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Abstract

Women have historically been excluded from work in the male-dominated American oil and gas industry due to unfavorable working conditions and industry hiring biases. However, due to recent developments in on-land drilling techniques and increased overall production, this gender discrimination is slowly beginning to change as more women are being hired for energy industry jobs. In the short term, this means a greater distribution of wealth in what can be a lucrative field. Greater access to employment with security and room for advancement could also mean a long-term structural change in industry hiring norms, granting women greater access to energy employment in the future.

Key Words: Oil and Gas, American Energy, Women's Work, Feminization of Poverty

Traditionally, jobs in the energy industry have not been considered "women's work," as few women have been involved in the planning, building or operation of energy systems such as coal or uranium mines, refineries, oil and gas drilling sites or transmission lines. Instead, female employment opportunities in these fields have long been limited to low-paying supplemental jobs at one end and, in a limited number, high-paying engineering and non-production jobs at the other. Female representation has been limited in mid-level work, in the labor-intensive jobs where experience and networking are valued over education. This article will first examine the most prominent causes of this problem of high-level and mid-sector labor underrepresentation, a phenomenon that is partly due to working conditions and labor restrictions but also to hiring biases within the industry. However, due to recent industry developments, this bias seems to be changing. Accordingly, this article will chart the recent emergence of a greater female working presence in the oil and gas industries of the United States due to recent increases in on-land production and exploration as well as offer explanations for this shift in hiring and labor practices. This increase in employment opportunities for women points to a greater distribution of wealth within what can be a lucrative profession with many high and mid-level job opportunities. This project concludes by offering an analysis of what this greater enfranchisement means for women's access to future higher-paying employment opportunities in energy industries.

According to the US Department of Labor, a male-dominated field is one in which less than 25 percent of the total work force is made up of women ("Quick Facts on Non-Traditional Jobs for Women," http://www.dol.gov/wb/factsheets/nontra2008.htm). Historically, the energy industry has qualified as one of these fields. Rigzone, an oil and gas industry recruitment and

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analysis group, reports that 82 percent of the jobs in the oil and gas industries are held by men (Unger, http://www.csmonitor.com/Environment/Energy-Voices/2013/0509/Unconventional-energy-rise-of-women-in-oil-and-gas-industry). The most obvious explanations for this occupational exclusivity are related to working conditions and labor restrictions. Drilling sites are in operation 24 hours per day, seven days a week, 365 days per year, often in some of the most remote and dangerous places in the world. A typical working shift on an oil rig located in US territory could be 7-7 (seven days at home, seven at work), 14-14, or, if working overseas, 28-28. Schedules rarely accommodate holidays. Travel time to and from working sites is taken out of the employee's non-working days and is often at the expense of the worker. The majority of labor on drilling rigs is manual, and the work can be dangerous. There is little privacy or separate living arrangements for different genders, a situation that is compounded by the isolation of working miles from shore. For many women who may work multiple jobs and serve as the family caretaker, being away for long periods of time is unrealistic and, given the working conditions, even undesirable. However, many women may already work in undesirable environments for much less pay than they would make in the energy industry and, given the option, would prefer this work for the compensation it brings. The fundamental problem with unequal hiring practices is that women are often not given the option to choose between undesirable working conditions with low pay and similar conditions with higher pay.

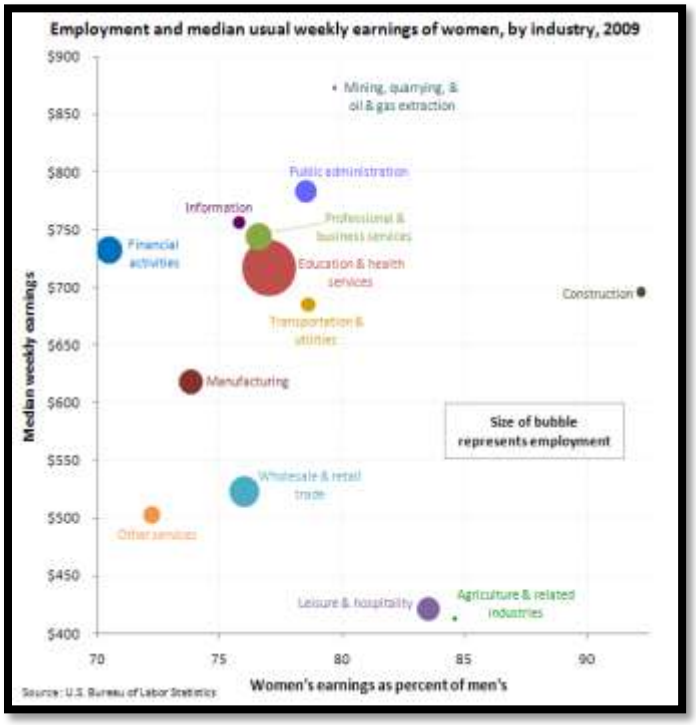
While the nature of this type of work places limitations on gender-equal hiring and advancement practices, additional limitations placed on women in energy industries stem from gender-based hiring norms. *Catalyst* research has found that "…talent management systems are frequently vulnerable to pro-male biases that inevitably result in less diverse employee pools" ("Women in Male-Dominated Industries and Occupation in the US and Canada," http://www.catalyst.org/knowledge/women-male-dominated-industries-and-occupations-us-and-canada). Senior management, usually dominated by men, sets the tone for hiring norms, which results in gender bias normalization in Human Resource tools. Thus, employment is based on a male stereotype of criteria, limiting those who qualify for jobs that are offered. Because male-dominated industries are particularly gender-biased due to an existing lack of diversity, it is even more difficult for women to break into them and begin to change those biased norms. Additionally, because these oil companies operate around the world, sometimes hiring a woman into a job for which she is technically qualified poses international problems. Live Connections CEO Hema Subramaniam says "the oil and gas sector has still not evolved as an industry that encourages the entry of women" (Venkatraman and Balasubramanian, http://articles.economictimes.indiatimes.com/2009-03-17/news/28472512_1_cairn-energy-rigs-oil-and-gas). For example, within the Gulf Co-operative Council Region, the primary energy head-hunting firm in operation found that the profile of a woman candidate for an HR function was rejected because the Abu Dhabi-based oil and gas company wanted to hire only a man for the advertised position.

The most frustrating aspect of these hiring limitations is that they exclude women from mid-level jobs that do not necessarily require extensive education but are also exceedingly well-paid. A roustabout, the most general labor entry-level position on a drilling rig, makes an average of $34,680 per year (equal to the average income of Americans) with little to no college education or experience (Hargreaves, http://money.cnn.com/2012/05/10/news/economy/oil_workers/). If a worker moves up quickly, with less than a year of experience and no college education, he or she can expect to make an average of $66,923 annually. In 2011, the average salary for oil rig workers and other industry

personnel was $99,175. Even truck drivers in North Dakota who transport machinery or refined products can expect to make $100,000 per year, or more ("Full Throttle Ahead," http://www.spiegel.de/international/world/new-gas-extraction-methods-alter-global-balance-of-power-a-880546.html). Comparatively, in the female-dominated field of education where the minimum requirement is a bachelor's degree, entry-level pay in the Texas school system, for example, was $36,000 in 2010-2011. These numbers may sound similar, but the opportunity for teacher pay increase is much more limited. The average teacher salary in Texas ranges from $41,000 to $48,000, and the pay increases in 2010-2011 were the lowest (2.2%) in the past decade, even given increased levels of education ("Teacher Salary Survey Released," http://www.tasb.org/about/news/press_releases/2010/january/teacher-salary.aspx).

There are jobs available to women in the oil and gas industry, but in terms of pay, they are either located at the top of the pay scale and require degrees and experience or cluster around the bottom of the pay scale and provide little job security or room for advancement. Schlumberger, for instance, one of the world's largest oilfield service companies, recently boasted that its male-to-female sex ratio is the best in the business and that they have "…100 hardcore women technical staff engaged in various roles like research and tool installation" (Venkatraman and Balasubramanian, http://articles.economictimes.indiatimes.com/2009-03-17/news/28472512_1_cairn- energy-rigs-oil-and-gas). They also have 30-40 women "technocrats" working offshore on oil rigs, 24/7. Though theirs is the "best" ratio in the field, it still hovers around only 8% employment of women ("Schlumberger: Workforce Diversity," http://www.slb.com/about/guiding_principles/diversity.aspx). These types of engineering, technology or research jobs can pay well, far above the median average salary for women employed in other more female-dominated fields such as education or public administration. Figure 1, provided by the US Department of Labor, illustrates the median weekly pay for women working in the mining, quarrying, oil and gas extraction field:

Figure 1 ("Women's Earnings and Employment by Industry, US Bureau of Labor Statistics, 2009," http://www.bls.gov/opub/ted/2011/ted_20110216.htm)



Though the pay for these mining, quarrying and extraction jobs is higher than other occupations on average per week, it still represents barely 80 percent of what men working in the same field earn on average, a statistic that is reflective of a more general gender gap in men and women's wages in the US.[2] The number of women employed in this energy field is also significantly lower than other fields—of the reported 45 million women who were employed in full-time wage jobs in 2009, 17 million women in the US worked in education and health services while only 87,000 were employed in the highest paid labor division of mining, quarrying and oil and gas extraction ("Women's Earning and Employment by Industry," http://www.bls.gov/opub/ted/2011/ted_20110216.htm).

This low employment rate in the highest-paid jobs can, in part, be explained by a lack of female expertise in areas of engineering, geology and other areas of study required for this type of work. On average, far fewer women than men receive degrees in the field of engineering. The American Society for Engineering Education recently compiled data that revealed only 18.4 percent of bachelor's degrees in engineering were awarded to women in 2011 (Yoder, http://www.asee.org/papers-and-publications/publications/college-profiles/2011-profile-engineering-statistics.pdf). Of these degrees, only 16.8 percent were awarded to women in the field of petroleum engineering, compared to 44.3 percent in Environmental Engineering and 39.1 percent in Biomedical Engineering. There are other jobs available in the oil and gas industry, for example, in human resources or communication departments, but the pay is generally not as high as the on-site technical and production jobs in the field. At Schlumberger, for example, an

[2] The US Department of Labor reports that in 2011 women's weekly earnings were roughly 82% that of male counterparts ("Highlight of Women's Earnings, US Department of Labor").

accountant can expect a starting pay of $34,000 per year with a college degree, whereas a petroleum engineer begins with a salary of $75,000 ("Schlumberger Salary List," http://www.glassdoor.com/Salary/Schlumberger-Salaries-E588.htm).

Jobs for women in the energy field also exist at the bottom of the pay scale for employment without a college degree. Catering and cleaning opportunities are sometimes available to women on offshore rigs and within the onshore drilling work camps. Chefs on offshore rigs can expect an average salary of $39,000, and dishwashers may earn up to $700 per week with two weeks of work per month ("Offshore Work," http://www.employmentspot.com/employment-articles/offshore-work/). Stewardesses can clean rooms and process laundry for $30,000 per year. The turnover rate for this type of employment is high and offers little job security or benefits for its workers while still requiring a flexible schedule that accommodates work for weeks at a time in a remote location.

While there is overwhelming evidence that illustrates women have largely been excluded from employment in the energy industry, the hiring trend seems to be moving toward greater inclusion as a result of the current American oil and gas production boom. The US has experienced a marked increase in domestic oil and gas production since the mid-2000s when energy industries began adopting expanded horizontal drilling programs that utilize new techniques, such as the controversial hydraulic fracturing, often referred to as "fracking." This drilling process combines a pressurized mixture of water and chemicals injected at high temperatures to break up the rock formations that hinder drilling access to "tight" oil and natural gas reserves. First used in 1947, modern fracturing has become a popular drilling technique among drilling companies in the US because it grants access to oil and gas deposits that were previously inaccessible. In 2011, the US Energy Information Administration reported that both oil and natural gas proven reserves had increased to record numbers in each of the five largest oil and natural gas producing states of Texas, Wyoming, Louisiana, Oklahoma and Pennsylvania ("US Crude Oil and Natural Gas Proved Reserves, 2011," http://www.eia.gov/naturalgas/crudeoilreserves/).[3] The same report predicted that 2012 and 2013 would bring similarly high numbers both in proven reserves as well as in actual production as new technologies facilitated the extraction of reserve resources.

The method of hydraulic fracturing certainly has its share of opponents, among them environmental groups such as the Sierra Club and Greenpeace, both organizations that have voiced concerned over possible risks associated with contamination to ground water, risks to air quality, and the potential health risks caused by spills. Individual states have also weighed in as Vermont became the first state to ban hydraulic fracturing within its borders in 2012, an act that was largely seen as symbolic considering there is little to no oil or natural gas to be found in the Green Mountain State. Internationally, countries including Germany, France and South Africa have outright banned or placed moratoriums on hydraulic fracturing indefinitely or at least until further environmental reports are analyzed. Even Hollywood has added its voice to the argument with the 2012 film *Promised Land*, an anti-natural gas fracturing film that was largely financed by Image Abu Dhabi, a United Arab Emirate-owned company.

Many proponents of hydraulic fracturing point to the economic benefits from increased domestic drilling; in fact, while some states have banned fracturing, others are openly pursuing it. In North Carolina, for example, Rep. Mitch Gillespie has been pushing new legislation to legalize and regulate hydraulic fracturing in the western portion of the state, a move designed to

[3] The term "proven reserves" refers to the volume of hydrocarbon resources engineering data demonstrates with reasonable certainty is recoverable under existing economic and operational conditions.

make North Carolina an energy-producing state (Andrews, http://www.carolinapublicpress.org/10089/mcdowells-gillespie-pushes-for-nc-fracking). Support for hydraulic fracturing techniques is also coming from non-governmental organizations such as The Women's Energy Leadership Coalition of New York, which has publicly spoken out in favor of hydraulic fracturing because of the economic opportunity it offers, particularly to women (Karlin, http://blog.timesunion.com/capitol/archives/135272/pro-fracking-women-speak-out/). At the national level, supporters claim such a significant increase in domestic production offers a cleaner alternative to coal and provides greater energy security and independence for the United States. Since January of 2007, for example, the six states of Colorado, Wyoming, Kansas, Utah, New Mexico and Oklahoma increased crude oil production to the rough equivalency of Colombia and Indonesia's output combined, and the International Energy Agency predicts that the US will surpass Russia as the largest producer of natural gas by 2013 and become one of the world's leading oil producers by 2020 ("Full Throttle Ahead," http://www.spiegel.de/international/world/new-gas-extraction-methods-alter-global-balance-of-power-a-880546.html.). These production increases potentially mean continued lower domestic natural gas prices and greater energy independence for the US as well as a more positive balance of trade resulting from the international sale of oil and natural gas.

A growing energy industry will also bring job growth. In North Dakota, for instance, the Bakken shale boom catapulted the state to the nation's second-largest oil producer, lowered its unemployment to 3.5 percent (compared to a nation-wide 7.9 percent) and grew the state's GDP 7.6 percent between 2010 and 2011, the largest jump in the US during the same time period (Cooper, http://www.marketintelligencecenter.com/articles/251069). In Kansas, another hotbed of drilling activity, land leases that were previously sold for $15-$20/share are now going for $1,700 per acre, making some landowners millionaires overnight. By 2020, it is estimated that the growing domestic energy sector will generate between 3 and 3.5 million new jobs (Carey, http://www.forbes.com/sites/energysource/2012/12/13/how-unconventional-oil-and-gas-is-transforming-the-u-s-economy/). While this flurry of domestic growth sounds encouraging, especially considering the US is only slowly recovering from a recession and high unemployment numbers, one has to beg the question of to whom these millions of new jobs will go.

The good news is that the recent oil and gas boom in the US seems to be slowly changing this system of hiring inequity within the oil and gas industry. One explanation is based purely on supply and demand. There are literally more jobs than people to fill them, and many contracting companies are taking on more women out of need for employees. According to HIS Global Insight, jobs specifically tied to drilling and fracturing are expected to total 2.5 million by 2015 (Gannon, http://www.post-gazette.com/business/businessnews/2013/05/19/Number-of-women-landing-jobs-in-oil-gas-industry-growing/stories/201305190240). One sector of the industry that has seen significant increases in the number of women employed is truck driving. Each oil well needs at least 800 loads of water, pipe and other drilling material, says Ray Kuntz, past-chairman of the American Truckdrivers' Association (ATA). Once oil is struck in the well, it needs to be transported to a refinery or pipeline. As most of the US's truck drivers are over the age of 55 and at the age of retirement, this increased demand has caused a shortage of drivers, a gap that Kuntz says has to be filled by reaching out to women and minorities (Yamanaka, http://www.wnyc.org/story/286264-regional-oil-boom-exacerbates-truck-driver-shortage/). The US Bureau of Labor Statistics reports that the demand for truckers will increase 21 percent between 2010 and 2020 and though women only currently make up 8 to 10 percent of total truck

drivers in the US, this number is expected to increase ("Heavy and Tractor Trailer Truck Drivers," http://www.bls.gov/ooh/transportation-and-material-moving/heavy-and-tractor-trailer-truck-drivers.htm). No formal college education is required for employment as a truck driver, only a Commercial Drivers License obtained from a certified program usually lasting 3-12 weeks ("Truck Driver Regulations," http://www.fmcsa.dot.gov/rules-regulations/truck/driver/truck-driver.htm). These jobs are well-paid: truck drivers in North Dakota working for oil and gas companies can expect to make up to $100,000 per year ("Full Throttle Ahead," http://www.spiegel.de/international/world/new-gas-extraction-methods-alter-global-balance-of-power-a-880546.html).

Women are also making employment gains within the drilling industry itself. Outside of trucking, many women have been taken on by drilling companies to mix the chemicals used in the hydraulic fracturing process, a job that requires minimal heavy labor and for which the only qualification needed is a license to operate heavy machinery. In Ohio, another state poised to experience a drilling renaissance, female enrollment in the heavy equipment operation certification at the local community center has increased, and now one in four students are women, many of whom are planning to take advantage of the drilling in the eastern part of the state (Whitman, Alfonsi and Francis, http://abcnews.go.com/Business/MadeInAmerica/breaking-ground-oil-boom-draws-women-industry/story?id=16312609). According to Rigzone, "approximately 48,900 women worked in America's oil fields in 2004. The numbers from 2012 show 78,400 women working in the industry—an increase of 29,500 in just seven years" (Whitman, Alfonsi and Francis, http://abcnews.go.com/Business/MadeInAmerica/breaking-ground-oil-boom-draws-women-industry/story?id=16312609). The most recent statistics show that of the 3,900 positions added in the US oil and gas industries in the first quarter of 2013, almost half (1,800) were filled by women (Gannon, http://abcnews.go.com/Business/MadeInAmerica/breaking-ground-oil-boom-draws-women-industry/story?id=16312609).

A second reason that explains greater employment opportunities is the land-based nature of the recent oil and natural gas boom, a development that has brought a change in living conditions for workers, though this point is contingent on location. Previous off-shore living situations were not ideal for women, considering workers are in the middle of the ocean cramped together in living quarters with their male co-workers. The housing situation for on-land operations, however, seems to be more favorable for women. Though housing prices in northwestern North Dakota, for example, are incredibly high right now due to increased demand and little supply, women have the option of more separation and privacy from their male counterparts. In the oil boomtowns of southern Kansas, trailers are available for oil workers but rent at $2000 per month, which may seem high until one considers the people renting them make over $100,000 per year and they will only be rented for six months out of a year of work (Ellis, http://money.cnn.com/2012/06/01/pf/kansas-housing-america-boomtown/). It is also more feasible for women to relocate their families to on-land drilling locations in order to take advantage of higher pay, making it easier to continue assuming care-giving roles during employment. Private trailers offer a living arrangement that does provide increased privacy for women, but this type of housing is not available everywhere. In North Dakota, trailer camps are technically supposed to be called "crew camps," but are informally referred to as "man camps" due to the overwhelming number of men living there. In Williston, North Dakota, the local Wal-Mart had to formally ban oil workers from living out of their cars and mobile homes in their parking lot in February of 2012 (Travis, http://www.bakkendispatch.com/walmart-kicks-

campers-williston-parking-lot). Though the nature of working on land versus on water or overseas may be more female-friendly, that generalization does not stretch to every well location.

In addition to increased demand and changing working conditions, new energy extraction technologies are creating opportunities for women at all levels of employment and diversifying the field of energy production. Chemical mixing, machinery operation and transportation are just a few occupations women can enter that pay well and do not necessarily require advanced degrees. Technological advances in the industry in general have also begun attracting more women to engineering programs with the promise of jobs in an ailing economy and potential high pay. The number of doctorates awarded to women in the field of engineering doubled from 11 percent of total engineering Ph.D.s awarded to women in 1995 to 22 percent in 2008 (Jaschik, http://www.insidehighered.com/news/2010/09/14/doctorates). Oil and gas companies have also begun actively pursuing women to add diversity to their ranks. BP, an industry giant that has been very public about their gender hiring goals, increased its senior leadership from 9 percent women in 2000 to 17 percent at the end of 2012, according to their 2012 Sustainability Review. The US Labor Department also recently released a guide for women aimed at helping them get into the "green jobs" market. The guide focuses on helping workers learn about a range of in-demand and emerging jobs as well as job training opportunities and development tools ("Why Green is Your Color," http://www.dol.gov/wb/Green_Jobs_Guide/). This is part of a larger undertaking by the US government to train women for jobs in a clean energy economy. In addition to outreach and education, the project also provides "Pathways out of Poverty" grants, a number of which are directed at recruiting women for jobs in green industries ("Women's Employment During the Recovery," http://www.dol.gov/_sec/media/reports/femalelaborforce/).

A more comprehensive explanation for women entering the oil and gas industries in higher numbers can be found by simply observing current news headlines on any given day. These initiatives aimed at recruitment and awareness are part of the larger energy narrative currently happening in the US. As gas prices fluctuate, instability continues in the Middle East, China surpasses the US as the largest energy consumer and the American economy slowly recovers, the conversation of the moment is largely about energy resources. Along with the renewed interest in a revitalized American energy industry comes greater public scrutiny. In an economy where job creation is imperative, there is pressure to implement more equitable hiring practices. Whether energy companies are recruiting more women because they genuinely value their input or because it creates an image of corporate social responsibility seems immaterial. When more women are hired and then advance to leadership roles, the norms of gender-discriminate hiring practices will slowly begin to change.

What does all of this really mean for women? Hopefully, it means a greater distribution of wealth among men and women in the US. As early as 1978, Diana Pearce wrote that poverty was becoming "feminized" in the United States ("The Feminization of Poverty: Women, Work and Welfare"). The feminization of poverty is now a well-known and widely-felt phenomenon that describes the concentration of poverty among women, particularly in single-parent households. Despite decades of advancements in gender equality, women globally still own only 1 percent of the world's wealth and occupy just 14 percent of leadership positions in the public and private sectors (Saidi, http://www.huffingtonpost.com/dr-nasser-h-saidi/the-real-arab-spring-is-a_b_4206716.html). Comparatively, gender gaps in oil and gas industry employment are not limited to just the US. In Australia, only 13 percent of energy industry workers are women ("Employed Persons by Subdivision and Sex,"

http://www.quandl.com/AUSBS/6291006_A2546102X-Employed-persons-by-Industry-Subdivision-and-Sex-Employed-Total-Manufacturing-nfd-Persons-000); in Great Britain, the number is slightly higher at 21 percent ("Finding Out About Oil and Gas," https://nationalcareersservice.direct.gov.uk/advice/planning/LMI/Pages/oilandgas.aspx).

The effects of this concentration of poverty among women extend beyond economic and material measures of relative wealth to also describe a condition in which women are denied choices or opportunities and are unable to achieve their goals, ultimately being left with feelings of helpless and inefficacy. These psychological effects further contribute to the cycle of poverty in which women see little hope in applying for work in male-dominated fields or pursuing education in traditionally male-dominated subjects. While opportunity structures have improved for women's employment opportunities, the mindset of difficulty or impossibility still persists. While male-dominated fields still exist and patterns of inequitable wage earnings continue even in developed countries like the US, recent hiring trends seem to demonstrate that the energy industry, an unlikely suspect, is beginning to provide women with opportunities for mid-level and higher-level work with security, benefits and room for advancement.

Despite decades of US labor legislation aimed at work equity, women still do not make comparable salaries for comparable work and are underrepresented in top-paying senior jobs. Though the percentage of women entering and graduating from college has finally reached equal numbers with men, female students still choose to pursue a degree in Science/Technology/Engineering or Math far less frequently than men. The idea that these fields are "men's work" or that women cannot compete in a "boy's club" must change. While the oil and gas industry has traditionally excluded women for various reasons, statistics seem to show that is changing. More women are being hired for technical, non-production jobs and for mid-level, well-paid production work. Even if this trend is the result of an imbalance in labor supply and demand, it is an inroad to begin further changing biased hiring norms in the energy industry so that women ultimately have greater access to the wealth these types of jobs can offer.

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