Workshop Report

Impacts of High and Volatile Energy Costs on Energy Intensive Industries: Coping Strategies and Future Research Needs

West Virginia University
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In response to volatile energy markets, West Virginia University organized a workshop on the impacts of high and volatile energy costs on energy intensive industries. The purpose of the workshop was to discuss successful coping strategies and identify research projects related to this problem. There was a great deal of enthusiasm on the part of the attendees and news media for the general topic of the workshop and presentations made by the various participants. The workshop included participants from Sloan Industry Centers, university research groups, private business, and state and federal government agencies (including the U.S. Department of Energy Industrial Technologies Program). In total, there were over fifty people in attendance. The presentations and panel discussions were indeed enlightening. One measure of the value of the workshop may be best reflected in the several requests we have received to hold follow-up conferences and/or workshops on this topic in the not too distant future, even to the point of making this an annual event.

On the first day of the workshop, there was a variety of industries represented and perspectives presented on energy challenges. It was quite evident that the workshop topic was highly relevant to all in attendance. There was a general consensus that high and volatile energy costs cut across wide sectors of industries and that the era of low cost energy is over.

The following three perspectives are a representative sample of the first day's discussions and presentations:

1. Kenneth Kern of the U.S. Department of Energy discussed the current upward pressure of electricity prices. The installation of new power generation has been slow. In this regard, he referenced a two-decade "valley of inactivity" for new coal based power generation plants and a three-decade "valley of inactivity" for new nuclear power generation plants.

2. Lester Lave of Carnegie Mellon University stated that higher energy prices may indeed be part of the solution. In fact, that may be the only thing that will really drive industry to be more efficient. He went on to compare the energy efficiency of various industries in the U.S. to their counterparts in other parts of the world. Professor Lave referenced that industry by industry we are not very efficient with energy since we have historically had among the lowest energy prices in the world. He recommended that the best thing for energy efficiency would be for government to discontinue energy subsidies, allow prices to rise to their natural levels, and let industry respond with appropriate energy efficient designs.

3. Dick Munson of Recycled Energy Development said that much of the attention on energy efficiency is focused on the demand side (e.g., new types of light bulbs, better insulation, and more efficient appliances). He stated that the real problem relates to the supply side where the production of electricity and thermal energy are very inefficient. In this regard, Recycled Energy Development's business is to recover waste energy, which is then used to produce electricity, steam, heat, and other energy needs of the host company. A report for the U.S. Environmental Protection Agency identified sufficient wasted energy to generate 96,000 megawatts, enough to provide almost 20 percent of the United States electricity demand.

On the second day of the workshop, participants were formed into small discussion groups. Each breakout group was asked to provide recommendations and action plans on three discussion topics representing different aspects of dealing with high and volatile energy costs. Topic 1: Company Level Coping Strategies, Topic 2: Public Policy / Regulatory Approaches, and Topic 3: Science and Technology Approaches

The following is a consolidation and summary of the breakout group reports as presented in the closing plenary session on Day 2 of the Workshop.

Discussion Topic 1: Company Level Coping Strategies to Deal with High and Volatile Energy Costs

Results and recommendations for Topic 1 were grouped into three categories: (1) Individual organization energy related planning, (2) Energy efficiency networking and education outside the organization, and (3) Influencing and utilizing government industrial energy efficiency incentives and programs.

1.1 Individual organization energy related planning

Alternative fuels and sources:

1. Develop alternative fuels and feedstocks (e.g., waste, multi-source, and economic and technical feasibility)
2. Reduce dependence on centralized power source (e.g., develop co-gen technologies, investigate alternate local energy sources, and improve process efficiencies to reduce energy demand)
3. Consider selling renewable energy credits, marketing "green products", and using waste energy

Energy efficiency ideas:

1. Develop and implement explicit plans for energy efficiency and needs across the entire organization
2. Outsource high energy use activities to more energy efficient suppliers.
3. Eliminate all non-value producing tasks

4. Work smart by combining operations and re-evaluate why things are done.
5. Work up supply chain to take energy out of processing steps (i.e., work outside your organization)
6. Shut down facilities that are non-profitable due to excessive use of energy
7. Set goals for energy use
8. Consider transportation costs in location and transport decisions
9. Work "off peak"
10. Adopt technology to shift electricity load off-peak

Supply contracts:

1. Develop long-term energy supply contracts to hedge against energy cost increases

Energy efficiency programs:

1. Work with the U.S. Department of Energy and other entities on energy efficiency programs to distribute the risk related to developing pilot programs

Energy use benchmarking and supply chains:

1. Perform baseline benchmarking on energy use
2. Develop energy/carbon footprint of your organization (e.g., life cycle energy use analysis)
3. Consider adopting the following energy efficiency measures: (a) vertical integration, (b) strategic alliances, and (c) short term futures
4. To achieve energy savings, need to extend research beyond scope of an industry segment and into the supply chain

Energy efficiency incentives:

1. Change internal reward system to include metrics that reflect energy efficiency
2. Invest in and internally incent R&D projects to reduce energy use and carbon intensity
3. Create an educated workforce with respect to energy use implications
4. Focus on continuous improvement efforts (e.g., lean production, six-sigma, and total productive maintenance) can contribute to energy savings as by-product
5. Utilize EPA toolkit to focus specifically on energy waste (http://www.epa.gov/lean/energytoolkit/)

Recycling and waste reduction:

1. Support efforts to recycle materials for manufactured processes
2. Reduce packaging to reduce waste and weight

Energy audits:

1. Conduct self-assessments of all your energy uses and wastes

2. Do continuous energy audits (i.e., be pro-active)

1.2 Energy efficiency networking and education outside the firm

1. Join state/regional/national energy user groups and policy discussions
2. Develop energy efficiency knowledge to inform and educate the public
3. Use open innovation approach toward energy efficiency improvements
4. Visit global organizations to understand their approach to energy efficiency (e.g., European based organizations)

1.3 Influence and utilize government industrial energy efficiency incentives and programs

1. Utilize tax incentives for energy savings projects
2. De-couple utility profits from volume of sales
3. Implement national energy recommendations (e.g., become DOE Save Energy Now Partner and only use EPA Smartway Transport Freight Services)
4. Work with the U.S. Department of Energy and other entities on energy efficiency programs to distribute the risk related to developing pilot programs

Discussion Topic 2: Public Policy / Regulatory Approaches to Dealing with High and Volatile Energy Costs

Results and recommendations for Topic 2 were grouped into five categories: (1) Power system regulation, (2) Taxes and subsidies, (3) Energy efficiency standards, (4) Program and policy development, and (5) Educational programs. There was a general feeling that current national energy policy is inadequate. The following could then be viewed as components of an overall national energy policy.

2.1 Power system regulation

1. Review and revise NSP (new source performance) and EPA requirements so as not to discourage energy efficiency projects, such as waste heat recovery and use of CHP
2. Review and revise rules that limit or prohibit the use of power from a non-utility
3. Develop strategies to reduce demand on the grid
4. Coordinate regulatory policy between agencies
5. De-couple utility profits from gross power sales
6. Re-evaluate reliability reserve margins
7. Fix regulations to remove barriers to using waste heat and CHP

2.2 Taxes and subsidies

1. Incent energy efficiency improvements with tax credits

2. Change the tax structure to support sustainable research programs for both long term (e.g., greater than 10 years) and short term
3. Develop property tax abatements for investment in energy efficient technology
4. Fix depreciation schedules to support energy efficiency
5. Provide tax credits for energy audits

2.3 Energy efficiency standards

1. Develop transportation policy aimed at energy efficiency, including aggressive CAFÉ standards
2. Increase efficiency requirements for new electricity generation (e.g., from 33% to 60%)

2.4 Program and policy development

Process suggestions:

1. Develop a process to facilitate industry, academic, and government interaction in identifying and developing energy efficiency programs
2. Include more science and technology in developing energy policy
3. Recognize the unique/special uses of energy plants that are dedicated to industrial facilities when crafting broad-reaching energy legislation
4. New EPA compliance dates should not be set until all legal proceedings are final
5. Conduct cost/benefit analysis of public energy policies
6. Need to ensure that energy policy is based on sound research focusing on the benefit of all
7. Need to be vigilant to ensure that interests with the most money at stake will not automatically win out (i.e., energy policy must be based on common good rather than on special interests)

Content suggestions:

1. Implement CESOP (clean energy standard offer programs)
2. Encourage recycling and sustainable technology development
3. Stop subsidizing corn for ethanol
4. Set energy efficiency floors for producers
5. Make energy efficiency tax credits permanent
6. Institute a major program for a coordinated and efficient national freight transit system
7. Develop a carbon reduction policy

2.5 Educational programs:

1. Develop programs to help small and middle sized businesses to improve their energy efficiency objectives
2. Develop programs for next-generation engineers on energy efficiency

3. Start university based ROTC or NDEA type programs for developing and running competitive energy efficiency companies
4. Educate policy makers and regulators

Discussion Topic 3: Science and Technology Approaches to Dealing with High and Volatile Energy Costs

Results and recommendations for Topic 1 were grouped into five categories: (1) Co-generation technologies, energy recycling, and waste heat recovery, (2) Environmental issues, (3) Fuel flexibility, alternative fuels, and feedstocks, (4) Business strategies and public policy, and (5) Industrial energy efficiency strategies and technologies.

3.1 Co-generation technologies/energy recycling/waste heat recovery

1. Develop safe and effective ways for small co-gen units to be grid-connected
2. Develop more effective ways to recover waste heat with effective thermal storage (e.g., heat exchangers)
3. Research technologies to economically capture and re-use waste heat

3.2 Environmental issues

1. Research and measure energy/carbon footprints in major industry groups
2. Develop NO_x reduction tool that does not require use of any NH_4
3. Develop CO_2 capture and removal technologies beneficial to industry
4. Perform economic cost/benefit analysis of decreasing CO_2 and other greenhouse gases for various industry sectors
5. Research utilization of waste streams for feedstocks and process inputs
6. Biotechnology and genetics research (e.g., on carbon sequestration and biofuels)

3.3 Fuel flexibility / alternative fuels and feedstocks

1. Research alternative fuels (e.g., biofuels, wind farms, and feed mixes)
2. Research on use of biomass instead of fossil fuel as feedstock
3. Research on use of waste products (e.g., plastics) for fuel or feedstocks

3.4 Business strategies and public policies

1. Research impact of alternate energy strategies and policies on corporate performance, structural relationships, and external constituencies
2. Research on tax rules (e.g., incentives, credits, and taxes) vis-à-vis energy behaviors
3. Analyze causes of increase in energy prices and develop linkages to other sectors

3.5 Industrial energy efficiency strategies and technologies

1. Develop real-time energy use equipment to track and optimize plant energy efficiency
2. Develop efficient load leveling/storage systems
3. Research economic and energy benefits of co-locating plants with multi-product coal-based gasification facility
4. Develop high temperature and long life materials for energy and industrial applications
5. Benchmark energy use/efficiency by industry sector with diagnostic tools for ongoing auditing/improvement
6. Collect data and perform research on industrial use of “green” energy
7. Develop energy efficiency metrics to prioritize replacement and/or modifications of plant equipment
8. Supply chain level research on how energy savings opportunities can be extended beyond industry segment and into interrelated geographical dispersion of businesses and customers