

The Advanced Energy Initiative of WVU has a strong emphasis on renewable energy research that can contribute to the drive for American energy independence. Coupled with its traditional expertise in seeking environmentally responsible technologies for the use of coal, WVU's renewable energy research is receiving a growing amount of national attention. Here are some examples.

Sustainable Energy Parks

Director, Water Research Institute – Paul Ziemkiewicz

The U.S. Environmental Protection Agency has asked for help with mine-scarred lands that are suitable for redevelopment into biofuels and other alternative energy production sites. These parks generate local economic growth, decrease or offset greenhouse gases through carbon sequestration and promote renewable energy technologies. Former surface mine sites are being used to support switchgrass “farms” and commercial forest plantations dotted with wind turbines. On mined land, switchgrass and trees, feed stocks for cellulosic ethanol, can yield six times more ethanol transportation fuel per unit of energy input than corn.

Wood Residues as Biofuel Feedstock

Division Director, Forestry & Natural Resources – Joseph McNeel

With high gas prices and concerns about diverting crops from food to fuel, a solution has been developed to convert wood residues to bio fuels. Current harvesting process yields around 2.4 million dry tons of wood residues each year (waste from forest operations--sawdust, chips and barks in sawmills). Wood wastes are sustainable and can be used as feedstock for biofuels, biogas and green electricity. With a conversion factor of 50-120 gallons of ethanol from one dry ton of wood chips, 159 million gallons of ethanol per year is possible. Even if a small fraction of woody biomass were used, a significant amount of bioenergy could be produced.

Waste Heat Recovery/Energy Efficiency Assessments

Director, Industries of the Future – Carl Irwin

Recovery and use of *waste heat*, combustible by-product gases, waste pressure drops, classified as “energy recycling,” leads to more competitive companies and is a key strategy for smart and efficient use of energy. The Department of Energy funds University/Industry teams to conduct heat balance calculations, feasibility analysis, thermal imaging which has resulted in significant cost reduction for businesses and the possibility of additional job creation in the region.

Ocean Thermal Energy Power Generation

Director, Constructed Facilities Center – Hota V. S. Ganga Rao

A cooperative agreement between Lockheed Martin and the U.S. Department of Energy has been developed to use the ocean's thermal gradient to drive a heat engine to demonstrate innovative technologies to enable ocean thermal energy power generation. Ocean Thermal Energy Conversion (OTEC) uses the ocean's thermal gradient to drive a heat engine. The fabrication and installation of large diameter cold water piping -- required to reach depths of thousands of feet -- represents one of the largest technical challenges to the successful installation and operation of an offshore OTEC system using modern fiberglass technology and recent low-cost composite material manufacturing methods at prototype and pilot plant scales.

Wind

Director, Center Industrial Research Applications – James Smith

Program resulted in innovative wind turbine designs which led to licensing, manufacturing and marketing support for a new wind turbine technology. The first generation of wind turbines consists of large blades rotating around a horizontal axis, with the blades spinning in a vertical plane. A new method for augmenting the flow of air over the blades of the turbine was developed and patented. The new technology increases performance in varying wind speeds and directions, while creating much less environmental impact on wildlife and people. The vertical axis wind turbine will also be easier to adjust to accommodate changes in wind direction, unlike a horizontal axis wind turbine, which requires adjusting the entire assembly when the wind changes direction. The new turbine technology will require less wind power, making vertical axis wind turbines potentially more efficient and less costly to operate. They will also operate over a greater range of wind speeds and produce more electricity than traditional turbines.

Summary

- \$100M of Energy related programs current under contract
- Fuels, Fuel Cells, Efficiency (Engine/Design/Operations), Air/Water Management, Sustainability, Wind, Solar, Biomass, Genomics, Energy Policy, Energy Economics, Modeling , and Smart Grid