br>77 South High Street, 24th Floor<br>P.O. Box 1001<br>Columbus, OH 43216-1001<br>614.644.9228<br>karen.fabiano@development.ohio.gov | ARC has Local Development Districts throughout the Appalachia. The one for Portsmouth area is:<br><br>Ohio Valley Regional Development Commission<br>73 Progress Drive<br>Waverly, Ohio 45690-1196<br>740-947-2853<br>Executive Director: John Hemmings<br>email@ovrdc.org<br>Web Site:<br>http://www.ovrdc.org<br>*Counties: Adams, Brown, Clermont, Gallia, Highland, Jackson, Lawrence, Pike, Ross, Scioto, Vinton, (Fayette)* |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| Fertilizer Production<br><br>(Industry) | Private sector involved in producing nitrogen based fertilizer from natural gas. | Ohio Valley Resources, Inc (OVR)<br>153 Highway 7 S<br>Powhatan Point, OH, 43942<br>(740) 795-5220<br><br>Doug Wilson<br>President & CEO | OVR has entered into a Memorandum of Understanding (MOU) with Tierra Del Fuego Power & Chemical Company Ltd (TEQSA) for the development of the proposed nitrogen fertilizer plant in Spencer County, Indiana, north of Rockport. The focus of the MOU is to provide equity financing for the project construction while retaining the US-based management and operations team assembled by OVR.<br>The high-tech facility is expected to produce ammonia and urea ammonium nitrate (UAN) solution for fertilizer. Some of the ammonia production will serve the local utility markets for NOx control (known as selective catalytic reduction units or SCRs), which reduces emissions in coal-fired power plants and industrial facilities. In addition, the plant will produce diesel exhaust fluid (DEF), a urea solution used to reduce emissions in diesel engines. |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| | | | ~ 1,200 workers will be needed to construct the plant during a three-year period. Upon completion in 2017, the facility will employ approximately 80 full-time workers. |
| Nuclear<br><br>(Industry) | Commercial Nuclear Power Plant for producing electrical power. | Duke Energy<br><br>Lawrence Denney<br>Nuclear Development Strategy Manager<br>704-382-1895 (O)<br>704-654-7491(M)<br>Lawrence.Denney@duke-energy.com | In 2009 and 2010, as part of the Southern Ohio Clean Energy Alliance, Duke investigated locating a commercial nuclear power plant at PORTS. The other alliance members were AREVA, USEC Inc., UniStar Nuclear Energy and the Southern Ohio Diversification Initiative (SODI). |
| Nuclear<br><br>(Industry Group) | Next Generation Nuclear Plant (NGNP), development and commercialize a Generation IV, intrinsically safe nuclear high temperature gas-cooled reactor (HTGR) technology that can be used for cogeneration of process heat and electricity, displacing other fossil fuels and the greenhouse gases | NGNP Industry Alliance<br><br>Mark Haynes<br>202-617-1687<br>haynes@concordiapower.us<br><br>Website: www.ngnpalliance.org | NGNP Industry Alliance has held collaboration meetings with the European Nuclear Cogeneration Industrial Initiative (NC2I) to discuss collaboration opportunities for the development and commercialize HTGR technology |
| Ohio Govern-ment | State agency responsible of agricultural activities in Ohio | Ohio Department of Agriculture<br><br>David Daniels<br>Director<br>614-466-3506 | Interface with for energy crop production. |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| Ohio Govern-ment | State agency responsible of the natural resources in Ohio | Ohio Department of Natural Resources<br><br>Robert L. Boyles<br>Chief, Division of Forestry<br>*2045 Morse Road, Building H-1*<br>*Columbus, OH 43229-6693*<br>614-265-6694<br><br>Southern District (Division of Forestry)<br>Nate Jester<br>Administrator<br>345 Allen Avenue<br>Chillicothe, OH 45601<br>740-774-1596 | Division of Forestry's mission is to promote and apply management for the sustainable use and protection of Ohio's private and public forest lands, which about 200,000 acres is State Forest. |
| Ohio Govern-ment | State agency responsible for:<br>**Advanced energy and efficiency program,** whose mission is to grow the economy of the state by connecting companies and communities to financial and technical resources increase efficiency and deploy advanced energy technologies.<br><br>**Alternative Fuel Transportation Program**, whose mission is to improve air quality through financial assistance to businesses, nonprofit organizations, school districts, or local governments for the purchase and installation of alternative fuel refueling, blending, or distribution facilities and terminals.<br><br>**Ohio Coal Research and Development Program**, | Ohio Development Services Agency (ODSA)<br><br>David Goodman<br>Director<br>614-466-3379<br><br>Office of Energy and the Ohio Coal Development Office<br>77 South High Street, 26th Floor<br>P.O. Box 1001<br>Columbus, Ohio 43216-1001<br>614-466-6797<br><br>Governor's Office of Appalachia<br>Jason Wilson | ODSA offers a broad range of services and administers a variety of programs that support economic development. |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| | which is administered by the Ohio Coal Development Office (OCDO) and provides funding for (i) research and development at educational and scientific institutions, and for (ii) demonstration projects. The program seeks projects that result in the maximum conversion or use of Ohio coal as a fuel or chemical feedstock in a cost-effective and environmentally acceptable manner.<br><br>**Qualified Energy Project Tax Exemption**, which promotes the deployment of alternative energy sources in Ohio by exempting the public utility tangible personal property tax and the real property tax for "energy facilities" in favor of an affordable, fixed annual payment in lieu of taxes for the life of the facility. Owners of large "energy facilities" must repair roadways damaged in the construction of the facility, train and equip emergency personnel, develop relationships with members of the university system of Ohio to promote education in alternative energy, and remain in compliance with all applicable federal, state, and local regulations.<br><br>**The Clean Ohio Fund**, which restores, protects, and connects Ohio's important natural and urban places by preserving green space and farmland, improving outdoor recreation, and cleaning up brownfields to encourage redevelopment and revitalize communities.<br><br>**Site Selection and Certification**, which helps | Director<br>614-644-9228<br>Office of Technology Investments<br>Norm Chagnon Ph.D.<br>Deputy Chief<br>614-466-3887 | |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| | businesses, choose the right location for their facility. ODSA works with JobsOhio to provide tools and resources for businesses, site selectors and communities looking to provide development-ready sites. Ohio has a database of available sites for businesses, as well as a program designed to certify and market a community's job-ready sites. ODSA can help communities ensure that sites are viable for their intended end use, and if not, can advise what investments need to be made in order to attract a high-quality end user.<br><br>**Appalachia Programs**, which is administered by Governor's Office of Appalachia, who serves as an advocate for Ohio's 32 Appalachian counties. The Office partners with organizations, agencies, and individuals to foster positive economic growth and improve the quality of life for all citizens living in the region. The Governor's Office of Appalachia works with Ohio's four Local Development Districts and with the Appalachian Regional Commission in Washington, D.C., to promote the region's assets and to support local, regional, state, and federal initiatives.<br><br>**Ohio Third Frontier**, which Frontier provides funding to Ohio technology-based companies, universities, nonprofit research institutions, and other organizations to create new technology-based products, companies, industries, and jobs. This program is administered by Office of Technology | | |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| | Investments. | | |
| Oil & Gas<br><br>(Industry) | Private sector producer and refiner of oil and is exploring biofuel co-processing<br><br>On Feb. 3, 2014 MPC announced that it signed an agreement to purchase a facility in Cincinnati, Ohio from Felda Iffco Sdn Bhd, Malaysia. The plant currently produces several products including biodiesel and glycerin. The capacity of the plant is 4,100 barrels per day. | Marathon Petroleum Corporation (MPC)<br>419-422-2121 (Findlay HQ)<br><br>Website:<br>www.marathonpetroleum.com<br><br>Gary R. Heminger<br>President and Chief Executive Officer<br><br>Richard D. Bedell<br>Senior Vice President, Refining | MPC is the nation's fourth-largest refiner, with a crude oil refining capacity of approximately 1.7 million barrels per calendar day in its seven-refinery system. MPC owns, leases or has ownership interests in approximately 8,300 miles of pipeline. Through subsidiaries, MPC owns the general partner of MPLX LP, a midstream master limited partnership. MPC's fully integrated system provides operational flexibility to move crude oil, feedstocks and petroleum-related products efficiently through the company's distribution network in the Midwest, Southeast and Gulf Coast regions. |
| Oil & Gas<br><br>(Industry) | Private sector oil and gas producer working the Utica and Marcellus shales. | Chesapeake Energy<br>Robert Lawler<br>CEO<br>6100 North Western Avenue<br>Oklahoma City, OK 73118<br>405-848-8000 | Chesapeake has grown to become the second-largest producer of natural gas, 11th largest producer of oil and natural gas liquids, and the most active driller of onshore wells in the country |
| Waste-to-Energy | Private sector company based in Ohio that utilizes anaerobic digestion technologies to convert organic | Quasar Energy Group | Partnered with Clean Fuels Ohio, OSU's Ohio Agricultural |

## Summary of Potential Energy Related and Supportive Programs and Projects

| Category | Description | Key Contact Information | Comments |
|---|---|---|---|
| (Industry) | solid waste from agricultural farmers, industrial food companies, municipal treatment plants and ethanol producers to produce biogas that becomes reusable energy while remaining liquid and resulting solids can be used for fertilizer and organic soil amendments. | Melvin R. Kurtz<br>President<br>Independence Tower<br>5755 Granger Road, Suite 320<br>Cleveland, Ohio 44131<br>216-986-9999 | Research and Development Center (OARDC) ENTER and OSU's Ohio Bioproducts Innovation Center (OBIC) |

# ENERGY SECTOR INDUSTRY OPPORTUNITIES FOR THE PORTS CAMPUS

**Analysis conducted by Mike Zimmer for PORTSFUTURE, 2014**

*Sponsored by Ohio University's PORTSfuture Project*

*The PORTSfuture project is funded by a grant from the U.S. Department of Energy Office of Environmental Management Portsmouth/Paducah Project Office*

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**VOINOVICH SCHOOL OF LEADERSHIP AND PUBLIC AFFAIRS AT OHIO UNIVERSITY**
**PORTSFUTURE**
# ENERGY SECTOR INDUSTRY OPPORTUNITY FOR THE PORTS CAMPUS
**Analysis conducted by Mike Zimmer for PORTSFUTURE, 2014.**

Energy has unquestionably become one of the most prominent topics at the national and state level in recent years. The economic health of Ohio depends upon our ability to build and maintain strong and resilient communities which includes an energy infrastructure to meet end user demands for transportation, industry, and buildings in the 21st century. These end users will rely heavily upon Ohio's capacity to attract, retain and grow private sector advanced energy companies. In an age of diminishing resources for local governments, communities are looking to invest in new energy technologies, attract energy producers and consumers to co-locate in park-like settings, and be integrated together to increase and promote energy efficiency. Thus, the US Department of Energy (DOE) PORTS campus near Piketon, Ohio needs to be examined to determine the site's suitability for co-locating and integrating various energy industries. Such use of the site could ignite the development and growth of energy clusters in the Appalachian counties of Ohio and demonstrate that the site is a significant asset in the regional economy.

This paper will provide a broad overview of energy related industries, energy efficiency, and renewable energy sub-clusters in particular with additional focus on employment statistics. This document includes a summary of key findings from the analyses, supported by graphical representations of the findings and more detailed data tables. These analyses show the value of both classic energy and clean tech sectors for the future regional economy. Targeted companies will be both established energy companies, utilities, industrial services and new clean tech companies with products and services to meet the new economy of the 21st century. Many of these companies will also integrate and align well with the other energy opportunities reviewed for the PORTS campus, and complement or supplement each other by fostering integrated or co-location strategies for energy production and utilization, as well as, promote efficient transportation and advanced manufacturing that can be leveraged to provide economic benefits.

A unique opportunity exists to integrate renewable energy resources with the strong fossil resources of oil, natural gas, and coal in the region. This provides the opportunity for a joint focus on clean energy research, leveraging technologies for waste heat recovery, combined heat and power (CHP), cogeneration, fuel cells, microgrids and smart grids, with resource recovery while also promoting advanced renewables using solar, biomass from crops and agricultural grasses, geothermal, waste gases and municipal solid wastes. Distributed generation and microgrid solutions could be explored to promote lower cost electric power solutions for oil and shale gas development. Rural co-ops, municipal wastes systems and eco-industrial parks would be the beneficiaries of aligned and integrated energy systems. Thus, a smart energy corridor could emerge from the PORTS campus integrating solar and emerging renewables, with biofuels and biopower rounded out with energy storage, advanced batteries, fuel cells, distributed generation and microgrids. This integrated approach provides opportunities to optimize efficiency and minimize environmental impact while creating a sustainable and predictable energy future.

## Methodology

We briefly are examining the economic characteristics of energy in the Appalachian counties of Ohio. We are introducing a concept of industry cluster as a broader and more meaningful category that

can used to better examine relationships between industries comprising energy clusters. Clusters were chosen because they foster innovation, entrepreneurship, productivity, better income levels, and employment growth as discussed by Muro, and Mark and Bruce Katz in "The New Cluster Movement: How Regional Innovation Clusters Can Foster the Next Economy" (Brooking Institute September 2010 p. 5). Using a variety of data sources, we reviewed for selection a number of NAICS[1] industries that constitute an energy cluster and Energy Efficiency and Renewable Energy (EERE) sub-cluster. Using data from IMPLAN we then mapped individual NAICS industries to IMPLAN sectors and aggregated them to estimate a relative size and economic performance of this cluster. IMPLAN was chosen as an economic modeling system created by MIG Inc. of Stillwater, Minnesota. IMPLAN is a well- known analytic tool that is widely used by government agencies, colleges and universities, non-profit organizations, private companies, and business development and community planning organizations. IMPLAN data sets offer the advantage that they combine data from different sources and as such provide a more complete picture including employment statistics since none of the publically available datasets[2] capture all information. It also helps us to get more detailed information for some industries avoiding "disclosure" or confidentiality issues.

The Appalachian region includes 32 counties in Ohio as defined by the Appalachian Regional Commission. Figure1 below shows a map of these counties, which includes a larger footprint surrounding the PORTS campus within a two hour travel radius to illustrate potential positive influence for regional economic performance.

**Why Cluster?**

The current structure of the North American Industry Classification System does not provide a clear and a direct definition of the energy sector. See http://www.census.gov/EOS/NAICS for more details. This means that practitioners have to devise a set of industries that comprise the energy sector. The question of what industries should be included is always an important one. A cluster is broader than a more traditional definition of the industry sector and includes a broader set of counties than Pike County, Ohio which is the county in which the PORTS campus resides. The cluster can be thought as a concentration of inter-related industries grouped on the basis of geographic, economic, business or any other factors that have the potential to create wealth and economic growth in the regional economy. The definition used is largely based on the review of existing literature, projects and the screening of potential industries. See Greater Ohio Policy Center "Restoring Prosperity: Transforming Ohio's Communities for the Next Economy" (Brookings Institution Metropolitan Policy Program 2010, p. 32) for additional information on clusters. For the complete listing of individual industries that comprise our energy cluster, please refer to the Appendix A, IMPLAN and NAICS comparison. Cluster identification is not a standardized process and relies on a range of simple to very complex statistical methods. Direct, indirect, and derivative industries are featured for the energy sector that reflect dynamics of labor market pooling, supply chain interactions, knowledge management, and leverage reflecting institutional and industry relationships in the region.

**Limitations**

In using IMPLAN, there are also some data limitations, which should be noted. NAICS and the IMPLAN system use different schemes to classify various industries. Loss of details occurs for some industries when a NAICS industry is mapped to IMPLAN's system. Such aggregation bias can be significant for some sectors. To minimize it, we excluded these industries from the analysis. For example, solar power structure construction (NAICS 237130) is a highly specialized industry. IMPLAN's

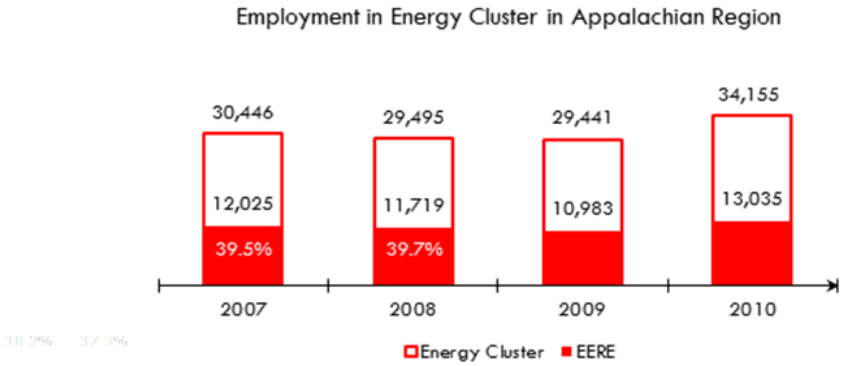
construction sectors on other hand are highly aggregated. Including solar power structure construction in the analysis will considerably overstate numbers.

Figure 1: Appalachian Counties


Source: Voinovich School for Leadership and Public Affairs at Ohio University

**Economic Analysis of Energy Cluster in Appalachian Ohio**

The results of our analysis illustrate the economic characteristics of an energy cluster and energy efficiency and renewable energy sub-cluster in the Appalachian Region possibly centered using the strengths offered at the PORTS campus. We apply the methodology described above to measure relative size and performance of an energy cluster on the regional economy and to show the potential for using energy as a centerpiece of PORTS redevelopment for the future.




After a slow decline in employment between 2007 and 2009, energy development was followed by a rather large increase in employment between 2009 (37.3%) and 2010 (38.2%) resulting in almost 5,000 jobs in the energy cluster and over 2,000 in the renewable sub-cluster. On average, the energy efficiency and renewables sub-cluster accounts for 37 % of regional employment, which is a lower relative percentage than the rest of the State of Ohio. However as shown on the chart below, the counties shown in the Appalachian Region accounted for a higher percentage of fossil energy than other regions in the state. Attraction of the Office of Energy Efficiency & Renewable Energy (EERE) and Smart Grid subcluster would diversify the energy supply profile for the region, enhance the supply chain and leverage other strengths offered by the PORTS campus.

| | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|
| Energy Cluster | 1.16 | 1.14 | 1.16 | 1.19 |
| EERE | 0.86 | 0.86 | 0.85 | 0.95 |

From our research, between 2009 and 2010, the increase in employment in the energy cluster was much more prominent. Overall, between 2007 and 2010, gain in employment in the energy cluster amounted to more than 12 percent. EERE sub-cluster on the other hand experienced a larger decline in employment between 2007 and 2009. The overall gain in employment between 2007 and 2010 stands at approximately 8.4 percent.

The graph above shows that both the Appalachian region's energy cluster and Ohio's energy cluster have seen positive increases in employment since 2007, with employment accelerating in these sectors since 2010. A focus in this sector for PORTS would build from that pre-established base.

Table 2: Employment in Energy Cluster

| County | Employment 2007 | % of Total Empl. | Employment 2010 | % of Total Empl. | '07-'10 % Change |
|---|---|---|---|---|---|
| Adams | 917 | 3.0% | 515 | 1.5% | -43.8% |
| Ashtabula | 1,376 | 4.5% | 1,498 | 4.4% | 8.9% |
| Athens | 745 | 2.4% | 1,079 | 3.2% | 44.9% |
| Belmont | 1,070 | 3.5% | 1,600 | 4.7% | 49.5% |
| Brown | 364 | 1.2% | 584 | 1.7% | 60.3% |
| Carroll | 386 | 1.3% | 443 | 1.3% | 14.9% |
| Clermont | 2,317 | 7.6% | 2,819 | 8.3% | 21.7% |
| Columbiana | 1,127 | 3.7% | 1,106 | 3.2% | -1.9% |
| Coshocton | 929 | 3.1% | 1,747 | 5.1% | 88.0% |
| Gallia | 1,162 | 3.8% | 1,126 | 3.3% | -3.1% |
| Guernsey | 826 | 2.7% | 1,385 | 4.1% | 67.7% |
| Harrison | 275 | 0.9% | 445 | 1.3% | 61.8% |
| Highland | 295 | 1.0% | 348 | 1.0% | 17.9% |
| Hocking | 524 | 1.7% | 372 | 1.1% | -29.0% |
| Holmes | 897 | 2.9% | 777 | 2.3% | -13.4% |
| Jackson | 524 | 1.7% | 503 | 1.5% | -4.0% |
| Jefferson | 1,395 | 4.6% | 1,605 | 4.7% | 15.1% |
| Lawrence | 495 | 1.6% | 543 | 1.6% | 9.5% |
| Mahoning | 2,951 | 9.7% | 2,647 | 7.8% | -10.3% |
| Meigs | 620 | 2.0% | 481 | 1.4% | -22.4% |
| Monroe | 470 | 1.5% | 842 | 2.5% | 79.3% |
| Morgan | 118 | 0.4% | 129 | 0.4% | 9.2% |
| Muskingum | 1,000 | 3.3% | 1,253 | 3.7% | 25.3% |
| Noble | 252 | 0.8% | 296 | 0.9% | 17.3% |
| Perry | 487 | 1.6% | 679 | 2.0% | 39.4% |
| Pike | 454 | 1.5% | 561 | 1.6% | 23.5% |
| Ross | 564 | 1.9% | 606 | 1.8% | 7.5% |
| Scioto | 1,029 | 3.4% | 1,187 | 3.5% | 15.4% |
| Trumbull | 2,460 | 8.1% | 2,435 | 7.1% | -1.0% |
| Tuscarawas | 2,285 | 7.5% | 1,895 | 5.5% | -17.0% |
| Vinton | 208 | 0.7% | 208 | 0.6% | 0.0% |
| Washington | 1,925 | 6.3% | 2,441 | 7.1% | 26.8% |
| Total* | 30,446 | 100.0% | 34,155 | 100.0% | 12.2% |

* Totals may not add up due to rounding

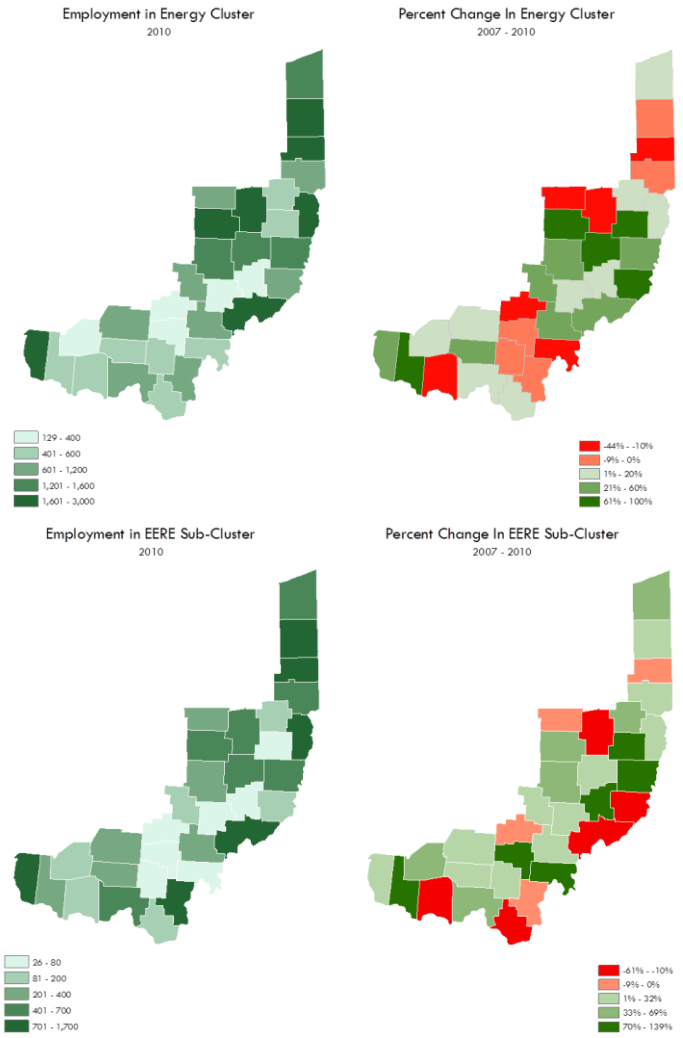
Table 3: Employment in Energy Efficiency and Renewable Energy

| County | EERE Empl. 2007 | % of Energy Empl. | EERE Empl. 2010 | % of Energy Empl. | '07-'10 % Change |
|---|---|---|---|---|---|
| Adams | 488 | 4.1% | 189 | 1.4% | -61.3% |
| Ashtabula | 419 | 3.5% | 580 | 4.4% | 38.4% |
| Athens | 211 | 1.8% | 233 | 1.8% | 10.4% |
| Belmont | 234 | 1.9% | 480 | 3.7% | 105.1% |
| Brown | 161 | 1.3% | 384 | 2.9% | 138.5% |
| Carroll | 114 | 0.9% | 153 | 1.2% | 34.2% |
| Clermont | 1,393 | 11.6% | 1,659 | 12.7% | 19.1% |
| Columbiana | 473 | 3.9% | 496 | 3.8% | 4.9% |
| Coshocton | 494 | 4.1% | 685 | 5.3% | 38.7% |
| Gallia | 977 | 8.1% | 891 | 6.8% | -8.8% |
| Guernsey | 338 | 2.8% | 414 | 3.2% | 22.5% |
| Harrison | 20 | 0.2% | 34 | 0.3% | 70.0% |
| Highland | 117 | 1.0% | 198 | 1.5% | 69.2% |
| Hocking | 43 | 0.4% | 40 | 0.3% | -9.1% |
| Holmes | 252 | 2.1% | 237 | 1.8% | -6.0% |
| Jackson | 58 | 0.5% | 78 | 0.6% | 32.2% |
| Jefferson | 927 | 7.7% | 985 | 7.6% | 6.3% |
| Lawrence | 175 | 1.5% | 143 | 1.1% | -18.3% |
| Mahoning | 1,083 | 9.0% | 1,067 | 8.2% | -1.6% |
| Meigs | 30 | 0.2% | 61 | 0.5% | 103.3% |
| Monroe | 100 | 0.8% | 82 | 0.6% | -18.0% |
| Morgan | 24 | 0.2% | 26 | 0.2% | 8.3% |
| Muskingum | 213 | 1.8% | 286 | 2.2% | 33.6% |
| Nobel | 21 | 0.2% | 44 | 0.3% | 109.5% |
| Perry | 84 | 0.7% | 98 | 0.8% | 16.7% |
| Pike | 268 | 2.2% | 339 | 2.6% | 26.5% |
| Ross | 188 | 1.6% | 213 | 1.6% | 13.3% |
| Scioto | 406 | 3.4% | 668 | 5.1% | 64.5% |
| Trumbull | 620 | 5.2% | 787 | 6.0% | 26.9% |
| Tuscarawas | 1,039 | 8.6% | 503 | 3.9% | -51.6% |
| Vinton | 24 | 0.2% | 50 | 0.4% | 108.3% |
| Washington | 1,039 | 8.6% | 932 | 7.1% | -10.3% |
| Total | 12,025 | 100.0% | 13,035 | 100.0% | 8.4% |

* Totals may not add up due to rounding

Source: Voinovich School of Leadership and Public Affairs at Ohio University

Table 3, similarly to Table 2, reflects an overall increase in employment for the EERE sub-cluster from 2007 to 2010 to supplement the energy cluster results. The region is already showing the benefits of such a co-location strategy between classic energy and EERE based strategies.




Source: Voinovich School of Leadership and Public Affairs at Ohio University

Table 4: Employment in Energy Cluster by Industries: 2007 – 2010

| Industries | Appalachian Region Employment | | AR % Change '07-'10 | Ohio Employment | | OH % Change '07- '10 |
|---|---|---|---|---|---|---|
| | 2007 | 2010 | | 2007 | 2010 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Extraction of oil and natural gas | 3,497 | 3,497 | 5,961 | 70.4% | 10,834 | 10,834 | 25,903 | 25,903 | 139.1% |
| Mining coal | | 2,146 | 2,866 | 33.6% | | 2,250 | | 2,980 | 32.4% |
| Drilling oil and gas wells | | 501 | 179 | -64.4% | | 952 | | 700 | -26.5% |
| Support activities for oil and gas operations | | 773 | 816 | 5.6% | | 1,576 | | 1,553 | -1.4% |
| Electric power generation, transmission, and distribution * | | 4,698 | 5,036 | 7.2% | | 16,569 | | 16,161 | -2.5% |
| Natural gas distribution | | 739 | 668 | -9.7% | | 3,517 | | 4,013 | 14.1% |
| Petroleum refineries | | 380 | 182 | -52.1% | | 1,534 | | 1,680 | 9.5% |
| All other petroleum and coal products manufacturing | | 92 | 283 | 206.4% | | 121 | | 314 | 158.6% |
| Petrochemical manufacturing | | 119 | 71 | -39.9% | | 487 | | 367 | -24.6% |
| Industrial gas manufacturing | | 156 | 155 | -0.5% | | 815 | | 739 | -9.4% |
| Other basic organic chemical manufacturing * | | 521 | 663 | 27.3% | | 3,737 | | 3,998 | 7.0% |
| Power boiler and heat exchanger manufacturing * | | 98 | 107 | 9.1% | | 1,774 | | 1,748 | -1.5% |
| Metal tank (heavy gauge) manufacturing | | 431 | 548 | 27.2% | | 2,674 | | 3,335 | 24.7% |
| Mining and oil and gas field machinery manufacturing | | 117 | 153 | 31.0% | | 686 | | 568 | -17.2% |
| Heating equipment (except warm air furnaces) manufacturing * | | 95 | 39 | -59.1% | | 932 | | 920 | -1.2% |
| Turbine and turbine generator set units manufacturing * | | 0 | 1 | NA | | 619 | | 954 | 54.2% |
| Semiconductor and related device manufacturing * | | 0 | 0 | NA | | 1,744 | | 1,868 | 7.1% |
| Automatic environmental control manufacturing | | 128 | 82 | -35.9% | | 1,256 | | 1,160 | -7.6% |
| Electricity and signal testing instruments manufacturing | | 7 | 153 | 2208.4% | | 1,836 | | 1,767 | -3.7% |
| Power, distribution, and specialty transformer manufacturing * | | 29 | 0 | -100.0% | | 768 | | 777 | 1.2% |
| Motor and generator manufacturing * | | 271 | 134 | -50.6% | | 2,823 | | 2,355 | -16.6% |
| Switchgear and switchboard apparatus manufacturing * | | 76 | 199 | 162.7% | | 1,798 | | 868 | -51.7% |
| Relay and industrial control manufacturing * | | 430 | 330 | -23.2% | | 3,961 | | 3,491 | -11.9% |
| Storage battery manufacturing * | | 0 | 0 | NA | | 868 | | 1,118 | 28.9% |
| Primary battery manufacturing * | | 0 | 0 | NA | | 0 | | 0 | NA |
| Communication and energy wire and cable manufacturing | | 0 | 0 | NA | | 245 | | 325 | 32.5% |
| Wiring device manufacturing | | 16 | 3 | -81.0% | | 2,438 | | 2,224 | -8.8% |
| Carbon and graphite product manufacturing | | 0 | 2 | NA | | 689 | | 524 | -23.9% |
| All other miscellaneous electrical equipment and component mfg. * | | 274 | 188 | -31.2% | | 1,926 | | 1,553 | -19.4% |
| Retail Stores - Gasoline stations | | 8,520 | 7,669 | -10.0% | | 35,841 | | 34,543 | -3.6% |
| Transport by pipeline | | 166 | 162 | -1.9% | | 981 | | 968 | -1.3% |
| Lessors of nonfinancial intangible assets | | 78 | 132 | 69.9% | | 1,189 | | 1,198 | 0.7% |
| Architectural, engineering, and related services * | | 4,900 | 5,620 | 14.7% | | 63,488 | | 57,171 | -10.0% |
| Environmental and other technical consulting services * | | 574 | 712 | 23.9% | | 6,126 | | 6,234 | 1.8% |
| Scientific research and development services | | 283 | 848 | 200.1% | | 22,483 | | 23,913 | 6.4% |
| State and local government electric utilities * | | 334 | 194 | -42.0% | | 2,766 | | 1,471 | -46.8% |
| Energy Cluster Total | | 30,446 | 34,155 | 12.2% | | 202,303 | | 209,461 | 3.5% |
| Energy Efficiency and Renewable Energy Total * | | 12,025 | 13,035 | 8.4% | | 108,218 | | 99,460 | -8.1% |

Table 4 above shows a detailed breakdown of the employment in both the energy cluster and the EERE sub-cluster by specific industries. It also compares the Appalachian region to the State of Ohio. Overall, the energy cluster in the Appalachian region has experienced a greater gain in employment than the State as a whole. The same applies to the energy efficiency and renewable energy sub-cluster. This foundation should be leveraged for the next decade using PORTS assets working with university support and employing R&D to promote more innovation and new commercialization of advanced energy products. Permitting and regulatory approvals in the region should foster attraction along with supportive air, water and solid waste management regimes.

Multipliers also show additional economic value from the industrial outputs for indirect employment and labor income in the region as illustrated in Tables 5 and 6. Multipliers are used to show broader economic impacts by measuring additional economic impact from a policy or project. Using most recent data available through 2010, the very recent trends in Ohio related to shale development may not be fully represented yet in this analysis. This provides regional insight to guide future targeted investments and overall advanced energy technology-based economic development for this region of Ohio. This illustrates positioning for economic growth over the next 3-5 years with strategies of growing new companies, expanding existing companies and attracting out of state (and international) companies. Specific areas of technology development are essential to illustrate comparative advantages for the state and region surrounding the PORTS campus. Battelle Labs has detailed the industries driving energy and alternative energy growth as electric power distribution, transformer manufacturing, semiconductors and solar PV, and nuclear power as is shown in Ohio Third Frontier's "Targeting Growth Opportunities for the Next 3-5 Years" (Battelle Laboratories, 2011). Battelle also suggests that Ohio offers strong niches in smart grid, smart metering( $165 billion market by 20 years), fuel cells and hydrogen ( $2.6 billion market by 2015), solar PV ( including installers) (compound annual growth of 33%) , energy storage and batteries ( $35 billion market in 10 years) , biofuels and biomass ( $160 billion market for fuels, biochemicals and power generation) by 2020 (see http://www.battelle.org).

**Selected References**

*Unlocking Rural Competitiveness: The Role of Regional Clusters.* (2007). Retrieved 2012, from Innovation at American Regions http://www.statsamerica.org/innovation/report_role_of_regional_clusters_2007.html

*Green Jobs*. (2012). Retrieved from U.S. Department of Labor: http://www.bls.gov/green/industry_by_naics.pdf

*New York State's Clean Energy Industry: Labor Market and Workforce Intelligence.* (May, 2009). Retrieved 2012, from New York State Department of Labor: http://www.labor.state.ny.us/workforcenypartners/PDFs/NYS%20Clean%20Energy%20Jobs%20Report%20FINAL%2006-09-09.pdf

MIG, Inc., IMPLAN System (data and software). 502 2nd Street, Suite 301, Hudson, WI 54016 www.implan.com.

*Green Jobs and the Ohio Economy: The Workforce Skills and Training Ohio Green Industries Need* (June 30, 2011). Wright State University Center of Urban and Public Affairs in cooperation with the U.S. Department of Labor Employment and Training Administration. http://ohiolmi.com/green/reports/Pt3SkillsTraining.pdf.

[1] North American Industry Classification System

[2] Covered Employment and Wages (CEW) by U.S. Bureau of Labor Statistics, County Business Patterns by U.S. Census Bureau, Regional Economic Information Systems (REIS) by U.S. Bureau of Economic Analysis.

## BIOMASS

Biomass has offered current power and fuels contributions in Ohio, and provides future potential still in the R&D and pre-commercialization stages. A solid supply chain and network, with transportation/ logistics support provides a foundation for the future growth of this industry in Ohio. Biomass from wood and wood wastes, and municipal solid waste and landfill gas have contributed to Ohio's net electricity generation for some time. These wood wastes also served as a source of pellet production from the region selling to wood fuel markets predominantly in the European Union. Corn and other feedstocks have served to provide fuel for the ethanol industry in the US. And according to the US Energy Information Association (EIA), Ohio researchers are investigating the potential of native Ohio switch grass for cellulosic ethanol production and the biofuel potential for giant miscanthus grass which is a perennial grass native to Asia and brought to the US for domestic production. Methane from manure produced in many Ohio farms can be used to produce electricity using bio-digester technology.

Biomass fuels can be solid, liquid, or gaseous and are all derived from biomass feedstocks. New technologies can efficiently transform biomass energy into new fuels for power generation, to replace diesel with biodiesel and can supply the growing aero fuels market. In Ohio there are over 1,300 wood manufacturing companies. Forests are a primary source of supply (tops and limbs) and wood companies provide sawdust, chips, barks and edgings for use. Biograsses and specialty agricultural crops could supplement these resources and provide a green, renewable source of feedstock supply for state and regional use. Ohio already studies the amount and types of wood residues available in state and their current uses and provides this data in its *Directory of Wood Manufacturing Industry of Ohio*. Industry categories for biomass use are broken down, and a linear programming model is available to identify possible sites for biopower generation. The state regularly surveys these biomass inputs in its research focused on industrial uses of wood residues – which are sold for other uses (45%), moved to landfills (21%), used internally (16%) and otherwise given away (18%).

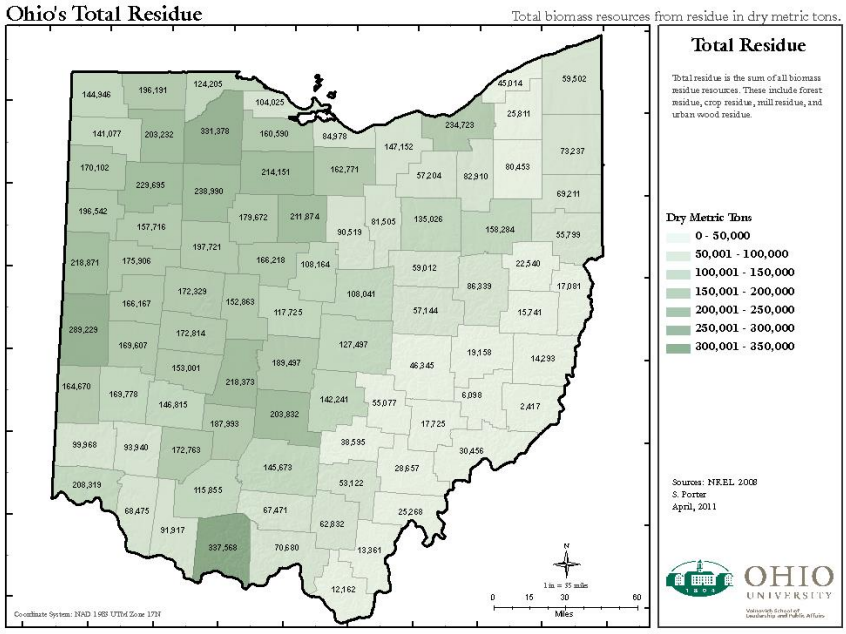
Livestock, food processing and other wastes are part of the Great Lakes Biomass Energy Program. These biomass markets focus on distributed generation, combined heat and power (CHP) and cogeneration, fuel cell applications that offer energy, waste and environmental benefits. This offers important support for biodiesel and ethanol plants in state, coupled with tax credits and financing incentives for these biofuel facilities through the Ohio Air Quality Development Authority (OAQDA). Landfill gas to energy is another state resource led by the cooperation of the Ohio Biomass Energy Program, OAQDA, and the Ohio Environmental Protection Agency (OEPA). Ohio has 17 landfill gas projects in operation but only seven are generating electricity using the gas resources with additional capital investment to support the power generation function. Finally, recovery of municipal solid wastes and wastewater sludge are another biomass resource and are used with anaerobic digesters in Akron and Toledo.

Potential agricultural feedstocks for cellulosic ethanol production, biodiesel and aero derivative fuels are varied in Ohio and can range from specialty energy crops to crop residues (corncobs, stover) or municipal wastes. Counties have been analyzed especially from agricultural sources in Northeast Ohio subject to price increases to incentivize more collection. Lands enrolled in conservation reserve programs (CRP) administered by the US Department of Agriculture will likely become the basis for production from dedicated energy crops.

The PORTS campus offers a convenient location to advance commercialization of agricultural feedstocks and specialty crops focused on biodiesel, aero derivative fuels, and cellulosic ethanol with compatible integration with solid waste, and bio product polymers and resins in the region. Excellent transportation and logistics delivery capacity exists and these can serve the needs of leaders in this space from General Electric, Poet Energy LLC, Marathon Petroleum, MFA Oil, Aloterra Energy and Quesar Energy.

Permitting for pellet production, bio crops, digester gas, distributed generation and CHP facilities should be timely and not difficult. Advanced bio refineries with bio-based polymers and resins along with power generation will require more advanced permitting for air, solid waste management, feedstock handling and disposal, transportation and boiler regulations (where necessary). University support in the region could come through Ohio University, Ohio State University, University of Akron, and/or Case Western Reserve. This commitment could be supplemented through DOE and the National Renewable Energy Laboratory (NREL), and other DOE research laboratories to support the regional commitment on a multi-state basis. Ohio is one of seven states participating in the Great Lakes Regional Biomass Energy Program established in 1983. It was administered by the Council of Great Lakes Governors and received funding from the US DOE and the State of Ohio. This federal program ended in 2009, but the state support continues and is administered through the Public Utilities Commission of Ohio.

Transforming more of our wastes, biomass and specialty agricultural crops into energy products or electricity provides alternative supplies to fossil fuels and provides fuel resilience and security. Waste management and clean tech investments fits well into this profile and offers R&D, innovation and fuel diversity benefits that aligns with advanced manufacturing. Nortech, an organization focused on strengthening Northeast Ohio's economic vitality by accelerating the pace of technology innovation in the region, has identified these areas as representing $1.7 billion in market opportunities offering over 1,800 jobs in eastern Ohio by 2018. Their focus centers especially on thermal depolymerization and anaerobic digestion in Ohio, but other markets exist and can be leveraged. A prior study by the Voinovich School examining biomass availability in the state found biomass resources exist in the four county study region that potentially could serve as feedstock for a biomass industry.



## BIOMASS RESIDUE IN 4 OHIO COUNTIES

| COUNTIES | TOTAL RESIDUE (in metric tons) |
|---|---|
| Scioto | 70,680 |
| Pike | 67,471 |
| Ross | 145,673 |
| Jackson | 62,832 |

## POLYMERS

Ohio's polymer industry maintains a global leadership position. Including this industry sector in the PORTS campus industrialization strategy could enhance statewide development and commercialization of higher-value technology based products that will meet increasingly demanding market needs. The Ohio polymers and advanced materials industry represents the largest manufacturing sector in the state, and is second by total size of workforce to agriculture. There are almost 2,500 establishments in this industry sector employing over 130, 000 people in the polymer workforce. There is significant opportunity to supply polymers to growing markets: electronics, biomedical, shale energy and renewable energy. There are also opportunities to integrate biomass production with specialty chemicals and polymers production in Ohio. This offers an integrative and leveraging benefit with other energy strategies and transportation and advanced manufacturing strategies for the PORTS campus.

PORTS offers siting benefits, new feedstock supplies, and transportation support that can supplement investment from private companies. Forged collaborations among universities, private companies and public sector entities to secure an operational bio- refinery in the near term could strengthen Ohio's global position in materials science. According to Battelle Laboratories, polymers will serve as the foundation of Ohio's future economy. The polymer industry will impact and contribute to a wide range of other industry sectors, like health, automotive, energy, transportation, construction, bio sciences, sensors and controls. Partnering can leverage resources through such groups/companies as the Ohio Third Frontier Program, Polymer Ohio, the Ohio Polymer Strategy Council, Zyvex Performance Materials, or PolyOne. Polymers are a smart choice for the PORTS campus future use because this technology is similar to information technology – in that its growth will foster the growth of many other technologies and a stronger supply chain to leverage better results for the region and the state. Regional development for polymers will come from leveraging the state's historical assets with resources from the value-chain, companies, specific third party investment and government support.

The Ohio opportunity is driven by materials availability. Clearly global demands for energy and consumer products will cause a shortage of key input materials, such as polymers and resins. Innovative solutions must be developed and deployed to reduce the rate of usage likely based on use of recycled materials and development of bio-based polymers. Traditional and historical reliance on oil and natural gas feedstocks competes with the energy industry demand and as world oil prices exceeding $100 per barrel evolve this will provide an incentive for new polymer development. Recycling of polymers is also becoming more critical in response to e-wastes, increased sustainability and environmental stewardship. Finally, changes in design, development and life cycle product development are changing the polymers sector. Polymer and resins materials are the second most common consumer material in the waste stream (exceeded only by paper).

Major Ohio companies in this sector are Goodyear Tire & Rubber, Eaton Industries, Parker Hannifin, Owens Corning, Cooper Tire & Rubber, PolyOne, Yamashita Rubber, Sherwin Williams, and A. Schulman. The advantages of locating in Ohio for this sector are several:

- Closer proximity to customers/ suppliers, other manufacturers and the supply chain.
- Advanced universities, Federal laboratories and commercial research institutions
- At least six economic development organizations serve this industry sector in Ohio
- Transportation and logistics support
- Existing skills and trained workforce
- State support for technology development in state
- Integration benefits with other industry sectors to support an overall polymers strategy

The PORTS campus and its locational and infrastructural strengths could provide a site for new technology commercialization, an improved value chain through the competitiveness of its small and medium sized manufacturers, talent and training through its universities, unions and economic development organizations, and access to funding from more diverse sources.

**Trends**

Polymers will continue to replace other materials like metal and glass. This is appearing heavily in the automotive and aerospace sectors to reduce weight, lower fuel operating costs and promote better durability.

Longer term market growth will come from housing, consumer durables and motor vehicle sales. The largest foreign export markets are with our NAFTA partners in Canada and Mexico, with China offering future long-term export growth.

Accelerated permitting through smaller plants, offers more shifts to bio feedstocks, better water, air and solid waste outcomes in Southeast Ohio.

Industry Cluster Analysis

To examine the plastics industry cluster in Ohio, we utilized an industry cluster process developed by Feser and Bergman (2000) and updated by Kelton, Pasquale, and Rebelein (2008) which examines the input-output relationships among firms. The plastics cluster is comprised of 20 industries with buyer-supplier relationships around the plastics industry. Utilizing 2013 Bureau of Labor Statistics Quarterly Census of Employment and Wage data, we examined the annual employment, establishment, and wage data for these industries in Ohio and the United States. We also calculated location quotients (LQ), a measure of relative concentration of the industry in Ohio relative to the US as a whole. A location quotient less than 1 reflect less concentration than the national average, a location quotient of 1 equals the same concentration as the national average, and a location quotient greater than one reflects a concentration greater than the national average. For example, an LQ of 2 could be interpreted as Ohio having two times as many firms in an industry as the US average. Larger location quotients, especially those exceeding 1.5 as a rule of thumb, may represent a competitive advantage for a particular industry. Scores below 1 may indicate areas of opportunity, if the overall cluster is strong, where improvements may occur.

The employment location quotient for the overall plastics cluster is 1.93 representing that Ohio has nearly twice the concentration of plastics industry cluster firms as the national average. Paint and coat manufacturing (3.71), bottles-plastics manufacturing (2.6), and plastics pipe, fittings & profile shapes

(2.54), respectively, are the highest ranking. The petrochemical industry (0.34) is among the least concentrated industries in the state. As discussed in the next section of the report, this could increase with the emerging downstream plastics production from shale gas development and byproducts if a cracker plant were developed in the state.

| Ohio Plastics Cluster | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ohio | | | United States | | | Location Quotient | | |
| 2012 NAICS CODE | 2012 NAICS Title | 2013 annual employment | 2013 annual establishments | 2013 total wages (in 000s) | US 2013 annual employment | US 2011 annual establishments | US 2011 total wages (in 000s) | LQ Emp | LQ Est | LQ Wage |
| 326160 | Bottles, plastics, manufacturing | 3,133 | 27 | $149,349 | 30,847 | 472 | $1,524,716 | 2.60 | 1.86 | 2.83 |
| 32611 | Plastics Packaging Materials, Film & Sheet | 5,301 | 84 | $286,595 | 84,471 | 1,315 | $4,485,826 | 1.61 | 2.08 | 1.85 |
| 337125 | Household Furniture (except Wood and Metal) Manufacturing | ND | 8 | ND | 4,791 | 241 | $193,400 | #VALUE! | 1.08 | #VALUE! |
| 321999 | All Other Miscellaneous Wood Product Manufacturing | 1,105 | 102 | $36,280 | 21,612 | 1,845 | $760,609 | 1.31 | 1.80 | 1.38 |
| 325991 | Custom Compounding of Purchased Resins | 1,494 | 32 | $74,363 | 16,672 | 414 | $892,398 | 2.30 | 2.52 | 2.41 |
| 32612 | Plastics Pipe, Fittings & Profile Shapes | 4,931 | 88 | $238,925 | 49,786 | 1,088 | $2,529,608 | 2.54 | 2.63 | 2.73 |
| 326191 | Plastics Plumbing Fixture Manufacturing | 189 | 7 | $7,522 | 12,511 | 377 | $482,374 | 0.39 | 0.60 | 0.45 |
| 326199 | All Other Plastics Product Manufacturing | 23,654 | 366 | $955,730 | 272,565 | 5,877 | $12,281,896 | 2.23 | 2.03 | 2.25 |
| 339930 | Doll, Toy, and Game Manufacturing | 681 | 22 | $28,121 | 11,525 | 673 | $881,782 | 1.52 | 1.06 | 0.92 |
| 325110 | Petrochemical Manufacturing | 324 | 5 | $30,851 | 24,116 | 161 | $2,680,271 | 0.34 | 1.01 | 0.33 |
| 326192 | Resilient Floor Covering Manufacturing | ND | ND | ND | ND | ND | ND | #VALUE! | #VALUE! | #VALUE! |
| 332994 | Small Arms Ammunition Manufacturing | 225 | 16 | $9,192 | 18,370 | 426 | $1,169,650 | 0.31 | 1.22 | 0.23 |
| 326140 | Foam polystyrene products manufacturing | 939 | 32 | $43,671 | 27,779 | 583 | $1,199,281 | 0.87 | 1.79 | 1.05 |
| 326150 | Foam plastics products (except polystrene) manufacturing | 1,607 | 45 | $77,109 | 31,688 | 813 | $1,447,979 | 1.30 | 1.80 | 1.54 |
| 313230 | Ribbons made in nonwoven fabric mills | 869 | 8 | $36,796 | 12,276 | 208 | $664,079 | 1.82 | 1.25 | 1.60 |
| 326130 | Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing | 1,089 | 37 | $53,027 | 16,870 | 399 | $856,254 | 1.66 | 3.02 | 1.79 |
| 325510 | Paint and Coating Manufacturing | 5,564 | 86 | $377,228 | 38,486 | 1,318 | $2,519,993 | 3.71 | 2.12 | 4.33 |
| 321219 | Reconstituted Wood Product Manufacturing | 211 | 5 | $9,779 | 12,842 | 211 | $685,431 | 0.42 | 0.77 | 0.41 |
| 325190 | Other Basic Organic Chemical Manufacturing | 4,222 | 67 | $389,524 | 47,903 | 1,037 | $4,047,910 | 2.26 | 2.10 | 2.78 |
| 313320 | Fabric Coating Mills | 441 | 11 | $30,162 | 7,830 | 212 | $417,674 | 1.44 | 1.69 | 2.09 |
| | **Total Plastics Cluster** | **55,979** | **1,048** | **$2,834,224** | **742,940** | **17,670** | **$39,721,131** | **1.93** | **1.93** | **2.06** |
| | Total Private | 4,404,185 | 273,758 | $194,056,495 | 112,958,334 | 8,912,174 | $5,614,162,352 | 1 | 1 | 1 |

**Ethane and Ethylene Production**

Polymers come as a product of Ethane and Ethylene; two chemicals bonds that are found and withdrawn in Ethane Cracker Plants. These plants are often found on the gulf coast, where the largest amount of natural gas is being excavated in the United States. This Natural Gas has the elements needed for Ethane and Ethylene to be created in a Cracker plant and then refined to be used for consumer products. Within 2013, the United States had 361,416 barrels of Ethane and Ethylene supplied through its refineries and crackers. Out if this, the Gulf Coast contributed 333,903 barrels, followed by the Midwest at 23,889 barrels of unrefined Ethane and Ethylene. In 2013, 2,626 barrels of refined Ethane and Ethylene were produced in the United States. Over 2,557 barrels were produced by the Gulf Coast, with most of the refineries being housed near the Texas shore (Petroleum and Other Liquids).

With the large amount of Marcellus Shale being utilized for natural gas extraction in the Appalachian region, gas companies and local governments are looking into utilizing this resource. By building local Cracker plants, it would utilize the nearby natural resources of natural gas by producing the Ethane and Ethylene needed to create polymers for consumer goods and plastics. Several Cracker plants have been under consideration for construction in the Appalachian region, with a price tag ranging from $2 billion to $5 billion for the initial construction.

Appalachian Resins have unveiled plans to lease land in Salem Township, Monroe County, Ohio for a $1 billion ethylene and polyethylene production facility. The company initially planned to lease the land in West Virginia but selected Ohio to accommodate a larger production facility (Appalachian Resins). Once the plant is built, it will process around 18,000 barrels of ethane a day, which is projected to begin occurring in early 2019 (Knox).

Yet eventually, these future plants will be able to integrate into the existing infrastructure of refineries, thus creating more probability of plastic's expansion within the Appalachian market. With the current refineries being placed at such a far distance away from the Marcellus Shale, the transportation of Ethane and Ethylene to the Gulf Coast for refining has many risks and costs (Cantrell et. al). Thus the possibility to utilize potential Ethane sources is lost.

The building of these cracker plants and refineries within the local region of Appalachia allows for the extracted Natural Gas to be altered into Ethane and Ethylene. Without these plants, the current Ethane removed from Natural Gas extraction must be wasted or sent to plants on the Gulf Coast. With plants located nearby, it will cut transportation costs and risks. This opens the door for a possible polymer and plastics market to be built in the Appalachian region.
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## Industry Profile: Coal

Substantial changes have overtaken the energy landscape including an increased interest in and mandates for moving toward energy efficiency, cost containment, and green-house gas reduction. The traditional primary use for coal is being challenged by competing generation sources, new environmental mandates, and utility business model changes. Coal in the U.S. has taken the brunt of these economic forces and needs to seek other alternative markets in order to remain a viable energy provider in this newly emerging business climate.

Coal has lost 7,700 primary mining jobs in 2012; with similar results in 2013 as U.S. policy on coal shifts, and more U.S. coal is serving export and metallurgical markets. Coal for power generation in the U.S. has declined for successive years this past decade in the face of excess natural gas supplies, regulatory policy shifts and reduced prices.

This reflects a trend of a continuing decline in U.S. coal production of 7.7 % and an over 9% decline in U.S. consumption of coal over the past several years. Of the jobs lost in 2012, almost 65% of the job losses were in KY and WV -- not OH. Ohio has a bit over 2,000 primary jobs left in the coal sector in state. The majority of Ohio coal is exported from the state and is not used to expand the Ohio economy except for coal severance taxes. Coal production is still important for metallurgical coals, power generation and for exports (which have increased to the EU, China and India).

The coal industry has failed to scope the new market opportunities for the future. It has clung to the markets of the past and is fighting environmental, permitting, regulatory and financing risk for new coal projects in the U.S. economy. Carbon conversion and capture, coal to liquids, co-firing strategies, coal washing and beneficiation and coal-based chemicals could open new markets and opportunities for the future. Conversion of coal to synthetic liquids remains viable. But conversion of coal to synthetic natural gas no longer is viable because of the supply and lower prices of shale gas from the Utica and Marcellus shale regions.

The PORTS campus is located in close proximity to coal research capacities and R&D commercialization opportunities in PA, WV, OH. KY and IN to leverage new market development. Company leadership could come from AEP, Consol Energy, B&W, and Alstom.

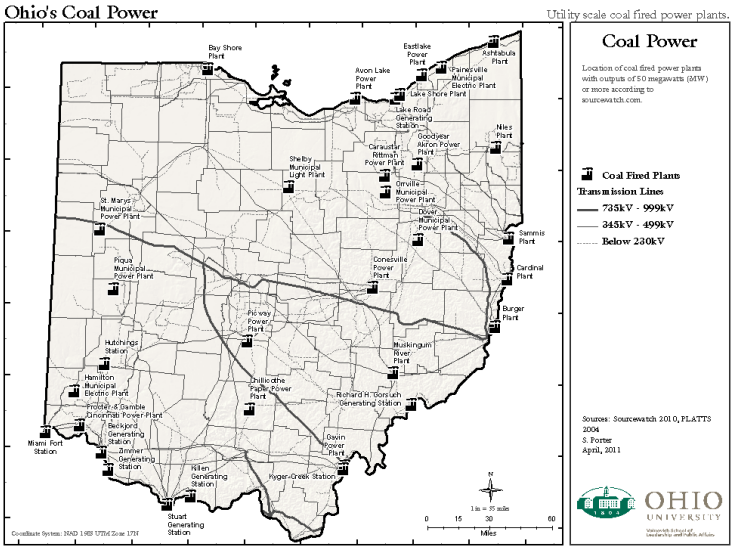
Alternative carbon conversion processes could produce from coal synthetics, such as transport fuels, chemical feedstocks and commodity chemicals that are building blocks for more refined and specialized chemical industry products. The chemical industry presence and strong multi- regional resource, fuel, transportation and construction capacity support this potential PORTS site strategy. Value added coal processes would better increase Ohio GDP for the state economy. This approach will better strengthen the state's resource economy and link well with other PORTS strategies and industrial sectors for enhanced jobs. This focus should center on processing plants for coal to provide diesel and aviation fuels, and a suite of fuel alternatives for the military. Movement into chemical processes and alternatives should be a secondary market building upon the Ohio chemical products, polymers and resins capacity which is world class. Reliance on coal for power generation should diminish in time until the economics of carbon capture and shale gas change in the future.

Coal plants will face unique air, water, solid waste and disposal challenges for permitting. Of all energy strategies, this will engender more delay, costs and permitting risk at higher levels than other energy development options that could be considered for PORTS. For these types of facilities, natural gas would be needed for steam reforming processes to produce the hydrogen required in coal conversion processes. Permitting and capital requirements could be phased while DOE could coordinate with the

various DOE labs to bring pre-commercial coal technologies to PORTS for testing and final R&D in advance of commercialization.

For the first time last year, wind jobs exceeded coal production jobs. Other jobs are appearing in natural gas fracking, gas processing and pipelines, energy efficiency, transportation and logistics, solar development and installation, Smart Grid and micro grids, metering and sensors, chemicals and processing, and water projects and development. All of these sectors offer higher growth prospects in state and nationwide markets. They are picking up the slack of job declines in other sectors such as coal for Ohio. Better job prospects for advanced coal strategies will come through technology, R&D and new markets for coal rather than focusing on coal uses and markets of the past relying on power generation that are declining.

Coal also needs more support in real estate, infrastructure development, manufacturing and construction -- as these are the missing foundation of jobs and economic recovery for the coal sector. Coal projects will contribute more direct and indirect jobs for advanced technologies, but will face equity and debt financing shortfalls for new coal development. U.S. lenders are not lending to this market so unique coal risks will need government loan guarantees or other risk management tools for successful project completion. These risks could be managed through a multi-state regional approach to create a different scale approach with an aggregate solutions approach for water, ash disposal, pre-combustion and coal to liquid alternatives to foster better U.S. market demand, and an export market for advanced U.S. technologies. PORTS infrastructure may make the region a least cost solution for advanced coal solutions to build coal markets for the future. These technologies could avoid the flaws of the past, and offer infrastructure and resource solutions leveraging site, fuel and regional benefits to create a national coal technology laboratory for commercialization of advanced coal alternatives for the national economy. The map below shows the location of coal power facilities in Ohio.



## Industry Profile: Solid Wastes and Wastes Resource Recovery

Ohio manages waste reduction and recycling strategies for solid waste streams by coordinating actions of multiple agencies through solid waste management districts. Wastes are materials no longer useful in their current form in a market of single use packaging and disposable items. The most predominant form of waste management is the permitted and licensed modern landfill. With modern growth and development, the most effective way to reduce stress on disposal systems is to reduce the volumes of waste that is produced. This places a renewed emphasis on reduction, reuse and recycling, or recovery before disposal occurs as part of integrated waste management systems and planning.
Ohio and the nation face growing concerns about waste management and disposal but also face the difficulty of achieving a healthy environment with the economic costs of delivering those benefits. Each person in the US generates 4-5 pounds of municipal solid waste (MSW) per day. The contents of the municipal waste stream in descending order are paper and paperboard, tree trimmings, plastics, metals, wood, food and glass. Most communities use integrated waste management to meet the challenges of waste management and disposal. Because waste management is the third highest cost to local governments, communities use cost-benefit analysis varying by region where almost 57% is landfilled, 33% is recycled and 16% is incinerated. The energy content of different kinds of solid waste varies, as paper constitutes almost 50 % and plastics 30% of the energy content from the waste stream.

No single solution is appropriate and each community or region has its own unique profile of solid waste. The composition of solid waste varies depending on variables such as urbanization, commercial enterprises, and degree of construction, manufacturing and service sectors. Complexity is added with hazardous wastes, unique wastes from e-commerce, and wastes, sludges and wastewaters from shale fracking occurring in Ohio.

Public education and involvement are essential for reduction and reuse strategies. Source reductions offer many resource utilization and environmental benefits to the community, including reduced green-house gas (GHGs) production, saving energy, conserving useful resources and reduced volumes of waste streams. Any actions that reduce the volume or toxicity of solid wastes prior to recycling or disposal will be least cost. Reuse of products could constitute 10% or more of the solid waste stream. Reuse is also favored because it delays other more expensive strategies and uses less energy. Recycling offers value recapture, reduced energy consumption and better resource recovery. Value can also be captured through the natural biodegradation process, such as composting for food and yard wastes to turn these organics into a soil conditioner. Finally, value can be recaptured through incineration and using the waste heat for energy heating, cooling or power generation.

Technologies to address these challenges offer growth markets for the future in US and global markets as urbanization is expected to reach 80% of the world population by 2035. Ohio will be reexamining its solid waste scheme starting in 2015 after almost 30 years. Permitting can be challenging and research needs to drive down costs to manage GHGs, combustion gases, particulate emissions, fly ash and bottom ash. Other separate strategies need to be developed for water streams from fracking and underground injection, storm water and water discharges from agriculture causing toxic plumes, construction wastes, and e- wastes from high technology products.

The PORTS campus offers a site with more attractive permitting, energy and related infrastructure and transportation and logistics to support a state center to pilot or demonstrate alternative waste management strategies for the future. Success will need to focus on levels of capital investment for results achieved, levels of operating costs, expenses of sophisticated pollution control equipment and accelerated permitting for sites. The PORTS site can deliver and support those desired outcomes. The prize could be

great as Columbia University recently forecasted that MSW could be used as a fuel to generate 12% of US electricity while reducing GHGs by at least 123 million tons of carbon dioxide equivalents each year.

References

Chris Kelton, Margaret Pasquale, Robert Rebelein, (2008). Using NAICS to Identify National Industry Cluster Templates for Applied Regional Analysis. Regional Studies, 305-321. - See more at: http://business.uc.edu/departments/finance/faculty/christina-kelton.html#sthash.jJoRpXZT.dpuf

Feser, Edward J., and Edward M. Bergman. "National industry cluster templates: a framework for applied regional cluster analysis." Regional studies 34, no. 1 (2000): 1-19.

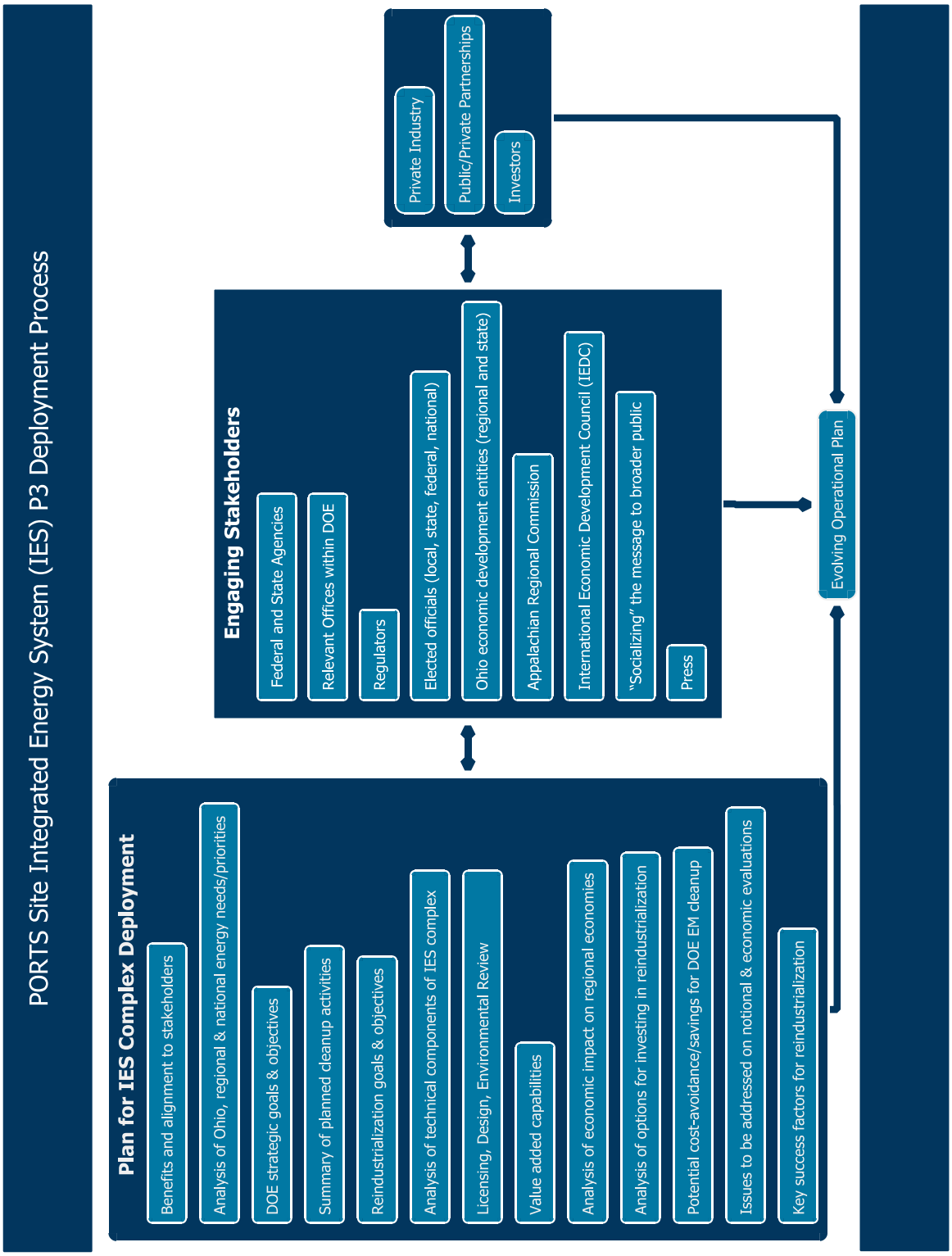
"Appalachian Resins signs LoI to Lease land for $1bn ethane cracker in Ohio, US." Chemicals-technology.com. Kable Intelligence Limited. 27 August 2014. Web. 16 October 2014.

Cantrell, J. Bullin, J. A. McIntyre, G. Butts, C. Cheatham, B. "Consider GTL as an economic alternative for stranded natural gas and ethane." Hydrocarbon Processing. October 2013. Web. 16 October 2014.

Knox, Tom. "Ohio Getting Ethane Cracker Plant." Columbus Business First. American City Business Journals. 29 August 2014. Web. 16 October 2014.

"Petroleum and Other Liquids – Product Supplied and Refinery Net Production." Product: Ethane/Ethylene. Period Unit: Annual – Thousand Barrels. U.S. Department of Energy. U.S. Energy Information Administration. 29 September 2014. Web. 16 October 2014.
http://www.eia.gov/dnav/pet/PET_CONS_PSUP_A_EPLLE_VPP_MBBL_A.htm
http://www.eia.gov/dnav/pet/pet_pnp_refp2_a_EPLLE_ypy_mbbl_a.htm

**Appendix 8**


PORTS Site Integrated Energy System (IES) P3 Deployment Process
Plan for IES Complex Deployment
Benefits and alignment to stakeholders
Analysis of Ohio, regional & national energy needs/priorities
DOE strategic goals & objectives
Summary of planned cleanup activities
Reindustrialization goals & objectives
Analysis of technical components of IES complex
Licensing, Design, Environmental Review
Value added capabilities
Analysis of economic impact on regional economies
Analysis of options for investing in reindustrialization
Potential cost-avoidance/savings for DOE EM cleanup
Issues to be addressed on notional & economic evaluations
Key success factors for reindustrialization
Engaging Stakeholders
Federal and State Agencies
Relevant Offices within DOE
Regulators
Elected officials (local, state, federal, national)
Ohio economic development entities (regional and state)
Appalachian Regional Commission
International Economic Development Council (IEDC)
"Socializing" the message to broader public
Press
Private Industry
Public/Private Partnerships
Investors
Evolving Operational Plan