# University Affiliate Cultivates Pulp & Paper Specialists with Energy Efficiency Focus

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## ABSTRACT

What role can you play in the development of the nation's future workforce? Academic programs are one tool in building regional infrastructure to achieve industrial targets; educating and familiarizing students in the importance of energy efficiency (EE) and future job opportunities. This paper will illustrate the benefits of one collaborative relationship that developed curriculum, established scholarship and internship programs; while, sharing achievements and lessons learned along the way.

Since 2008, the Bonneville Power Administration (BPA) has supported the Washington Pulp and Paper Foundation (WPPF), an affiliate of the University of Washington, through grant money and facilitating student internships at pulp and paper (P&P) facilities. Grant funding attracts top-qualified students to the P&P industry through scholarships, promoting the development and expansion and of education and research related to P&P science. The curriculum in the Bio-resource Science and Engineering department was modified to incorporate emerging technologies in the production of fuels, energy and chemicals, as well as P&P from cellulosic materials. The curriculum supports graduates with strong technical and problem solving skills with a greater understanding of sustainable business practices.

The business reason to support the WPPF is based on BPA's distribution utilities' P&P load equaling 5 percent and this industrial segment is important to the Pacific Northwest economy.

## About Bonneville Power Administration

The Bonneville Power Administration (BPA) is a federal agency based in the Pacific Northwest. Although BPA is part of the U.S. Department of Energy (US DOE), it is self-funded and covers its costs by selling its products and services at cost. BPA markets wholesale electrical power from 31 federal hydro projects in the Columbia River Basin, one nonfederal nuclear plant and several other small nonfederal power plants. The dams are operated by the U.S. Army Corps of Engineers and the Bureau of Reclamation. About one-third of the electric power used in the Northwest comes from BPA. BPA also operates and maintains about three-fourths of the high-voltage transmission in its service territory. BPA's service territory includes Idaho, Oregon, Washington, western Montana and small parts of eastern Montana, California, Nevada, Utah and Wyoming. As part of its responsibilities, BPA promotes energy efficiency, renewable resources and new technologies. The agency also funds regional efforts to protect and rebuild fish and wildlife populations affected by hydropower development in the Columbia River Basin.

Approximately 8,000 aMW[1] of energy are generated annually by the federal hydro projects in the Columbia River Basin. BPA customers include: cooperatives (57), municipalities

[1] aMW = an average megawatt, or 8,760,000 kWh.

(42), public utility districts (29), federal agencies (7), direct-served industries (3), port districts (1), tribal (2), and investor-owned utilities (6).

The Northwest Power Act of 1980 outlined BPA's role to fund conservation of electrical energy projects to reduce the need for new power plant construction. This effort translates into aMW savings projects that are cost-effective, and measured and verified savings.

Since 1978, utility & BPA programs, energy codes & federal efficiency standards have produced over 3,000 aMW of savings.

The Northwest Power Planning Council's 6th Plan (2010 to 2014), includes industrial sector regional targets of 212 aMW; of which BPA's industrial program target is 74 aMW. The fiscal year 2010 (FY2010) industrial sector target was met (12 aMW[2]); and increased to 15 aMW in FY2011. Five percent of the total electrical power load that BPA markets from the Federal Columbia River Power System to distribution utilities serves P&P facilities. A large percentage of these aMW targets have been energy efficiency projects implemented at P&P facilities. Therefore, identifying additional projects will be key to achieve the FY2011 targets.

**About the Washington Pulp and Paper Foundation**

The Washington Pulp and Paper Foundation (WPPF), established in 1968 with the primary purpose: *To interest students in preparing for careers in the pulp and paper (P&P) industry*. Since the formation of WPPF, over 450 students have graduated from the program and about 80% of them have made their careers in the P&P and allied industries. WPPF is composed of member companies that are P&P producers, suppliers, and engineering firms that make contributions to scholarship funds. Students enrolled in the Bioresource Science and Engineering (BSE) department at the University of Washington, Seattle campus, are eligible for merit tuition scholarship support and have the option for a dual degree in Chemical Engineering.

BSE is the study of the conversion of biomass into pulp, paper, fuels, chemicals and energy. It is a rigorous engineering discipline, that receives the Accreditation Board for Engineering and Technology (ABET), and is closely aligned to Chemical Engineering, Material Science and Chemistry. Students of the BSE department have a curriculum that teaches chemical engineering through the junior year, math through linear algebra, and organic chemistry for the BSE degree and physical chemistry for the dual degree BSE/Chemical Engineering. In addition, BSE students are required to complete at least one intern or Co-op position in the P&P industry including supplier and engineering organizations. The curriculum is updated based on membership feedback and emerging trends such as recent national interest in biomass conversion to fuels, energy and chemicals. BSE students are well prepared to enter the work place with having excellent problem solving skills, good interpersonal skills, the ability to work in teams, and has received experience working for various member company operations.

[2] 12 aMW = 105,120,000 kWh

The WPPF constantly seeks feedback from its members on the technical, social, and environmental challenges. Recent surveys have presented key issues (as listed in order of importance):

1. Energy
2. Raw material optimization
3. Succession planning
4. Environmental compliance
5. Product development

In addition, many of the producer companies have reduced staffing at their mills and are lean when it comes to technical talent. These trends when combined provide an excellent opportunity for BSE students to impart additional technical support to mills, and in particular to provide technical support for new capital expansion and special project work such as energy audits. For the mill, the student provides a resource that can focus on the project work and not be distracted by the day-to-day issues that arise. This truly creates a win-win for the mill and the student.

**A win-win partnership: BPA and WPPF.** In the spring of 2007, the BPA's Energy Efficiency (EE) Industrial Sector Lead was approached by a Board Member of Pacific Section of the Technical Association of the Pulp and Paper Industry (TAPPI), who was also President of the WPPF. This contact initiated an idea on how the WPPF and BPA might share portions of a common mission - to enhance student education on industrial EE. At that time, many in the EE community had been talking about the need for further development of the EE workforce-including industrial EE skilled engineers. Since P&P is the top industry for potential energy acquisition, the Industrial Sector Lead saw the collaboration as a way to influence the education of students at the university level. Together, WPPF and BPA's missions, while different, overlapped into a common mission to improve the education of students in the forest product industry. BPA believes that an education and academic program is one tool in building the regional infrastructure to help achieve BPA's industrial EE aMW targets.

After the first year of the grant, BPA was briefed by the Executive Director in the number of students that had benefited from BPA's grant. He also shared the idea of BSE students interning with a BPA public utility served P&P plant. The idea evolved to having a Senior BPA Energy Engineer mentor students while they participate at the plant through an internship.

**BPA & WPPF: joint effort with G-P Toledo & Central Lincoln PUD.** The WPPF has been successful in connecting one of its BSE students with a mill to carry out specific problem-solving needs and energy audit projects. One of the P&P mills served by Central Lincoln PUD is Georgia-Pacific Toledo (GP Toledo), a 70 aMW load, located in Toledo, OR. The GP Toledo mill was originally built in 1957 and modernized in 1994 and 1995 to more than double its capacity to use recycled fiber in its product. The mill manufactures Linerboard, including the high performance UltraStak Plus®, and a premium Corrugating Medium on three paper machines. GP Toledo has actively worked to manage its resources while implementing electrical EE projects with incentives from Central Lincoln PUD and technical engineering studies through BPA's Technical Service Provider (TSP) program. In order to enhance its competitive position,

GP Toledo has been working with Central Lincoln PUD and BPA to explore opportunities to further improve electric EE and reduce energy costs at the mill.

An excellent example of BSE students providing technical support to the member company mills is the joint effort between BPA, GP Toledo's Oregon Mill, Central Lincoln PUD and WPPF. The agreement reached in this joint effort resulted in a Work Plan "to support the Financial Assistance Cooperative Agreement and assist with the internship of a University of Washington's BSE student in the GP Toledo mill to focus at least one-half of his/her time on EE opportunities at the mill. The student's duties and responsibilities include identifying and assisting mill engineering staff with implementing cost-effective EE projects at the GP Toledo mill."

Furthermore, as a large number of the existing northwest industrial and EE workforce nears retirement and with an increasing EE aMW targets in upcoming years, the need is great for new workforce staff with such capabilities as this opportunity provides. Moreover, David Bell (TAPPI VP of Corporate Relations & Marketing) warns about our skilled work force: *"In the next few years, our industry will go through what is being called the retirement tsunami. It is expected that half of all the skilled workers will retire within the next five years."* The student intern upon graduating and entering into the workforce may continue to grow into the roles of "Energy Champions" at mill sites throughout the Northwest and beyond. Thus the BSE program not only provides technical expertise to tackle the No. 1 issue facing the P&P industry, *namely energy*, but in addition, provides human capital for succession planning options.

Craig Walley, Plant Engineer at GP Toledo commented on the experience, "*Once Andy (the BSE student intern) completed safety training, he began to catalog his own set of findings, and the mill supported him on setting up projects. Andy took on a existing list of potential projects, where Variable Frequency Drives (VFDs) were likely candidates, and also took on the analysis of other pumping systems with EE opportunities, as well as finding others under his own investigation. What Andy and the joint effort brought to GP Toledo was an engineer that was dedicated to looking for energy savings opportunities. The value of using an intern-type person is two fold: (1) the intern gets a chance to work and learn in an active manufacturing environment, and (2) the mill gets a person who is well versed in using technology for finding potential projects, is dedicated to do so, and has the knowledge necessary to filter out the good projects from the ones that should not be pursued.*"

This collaborative effort combined the expertise of a Central Lincoln PUD conservation staff member, a senior BPA energy engineer, and the GP Toledo engineering staff to support the BSE student's work experience at the mill. Specific tasks assigned to the engineering intern included:

- Prepare a job description including how the student intern position will be integrated into the mill organization.
- Conduct technical assessments of one or more major systems.
- Establish Key Performance Indicators (KPIs) and a means to measure and report them.
- Identify the scoping, cost estimates, estimated energy savings, and prioritization of each EE project.
- Provide draft EE custom project proposals and/or completion reports for the review and approval by mill management.
- Identify and coordinate outside energy management resources available to the P&P mill.

Andy Ellingson, a University of Washington BSE student in his junior year, was onsite at GP Toledo, July through December 2009. He identified several EE pumping project opportunities, learned to use metering equipment that Todd Amundson, a senior BPA energy engineer, had loaned and trained him to safely use. Todd also provided training on use of US DOE's Pumping System Assessment Tool (PSAT), to analyze the pump system EE opportunities. Three pumping projects were implemented during Andy's tenure at GP Toledo - saving a total of approximately 700,000 kWh per year. Andy developed the draft custom project proposal applications and submitted them to Central Lincoln PUD and, during his final weeks, was able to assist with post-measurements and verification (M&V) on each project and submitted draft completion reports for each, to Central Lincoln PUD. In addition to these, Andy identified 33 pumping system EE opportunities, all with energy baseline usage developed and savings opportunities estimated. BPA's engineering contacts at GP Toledo all had positive feedback to share regarding their working relationship with Andy.

Tasks to establish KPIs and identifying and coordinating outside energy management resources available to GP Toledo were not fully completed in this time frame, but all other tasks were. In future efforts, the KPI and outside energy management resource tasks may be considered for longer time-frame performance periods. These tasks have been a main focus with the new BPA Energy Smart Industrial (ESI) program's Energy Management pilot, launched after Andy's internship, and can also be more readily supported early on during the student's internship.

Andy returned to the University of Washington to continue his undergraduate BSE studies, and has expressed a strong interest to return to work on EE in the P&P industry during summer break and beyond.

With the success of this first joint effort, and observation of the following successes with neighboring Energy Trust of Oregon (ETO) at P&P plants in their service territory, there are plans for BPA and WPPF to continue engaging with utilities and their P&P plants to create similar joint efforts.

**Development of the nation's workforce.** Mills are short on technical support and research resources, and students provide a fresh answer to this essential need. In addition to bringing enthusiasm and energy to aging groups, students bring excitement and creativity to problem solving. The student internship is a valuable opportunity for a company to conduct an "extended interview" to assess whether or not the intern will be a good fit as a permanent employee after graduation. Likewise, the student has extended time to discern whether or not he/she finds the work a desirable as a place to build a career. If the experience is positive for both parties, the hiring and training time are both seamless and cost-effective.

The nation's rising workforce will need to be well-versed in leadership and "people skills." The intern gains significant exposure to skills such as the ability to work effectively in a team, and to bring out the best in one's team rather than seeking only personal successes. The intern enjoys a dynamic environment where he/she can receive mentoring, exercise interpersonal skills, and tackle and solve real world problems in a team setting. The internship is a rich opportunity to see modern technology such as process control in action in the mills. Such exposure will align directly with his/her coursework during junior and senior year, which highlights process control. Therefore, not only will the intern's academic knowledge base bring value to the mill, but the mill experience will bring to life and illuminate the coursework he/she studies thereafter.

## Summary of Benefits

1. Energy producers: conservation
2. Manufacturing: conservation of energy, lower costs of production, strengthen technical department, and succession planning
3. Students: developing skills in solving energy related problems and gaining a greater understanding of sustainable business practices
4. WPPF: highlight internships as examples to recruit outstanding students to the BSE program
5. Expansion of other utilities/regions to do similar partnerships