## PORTSFUTURE

#### **OHIO UNIVERSITY**

#### VOINOVICH SCHOOL OF LEADERSHIP AND PUBLIC AFFAIRS

#### **DOE EDUCATIONAL ASSISTANCE GRANT**

PUBLIC OUTREACH AND APPLIED-ENVIRONMENTAL TASKS FOR THE FORMER PORTSMOUTH GASEOUS DIFFUSION PLANT (PORTS) IN PIKETON, OHIO AND SURROUNDING COUNTIES



# What is an IES?

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### Outline

- IES Definition
- IES Premise
- Closed-Loop Manufacturing
- Process Heat Applications & Usage
- PORTS IES Complex Concept
- IES Potential Benefits
- IES Challenges
- Summary

### **Integrated Energy System**

- <u>Technical definition</u>: Two or more energy resources are utilized as inputs to two or more physically coupled subsystems to produce one or more energy commodities as outputs
- <u>Simpler definition</u>: Multiple energy resources combined together to produce one or more energy related products
- IES is not a technology, but integrated approach to applying technologies, "<u>systems of systems</u>"
- Co-locating, combining, interconnecting and/or networking of energy producers and energy users



### **IES by Different Names**

- **Cogeneration** (Traditional among technical people)
  - Usually thought of as a single energy resource producing two energy commodities
- Combined Heat and Power (CHP)
  - Natural Gas/Coal/Oil/Biomass to produce steam (process heat) for a chemical process and additionally generate electricity
- Hybrid Energy Systems
- <u>Combined Energy Systems</u>
- Polygeneration

### **China & Polygeneration**



### Coal chemical recycling economy demonstration park in Wuzhong City in Ningxia Providence



### **IES Premise**

- The "whole" is worth more than the "parts" — Synergy from an "systems of systems" approach
- Utilizing "smart systems" to create "smart solutions"
- "Value" is driver—not absolute "cost"
  - Value Propositions:
    - > High Efficiency (i.e., Thermal, Economic)
    - > High Reliability and Resiliency
    - > Low Emissions/Waste Minimization
    - Acceptable/Low Cost

Synergistic integration of an "All-the-Above" energy strategy

iketon, Ohio PORT



### **Closed Loop Manufacturing** (Industrial Symbiosis)





### **Process Heat Applications**



Utilize process heat at every temperature leve



### **Process Heat Usage**



The facility at Piketon, Ohio

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Scioto





### **IES Potential Benefits**

- Effective resource management (Cost Savings)
  - Higher overall energy usage efficiency
  - Better utilization of capital equipment and lower operating expenses
    - Shared resources (e.g. infrastructure, facilities, personnel)
    - $\circ$  Shared processes (e.g. common/support systems)
- Reduced emissions [especially of carbon dioxide (CO<sub>2</sub>)]
- Use of domestic resources rather than imported resources (e.g., natural gas, biomass)
- Industry collaboration and co-location

   Jobs and more jobs (non-exportable)



### **IES Challenges**

- Multiple organizations working together (Planning)
  - Must integrate people before you can integrate systems
- Large Capital Investment (\$B's)
- Security (investment protection)
  - Potential targets by terrorists
- Requires unique sites (Megasites)
  - Near energy and other natural resources
  - **o** Excellent infrastructure
    - Heavy Industrial & Support Services
    - > Electric Transmission Lines
    - Resource and Product Pipelines
    - Transportation



### Summary

- IES is not a new concept or technology but it is an approach for applying technologies
  - "Systems of Systems" approach focused on comprehensive synergistic integration
- IES provides opportunity to optimize efficiency
   Minimize cost and impact on the environment
- PORTS is ideally suited for an IES complex that includes the synergistic integration of closedloop manufacturing systems

The facility at Piketon, Ohio



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#### PORTS REINDUSTRIALIZATION IMPACT

#### -VOINOVICH SCHOOL of Leadership and Public Affairs

#### Appalachia HOPE

Capitalize on natural resources Repurpose coal Shale gas Focus area for innovation Provide bulk feedstock materials Supply chain opportunities Develop intermodal transportation hub

#### National

Convert a Federal liability to an asset Increase US competitiveness Leadership in integrated technologies Improve energy price stability & predictability Promote energy security & sustainability Reduce greenhouse gas emissions

#### Ohio de Cleveland

Conomic development in depressed area State-wide supply chain opportunities Create an intermodal transportation hub Expands Ohio based companies in Ohio Capitalize on available natural resource Capitalize on a Federal investments Attract major industry investments

#### Community

Economic stability Increase local tax revenues Retain educated & skilled workers Import & home grow talent Improve education at all levels Enhance quality of life Increase civic pride New recreational areas & civic/cultural activities

#### PORTS

Purpose, mission & vision for the future Host a megaproject & attract \$B investments Utilize and enhance industrial infrastructure Accelerate site cleanup Integrate utility & support processes Innovation hub for integrated systems Economic driver/engine Co-location of energy producers Focal point for recycle & reuse

#### Technology

Development of integrative technologies Next generation technologies Focused research, development, demonstration, & deployment opportunities Design for flexibility, robustness, & resilience Enhance separations and recycling technologies Develop a model of innovation to be replicated

#### **Industry**

Ohio Rive

Synergistically integrate technologies Optimize efficiency & minimize waste Share resources & processes Leadership in closed loop manufacturing Significantly reduced operating costs Promote partnerships & collaborations Promote industry symbiosis (closed loop manufacturing)

#### Environmental

Promote Recycling & reuse Optimize efficiency & minimize waste Reduce greenhouse gas emissions Provide new wetlands & recreational space Enhance natural resource utilization Utilize brownfield site

#### Workforce

Create permanent non-exportable jobs Opportunities for all skills and education levels Development of advanced skills Vertical & horizontal expansion of skills Challenging opportunities with a greater purpose Opportunities to work old & new technology

# For more information on the project, visit www.portsfuture.com

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