



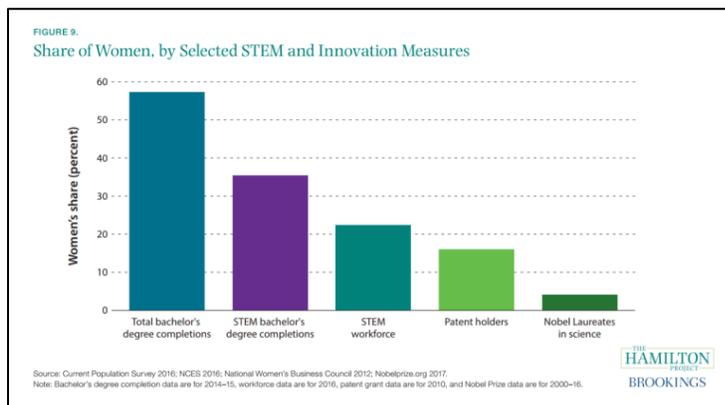
Attracting Women to Hydro: The Push for Innovation and Gender Equality in an Aging Industry

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A “Man’s Job”

Women have been vastly underrepresented in the male-dominated fields of science, technology, engineering, and mathematics (STEM) for decades, though their numbers have improved as engineering and other sciences have evolved over time to require increasing numbers of new STEM professionals. In the hydropower industry especially, women engineers are rare,



Source: brookings.edu

comprising less than one percent of the workforce. In a society where women have traditionally been discouraged from pursuing the hard sciences by a variety of factors, including a lack of family-friendly flexibility in these

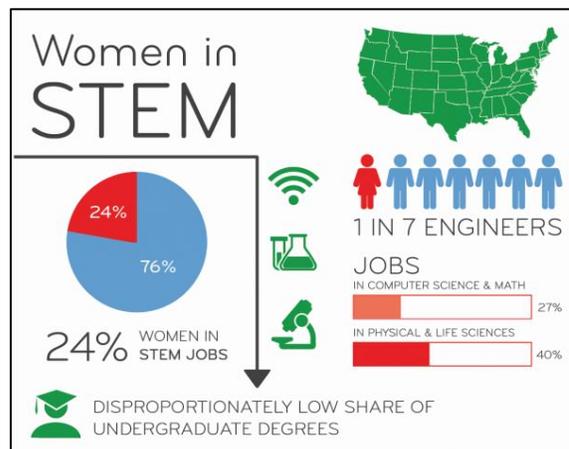
fields, they are hindered even further by the gendered notion that the physical demands of working in the power and utilities industries is a wholly masculine pursuit – a “man’s job.”

In recent years, there has been a push to make STEM, and subsequently the hydro industry, more relevant and appealing to women. According to a U.S. Department of Commerce report, women represent more than half of college graduates in most of the developed world but hold less than 25% of the jobs in the STEM fields (Beede et al., 2011). In a rapidly aging industry that is both critical to the nation’s infrastructure and in danger of losing vast portions of its specialized

knowledgebase as experienced veterans retire, it has become crucial to develop larger, more vibrant, and more competitive candidate pools. A targeted focus on workforce development for women in hydro is a critical step in addressing that need. This article will address not only how to entice younger professionals to take a role in our clean energy future, but specifically how to attract women to this career path.

The Troubling Gap

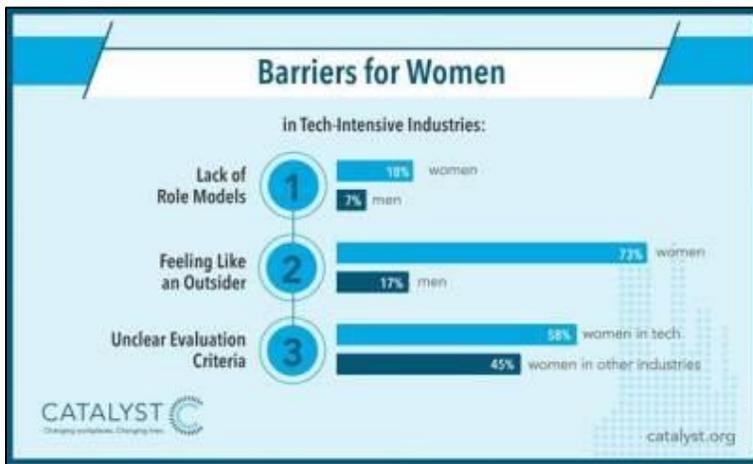
In a society where the empowering #MeToo and Time's Up movements run alongside chants of "the future is female," women have been given a voice and a place as the public conversation has turned to elevating global consciousness about women's issues, both personal and professional. On the professional level, it is not a new argument,



Source: 3plearning.com

but it is an old issue: "women remain underrepresented at every level in corporate America, despite earning more college degrees than men for thirty years and counting," according to the most recent Women in the Workplace study, a partnership between LeanIn.org and McKinsey & Company (Cooper et al., 2017). Fewer women than men are hired at the entry level, and women of color face even more dramatic challenges at every step in the corporate ladder. In the sciences, a stark gender disparity still exists as a result of subtle biases and discrimination, as well as a simple lack of female role models and general interest (due in no small part to a lack of encouragement on the part of the missing role models). These factors have led to a troubling gap between male and female employment rates.

This problem is twofold. First, the science and engineering workforce is missing roughly



Source: catalyst.org

half of its potential talent pool, and therefore is missing out on the innovation and creativity that new, alternative voices would bring. Second, “women themselves are missing out on opportunities to leverage learning and skills in

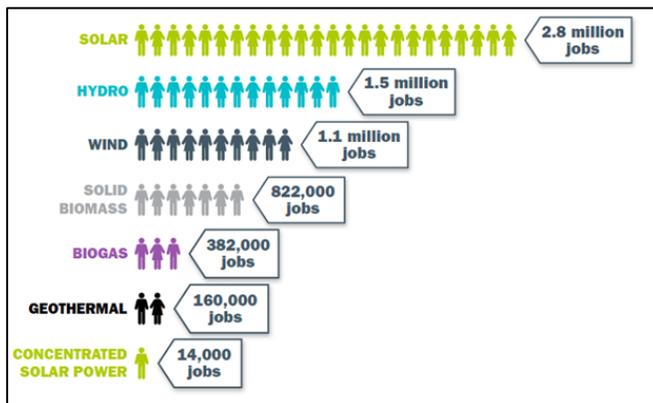
interesting and rewarding careers” (National Academy of Sciences et al., 2003). This inequity is driven by many factors, not all of them scientific: innate sex differences; educators’ lack of acknowledgement or encouragement of women who show interest in the sciences; societal gender roles and expectations; gender bias and discrimination; female students’ lack of confidence; and a lack of strong female role models and mentors. Despite the push in recent decades to recruit more females to STEM, their numbers are still depressingly small, and, even when present, their talent is often underutilized.

This difference seems even more alarming when viewed in the context of the hydropower industry. An instructor teaching hydroelectric turbine governor theory said during his opening session, “Water is slow to change.” This is an apt picture of the hydro industry: hydropower is one of the oldest power sources on the planet, with one of the oldest, most experienced workforces. Historically, utility employees stay with one company throughout their career, making utilities less prepared to handle sudden and rapid turnover (Bennett, 2015). Much of hydro’s workforce has reached or is soon reaching retirement age, taking with them valuable expert knowledge of the inner workings of hydroelectric facilities, at a time when older plants are beginning to require significant upgrades or maintenance and more rigorous regulatory strictures necessitate increasingly structured training and education (Russell, 2010). As a result, hydro faces a

demanding need to expand its current workforce. By growing efforts to attract women to hydro now, the industry can overcome many of the challenges it faces in losing its most skilled workforce.

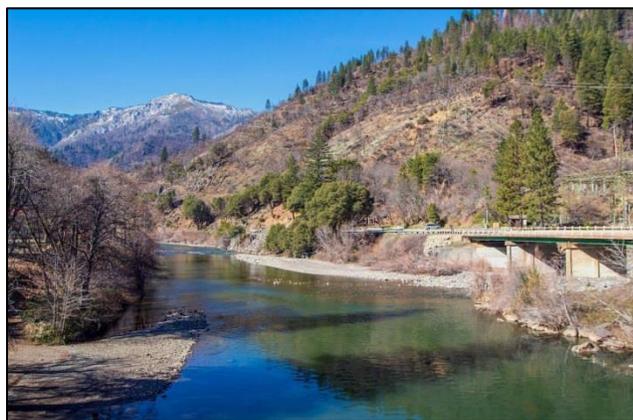
But... Why Hydro?

The hydro industry offers many opportunities for potential new employees, women included. Hydropower is the world's most available, reliable, affordable, and sustainable clean energy source with the capacity for creating hundreds of thousands of jobs in the United States alone. Hydro



Graph showing that hydro is leading the way in clean energy jobs worldwide, second only to solar. Source: irena.org

facilities span the gamut of infrastructure-supporting activity, including but not limited to electricity generation, flood control, navigation, irrigation, water supply, and recreational



Bear River, CA, six miles from the Dutch Flat Powerhouse. Source: AGC

opportunities. Industry workers, like the authors of this paper, are given greater occasion to travel, as hydro facilities can be found everywhere in the world – and, aesthetically speaking, these facilities are often located in some of the most scenic and beautiful locations in the world. Though it is an

older industry, it is also an industry bursting with opportunities for professional development and networking across multidisciplinary fields. By many accounts, hydro is the energy industry leader in diversifying their workforce – HydroVision, for example, recognizes women who have made and/or continue to make significant contributions to the industry.

Partnerships, Mentorships, and the Need for Change



Source: hydroworld.com

Creating a pathway for women to be successful in the hydro industry is a problem that must be addressed on several levels in order to be effective. Young girls continue to face cultural stereotypes that discourage the study of STEM subjects and, even if they receive such degrees, the pursuit of careers in STEM fields and professions. To combat this, many hydro businesses are forming partnerships with high schools, universities, and women-led or -focused organizations to gain access to a younger generation at an earlier age in order to expose them to the potential of the industry before societal expectations push them in alternate directions.

The Foundation for Water and Energy Education (FWEE) has already begun working with high school students to lay the foundations for STEM and hydropower careers by providing educational programs and information about water as a renewable resource. The Argonne National Lab’s Women in Science and Technology (WIST) hosts a Girl to Engineering Day, where girls in sixth through eighth grade are invited to learn about career opportunities in science and engineering. Across the world, initiatives such as Powered by Women, which was launched in Myanmar, are drawing attention to the gender gap in the hydropower industry. The Women in Sustainable Energy South-East Europe (WISE SEE) project “promotes women’s active participation and representation and strengthening[sic] their role in the sustainable energy, climate change, and environmental protection section” (Branislava et al., 2018).

Mentorship is also a key effort in attracting women to the hydro industry. Studies have shown that women prefer engineering to be linked to social content and needs, and that, when paired with a strong female role model in the same or a similar field, they are more motivated, more self-

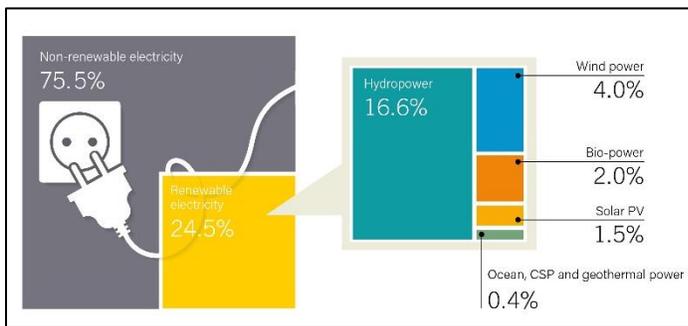


Source: chronus.com

assured, and less anxious than those who had no mentor or a male one. Women tend to learn in cooperative spheres that encourage engagement with peers; fruitful mentorship between potential women engineers or plant operators and current hydro personnel can net further female interest in the industry. The benefits of mentorship cannot be understated, as women can gain practical advice, encouragement, and support; can learn from the experiences of others; and, perhaps most importantly, can become more empowered and confident in their academic and social pursuits.

Many organizations have already made the connection between mentorship and STEM success: the National Hydropower Association (NHA), Northwest Hydroelectric Association (NWhA), Midwest Hydro Users Group (MHUG), and PennWell's HydroVision support the Women in Hydropower Mentorship Program, which offers an opportunity for women to connect and share experiences in the hydro industry. This mentoring initiative is an excellent opportunity for supporting existing relationships between women in the industry and can potentially be expanded to include women in universities and in other STEM fields. The Women in STEM Mentorship Program (WISMP) was created to connect women university students to practicing industry mentors, targeting the critical university-to-industry transition. Meanwhile, Million Women Mentors is a national movement aimed at developing mentoring relationships between girls and women in STEM programs and careers.

It is worth considering, when looking to recruit women to the hydro industry, starting a conversation about the role of women as environmental leaders. By emphasizing key environmental challenges facing the world today, including barriers to fish migration, dam safety, sustainability, and other issues, organizations may yet be able to entice women to the industry. Studies have shown that women often rank environmental concerns as more important, and, historically, women, such as Wangari Maathai, Jane Goodall, Ursula Sladek, and Angela Merkel, have spearheaded many groundbreaking environmental movements. In rural parts of the world, it is often women who are most affected by the increased frequency of extreme weather events wrought by climate change. A report recently released by Women Rising 2030, written in honor of Women’s History Month, states that “boards with gender balance tend to prioritize environmental issues and are likely to invest in renewable power, low-carbon products, and energy



Hydropower leads in producing renewable electricity. Source: ren21.net

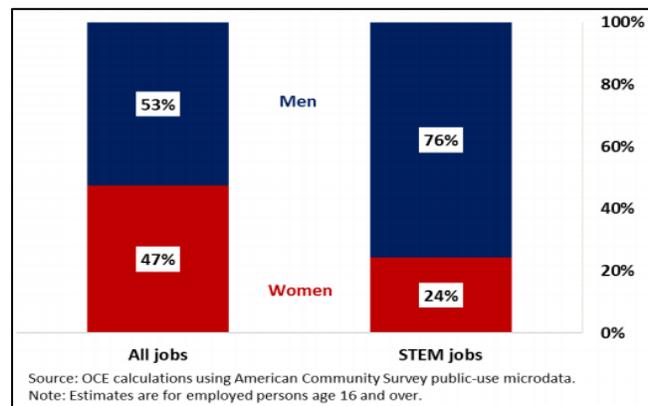
efficiency” (Business and Sustainable Development Commission, 2018). The report further noted that organizations with a long-term environmental, social, and governance approach tend to perform better financially than those that do not;

thus, it stands to reason that further emphasis on hydro’s role as a clean and sustainable power source may be key to attracting more women to the industry.

From a purely business standpoint, hydro companies can also promote the variety of roles that women can pursue within the industry, including female engineers, hydrologists, plant managers, board members, and Chief Executive Officers. There is no shortage of jobs for women, between the pending boomer retirement and the growth of jobs in the clean energy industry: on a global scale, jobs in renewable energy are growing every year as advances in technology and business models have coincided with efforts made by traditional institutions to reduce their

operations' environmental footprint. One article notes that “green-based job sectors are vastly outpacing the U.S. economy in growth and job creation and are generating more jobs per dollar invested” (Rupp, 2018).

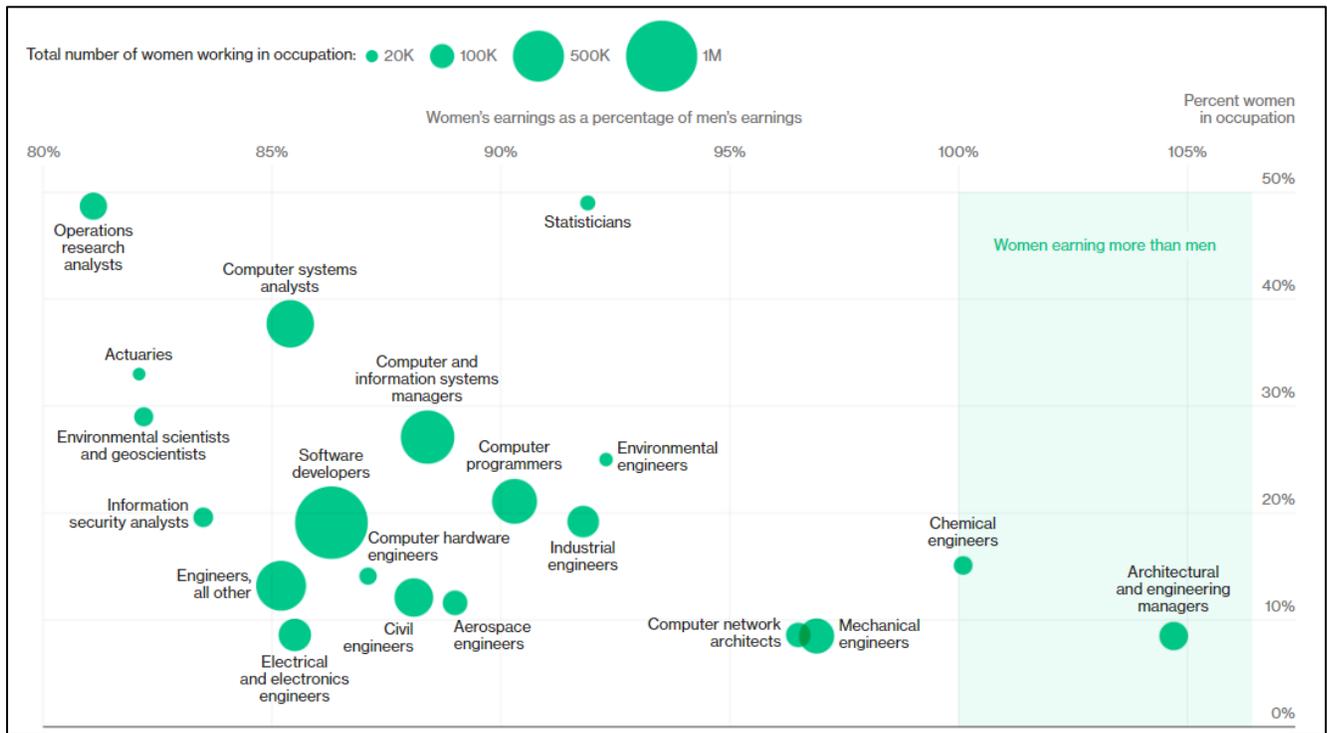
When recruiting women to hydro, we must also consider the discouraging issue of the gender wage gap. According to the National Partnership for Women & Families, women are losing out on over \$10,000 in pay each year because of the pay gap, contributing to higher levels of poverty,



Source: esa.gov

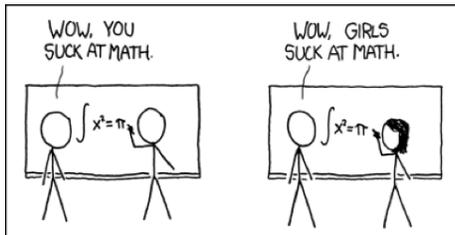
income inequality, and retirement insecurity. One article points out that lower pay for women starts with occupational segregation, a cultural phenomenon in which, from a young age, girls are steered toward “soft” professions such as education or the arts, and boys are steered toward the sciences. This leads to a disproportionate number of women working in lower-paid fields “while men dominate higher-paid industries” (Picchi, 2018). Women face implicit penalties when they have children or take care of family members by taking paid time off from work, and women tend to get smaller salary bumps than men – 10% versus 30%, according to the 2016 Global Talent Trends Report released by LinkedIn (Cruz, 2016). Even with these unerring odds, the gender wage gap in STEM fields is smaller, with women in STEM fields earning 35% more than their female counterparts in non-STEM fields. A report issued by the Office of the Chief Economist (OCE) in late 2017 found that women with STEM jobs “also earned 40% more than men with non-STEM jobs” (OCE, 2017). Generally, women in STEM positions earn 92 cents to every dollar made by men in the same field, versus 81 cents on the dollar in non-STEM fields. The STEM professions are the most progressive in terms of closing this pay gap – in fact, as reported by Bloomberg and the U.S. Census Bureau in 2017, a few STEM professions have already done so: women actually

earn *more* than men in the fields of chemical engineering and architectural and engineering management (Busso, 2017).



Source: bloomberg.com

Gender diversity is yet another angle from which to appeal to women. Diversity in the



Source: xkcd.com

workplace is critical in driving innovation, and many reports have pointed out the obvious: a more diverse workforce means more diverse perspectives, which in turn means a higher probability of problem solving and, ultimately, revenue for the employer. But, as previously stated in this

paper, while women hold more STEM jobs than in previous decades, they still only make up a quarter of the STEM workforce in the United States. Moreover, while women comprise more than 20% of engineering school graduates, only 11% of practicing engineers are women (Boykin, 2011). This indicates, at first glance, that women either enter the engineering field and then leave, or never enter the profession at all. The Harvard Business Review studied 700 engineering students

across four schools beginning in 2003 and found that many women engineering students found themselves relegated by their male peers to routine managerial and secretarial jobs and excluded from actual engineering work. Women engineering students described being treated differently by professors and, when exposed to the engineering workplace through internships and summer jobs, finding this gender stereotyping behavior echoed in the real world (Silbey, 2016). Thus, hydro organizations must focus their efforts on changing a dated and gendered attitude toward women in STEM. To overcome the gender disparity in STEM fields, the industry as a whole and organizations in particular must commit to strengthening gender equality practices and to weakening the notion that engineering and the sciences are exclusively male disciplines.

A Case Study of Women in Hydro

As women in hydro, the authors of this paper have faced many difficulties in their respective fields. Giovanna is an engineer at American Governor Company, a hydroelectric turbine controls manufacturing facility in Pennsylvania. As a woman in the U.S.



Gi after commissioning an 80MW unit at Chief Joseph, the second largest power plant in the U.S. Source: AGC

workforce, she has faced unequal wages, lower expectations, and greater discrimination and gender bias. As a female engineer, particularly within the hydro industry, she often finds herself in a room full of men. At her home office in Bucks County, she is the only female engineer on staff. She contends with frequent travel requirements to remote locations (surrounded by men) and the struggle to prove to the men she trains and works with on site that she is up to the job. She walks a thin line between being “one of the guys” and maintaining the confidence to be herself. But in the time that she has been in the industry – close to three years as of the writing of this paper – she has fallen in love with hydro. Her job brings her to beautiful locations where giant

powerhouses utilize her designs and her programs to bring power to the grid. She has had the opportunity to follow her projects from conception through to completion. She has met hundreds of fellow engineers, not all of them men, and she recognizes the importance of the work that she does. She also recognizes the importance of having more women like herself, knowing that the industry is missing a potentially vast resource in women’s intelligence, innovation, and diversity.



Ashley at HydroVision 2017 in Denver, CO, before presenting on on-site advanced simulator training. Source: AGC

Conversely, Ashley came to the hydro industry by accident. Unlike Giovanna, Ashley pursued a degree in the arts, focused entirely on literature and writing in the initial stages of her career, in fields dominated by women. She was never discouraged from studying arts-leaning subjects; but at many turns, she faced skepticism when she exhibited interest in the sciences.

Often, she wonders where she might be now had someone said to her, “Sure, why not?” She is cognizant of the many challenges that lay in the workforce as a whole for women, but during her tenure at American Governor, she has seen firsthand the disparity between men and women in the industry, and the many challenges that may be mitigated with a more diverse skill set. Having been exposed to the appeals of hydropower, she finds herself most interested in the environmental aspects of the industry and the outreach that can be done to make hydro more appealing to women.

We’re Getting There, But We Have a Long Way to Go

Ultimately, women need more opportunities to succeed at technical tasks, and they must be approached at earlier stages of their career – even as far back as childhood, with more STEM toys marketed toward girls and not just boys, as they so often are. They must be verbally

encouraged, and they must be given the opportunity to see other women in the STEM and hydro fields. Organizations in hydro must improve their work culture and be cognizant of their subtle tendencies toward gender bias; they must offer mentorship, education, and training;



Source: change.org

and they must expand their outreach by presenting a more appealing public image centered upon environmental and social impact. We must cultivate the science career aspirations of young women, and we must nurture the career advancement of women who show interest in STEM and other related fields, in order to mitigate the workforce challenges the hydropower industry faces today and must confront in order to help secure an environmentally-friendly energy future.



Women engineers. Source: internationalwim.org

Reference List

- Beede et al. (2011). *Women in STEM: A Gender Gap to Innovation*. Retrieved from <http://www.esa.doc.gov/sites/default/files/womeninstemagaptoinnovation8311.pdf>
- Bennett, A. (2015, April 1). *Solving the aging workforce dilemma in today's utility industry*. Retrieved from <https://www.elp.com/articles/2015/04/solving-the-aging-workforce-dilemma-in-today-s-utility-industry.html>
- Boykin, D. (2011, November). *Heading for the Exit*. Retrieved from <https://www.nspe.org/resources/pe-magazine/november-2011/heading-exit>
- Branislava et al. (2018). *Women in sustainable energy, climate change, and environmental protection – Leadership for Change*. Retrieved from https://balkangreenenergynews.com/wp-content/uploads/2018/03/WiseSee_E.pdf
- Business and Sustainable Development Commission. (2018, March). *Better Leadership, Better World – Women Leading for the Global Goals*. Retrieved from <https://s3.amazonaws.com/aws-bsdc/WomenRising2030-Better-Leadership-Better-World.pdf#asset:639>
- Busso, M. (2017, June 2). *Women Close Gender Pay Gap in Two STEM Jobs, Lag in Others*. Retrieved from <https://www.bloomberg.com/graphics/2017-women-stem-jobs/>
- Cooper et al. (2017). *Women in the Workplace*. Retrieved from <https://womenintheworkplace.com/>
- Cruz, E. (2016, July 27). *The Gap Between Women and Men in STEM and What You Can Do About It [INFOGRAPHIC]*. Retrieved from <https://business.linkedin.com/talent-solutions/blog/trends-and-research/2016/the-gap-between-women-vs-men-in-stem-and-what-you-can-do-about-it-infographic>
- Marcus, B. (2014, March 28). *Mentors Help Create A Sustainable Pipeline for Women In STEM*. Retrieved from <https://www.forbes.com/sites/bonniemarcus/2014/03/28/mentors-help-create-a-sustainable-pipeline-for-women-in-stem/#31eede2c53d3>
- McKenna, C. (2018, February 9). *Charts of the week: Advancing women and girls in science*. Retrieved from <https://www.brookings.edu/blog/brookings-now/2018/02/09/charts-of-the-week-advancing-women-and-girls-in-science/>
- Moss-Racusin, C., Dovidio, J., Brescoll, V., Graham, M., & Handelsman, J. (2012, July 2). *Science faculty's subtle gender biases favor male students*. Retrieved from <http://www.pnas.org/content/pnas/109/41/16474.full.pdf>
- National Academy of Sciences, National Academy of Engineering, Institute of Medicine, Government-Industry-University Research Roundtable, & Fox, M. (2003). *Pan-Organizational Summit on the U.S. Science and Engineering Workforce: Meeting Summary*.
- Picchi, A. (2018, April 10). *4 ways women earn less than men*. Retrieved from <https://www.cbsnews.com/news/4-ways-women-earn-less-than-men/>

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- Rugheimer, S. *Women in STEM Resources*. Retrieved from https://www.cfa.harvard.edu/~srugheimer/Women_in_STEM_Resources.html
- Rupp, S. (2018, May 17). *Renewable energy jobs are growing worldwide*. Retrieved from <http://exclusive.multibriefs.com/content/renewable-energy-jobs-are-growing-worldwide/waste-management-environmental>
- Russell, G. (2010, June 1). *HydroVision Preview: Overcoming Operations and Maintenance Challenges*. Retrieved from <https://www.hydroworld.com/articles/hr/print/volume-29/issue-4/articles/hydrovision-preview0.html>
- Silbey, S. (2016, August 23). *Why Do So Many Women Who Study Engineering Leave the Field?* Retrieved from <https://hbr.org/2016/08/why-do-so-many-women-who-study-engineering-leave-the-field>
- Stearnes, R. (2017, January 1). *Another Benefit of Hydro*. Retrieved from <https://www.hydroworld.com/articles/hr/print/volume-36/issue-1/departments/another-benefit-of-hydro.html>
- Stonyer, H. (2002). *Making Engineering Students – Making Women: The Discursive Context of Engineering Education*. Retrieved from <https://www.ijee.ie/articles/Vol18-4/IJEE1291.pdf>
- United Nations Educational, Scientific, and Cultural Organization. (2017). *Cracking the code: Girls' and women's education in science, technology, engineering and mathematics (STEM)*. Retrieved from <http://unesdoc.unesco.org/images/0025/002534/253479e.pdf>

About the Authors



ASHLEY SCHEIBER, TECHNICAL WRITER A New York City native, Ashley received her Master of Arts degree in English from Arcadia University in Glenside, PA. Ashley has been a “woman in hydro” since 2017 and is an integral member of American Governor Company’s quality management, operations, and engineering teams, facilitating the creation of technical documentation in support of hydro governor manufacturing operations.



GIOVANNA TOMIOTTO, CONTROLS ENGINEER “Gi” was born and raised in Brazil and moved to the U.S., where she obtained her Bachelor of Science degree in Mechanical Engineering from Embry Riddle University in Daytona, FL. Along with knowledge garnered from her time on the controls team as part of her senior thesis in college, she is experienced in designing, troubleshooting, and commissioning digital governors for hydroelectric turbines. Gi has been a woman in hydro since 2016.