



Mexico's Energy Reform: Bridging the Skills Gap

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Introduction

Firms across Latin America are complaining about the difficulties of recruiting workers with the technical skills their businesses demand. Lack of adequate skills is becoming a bottleneck for growth in technologically complex industries, harming government efforts to increase investment in strategic sectors of the economy. In Mexico, the energy reform creates opportunities to generate new jobs and educate and train workers in specialized skillsets, but the country will also face challenges in meeting additional demand for skilled labor.

The reform, which ended state oil company Pemex's monopoly and opened the electricity sector to increased private participation, will boost economic growth by 1% by 2018 and 2% by 2025, while spurring development of the industrial sector, according to government projections. Many new oil companies, utilities and service providers are expected to enter Mexico and compete for talent in the coming years. New and expanded government agencies will also need more skilled professionals. At the same time, as many as half of Pemex's employees will be at or near retirement age within a decade. The energy sector will likely see at least \$50 billion of new investment by 2018, with each billion dollars yielding 2,700 direct jobs and 2,700 indirect jobs, the government estimates.

However, the absence of quality education at the primary and secondary levels, low enrollment in energy-related higher education programs and weak industry-academia ties mean not enough graduates are prepared to work in the sector.

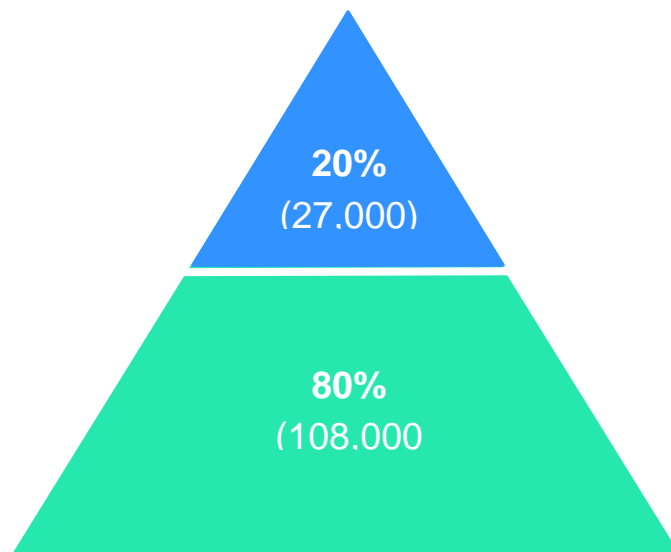
On April 28, 2015, the Inter-American Dialogue, in partnership with Comexi and the American Chamber of Commerce of Mexico, hosted a roundtable discussion to bring together senior representatives of the Mexican government, industry executives and leaders in education to discuss challenges and opportunities for human capital and the energy and oil and gas sectors in Mexico. Participants discussed what skills will be needed in the sector, what Mexico's educational institutions can do to meet this new demand, and how government policies can help close the skills gap.

Educational Enrollment has Increased but Quality Remains Low

Enrollment of children age 5-14 in Mexican schools has increased rapidly over the past half-decade, reaching almost 100%. Yet, enrollment in upper secondary education remains just above 50%.¹ While overall education budgets in Mexico are close to the average for member countries of the Organisation for Economic Cooperation and Development (OECD), public spending per student is low and inefficient. Quality of education also remains below average – on the most recent Program for International Student Assessment (PISA) exams in reading, mathematics and sciences, Mexican student scores were the lowest of all OECD countries.² The rate of doctoral degree completion in Mexico is one of the lowest among OECD countries, and according to government statistics, only 14.2% of higher education programs in Mexico are accredited by the *Consejo para la Acreditación de Educación Superior*.³⁴

Continuous improvement of the quality of primary and secondary school education, especially in science, technology, engineering and mathematics (STEM) fields, and an increase in enrollment in secondary education will increase the pool of potential skilled workers in the energy sector and more broadly.

FIGURE 1: DISTRIBUTION OF NEW DIRECT JOBS
SOURCE: PROGRAMA ESTRATÉGICO DE FORMACIÓN DE RECURSOS HUMANOS (PEFRHME)



Practical Training is Key to Bridging the Skills Gap

Mexico has no shortage of skilled workers but needs to better align the qualifications of its graduates with the needs of the energy sector. By 2018, investment in the sector as a result of the reform will create 135,000 new direct jobs requiring a specialization in the energy sector. An additional 135,000 indirect jobs will also be created as a result of the reform. Of the 135,000 direct jobs, 20%, or 27,000, will require a bachelor's, master's or doctoral degree and 80%, or 108,000, will require specialized technical training or a vocational degree (see Figure 1). Matriculation in higher education programs directly related to the energy sector, such as geophysics, geology, oil engineering, oil chemistry and renewable energy is more than sufficient to meet this demand – 70,000 students a year graduate from energy focused bachelor's degree programs and matriculation for energy related master's and doctoral degrees in the 2013-2014 school year was approximately 17,000 and 2,000, respectively, comprising 8% of the national total. But students graduating with relevant degrees lack the specific skill sets needed to execute the day-to-day demands of energy sector jobs. University programs are often unaccredited and lacking quality control, and even those of quality are mostly theoretical and do not take into account the skills needed for a career in the energy sector.

Creating certifications that can be obtained while studying for a degree is one solution, according to Carlos Ortiz, General Director of Research, Technological Development and Human Resource Formation at the Mexican energy secretariat. The certification programs would be designed based on the technical skills needed to perform energy sector jobs and would train and test students on this specific technical knowledge. Universities would also be able to direct their curricula toward these skills by preparing students for the certification exams, ultimately producing graduates equipped to work in the sector.

Mexico can also reduce the skills gap by re-training engineers and technicians who previously focused on other areas to work in the energy industry. Companies can play an important role in developing human

capital by creating training programs and utilizing local workforce and service providers. Pemex and the Federal Electricity Commission (CFE) both have internal training programs and Pemex has an additional “Corporate University” program to train employees.

Regulators too will need specifically trained graduates with a unique set of skills. While operators must intimately understand specific processes to maximize production, efficiency and safety while minimizing costs, regulators must understand the process at a macro level in order to create specific quality control points from which universal, industry-wide guidelines can be developed. Special training to comply with regulatory guidelines is a fundamental part of the instruction that technicians must receive, according to Ana Luisa Fajer, the General Director for North America at the foreign relations secretariat. This applies to technicians working on a range of projects, from aluminum and aquatic structure welders to gas plant operators to oil and gas production technicians.

A lack of English language skills is another barrier that can inhibit Mexicans from working in international companies. English classes offered in Mexican public schools are generally of very low quality and private classes are unaffordable for much of the population.⁵ The Bilateral Forum on Higher Education, Innovation and Research, an agreement between Mexico and the United States also known by its Spanish acronym FOBESII, lists improvement of English language skills in Mexico and Spanish language skills in the United States as one of its main components to facilitate exchange and promote workforce development.⁶

The shortage of job opportunities and competition for talent in the energy sector has in itself created a bottleneck to growing the workforce. There is a perception among students and graduates that the energy job market is inflexible and opportunities are scarce. PEMEX employees’ salaries are on average higher than those for the rest of the economy, but the lack of flexibility in the Mexican labor market makes the probability of obtaining employment at PEMEX relatively low – creating a disincentive for students to study energy-related fields, according to Victor Carreón Rodríguez, Deputy Director of Planning and International Coordination at Mexico’s National Council of Science and Technology (CONACYT). Increased opportunities and competition from international oil companies entering the Mexican market will boost demand for energy sector professionals, creating a more dynamic and competitive market, and thus more incentive for students to study energy-related fields.

To make the sector more dynamic and competitive, diversity must also be a priority, and women in particular should be encouraged to study energy-related fields. To that end, CONACYT currently offers scholarships specifically for women. Of the OECD countries, Mexico has the widest gender gap in labor participation rates. According to OECD estimates, a 25% reduction in the gap by 2025 could lead to an additional 1% of GDP growth for the country.⁷

Local Content Rules Will Require the Development of Local Talent

A shortage of domestic skilled labor would be particularly challenging for international companies that will have to comply with Mexico’s local content requirements. Federal law requires that at least 90% of a company’s workers, both skilled and unskilled, be Mexican nationals. This limit on foreign employees does not apply to key high level positions which require a special immigration permit. A company can also hire up to 10% of foreign technicians after proving that they are not available locally.⁸

For the oil and gas sector specifically, local content rules require a minimum percentage of total investment to be made up of goods and services produced in Mexico. For example, in the first two phases of the so-called Round 1 oil and gas auction, 13% and 17% local content was required for exploration. For development of the fields, the requirement starts at 25% and reaches 35% by 2025. In the third phase of Round 1 bidding, 22% local content will be required during the two-year evaluation period and 27% for the first year of development, increasing to 38% in 2025.⁹

While local content requirements can be challenging, they also present an opportunity for companies to create jobs by developing local supply chains. In Iraq, for example, Shell has created programs to train welders, construction workers, electricians, and others – about 1,000 individuals who work as contractors for the company. Multiple industry players can also collaborate to develop local supply chains.

Government Action Focuses on Identifying Skills Gaps and Funding Talented Students

In August 2014, President Peña Nieto highlighted ten priority items to effectively implement the energy reform, including human capital development. The Strategic Program for Human Resources Development in Energy was created to improve national innovation in science and technology, developing human capital, promoting regional development across Mexico, strengthening industry-academia ties and developing science and technology infrastructure. The program is an inter-ministerial and inter-organizational collaboration between the energy, foreign relations and public education secretariats, CONACYT, the CFE and other government entities.

The Mexican government, with consulting firm Deloitte, is creating a comprehensive diagnostic to identify talent gaps in the energy sector and the key occupations needed to develop the industry. For example, for the two rounds of the bidding process already underway, critical occupations would include geologists and geophysicists to analyze oil fields, petroleum engineers to make decisions regarding drilling, well completion strategy and recovery methods, and mechanics that can evaluate devices and plan and supervise installations.

Mexico's energy secretariat (SENER) intends to publish this diagnostic by July, detailing the outlook and possibilities for talent in the sector. The study will be used to guide investment strategy, allowing the government to focus on specific talent gaps while optimizing the use of resources. It will also enable universities to better determine how they can adjust academic offerings to meet the needs of the sector. The study will provide industry players with a better understanding of the main challenges and offerings of the Mexican labor market.

In 2013, CONACYT, along with SENER, launched the creation of three Mexican Centers of Innovation in Energy focused on geothermal, solar and wind energy. In 2014, innovation centers for biomass and ocean energy were also created. The two entities will also collaborate to implement new higher education scholarships and hire new research professors distributed throughout the country that specialize in hydrocarbons, sustainability and other energy-related topics. Mexico's sustainability fund and hydrocarbons fund will each provide scholarships and capital to invest in human resources development (see Figure 2).

FIGURE 2: SUPPORT FOR HUMAN RESOURCE FORMATION FROM MEXICO'S SUSTAINABILITY FUND IN PESOS (JANUARY 2013 - JUNE 2014)

SOURCE: PROGRAMA ESTRATÉGICO DE FORMACIÓN DE RECURSOS HUMANOS (PEFRHME)

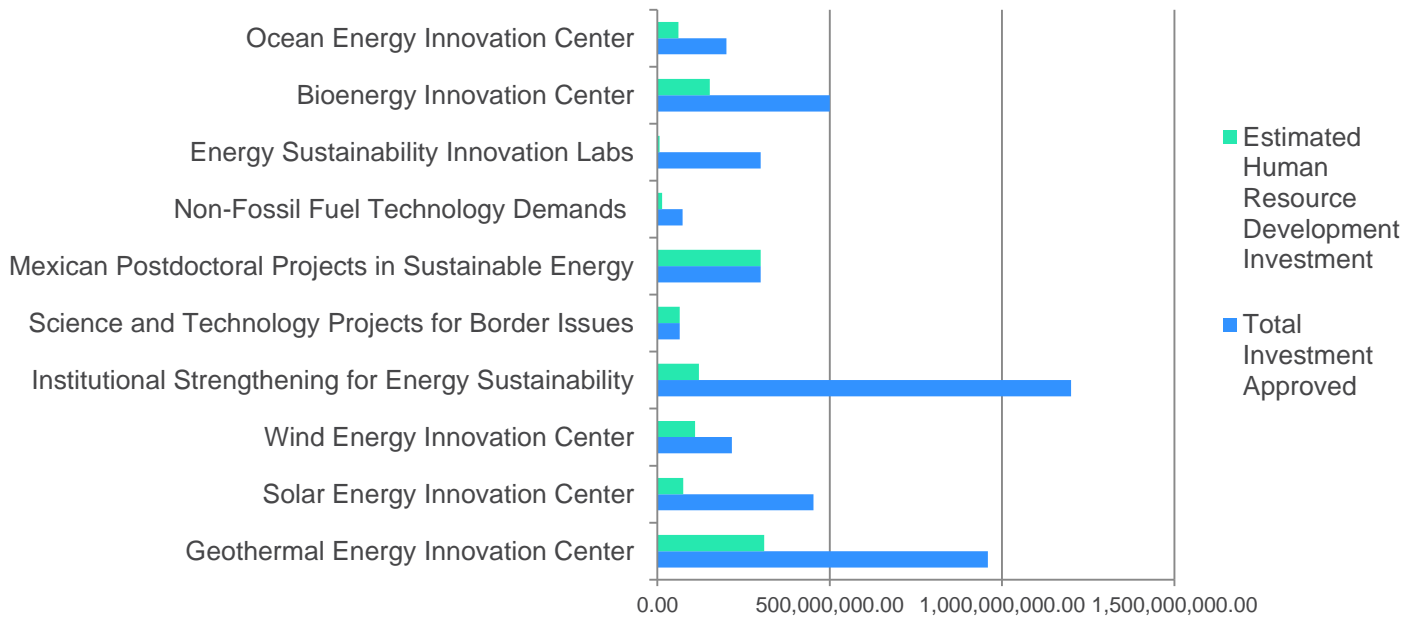
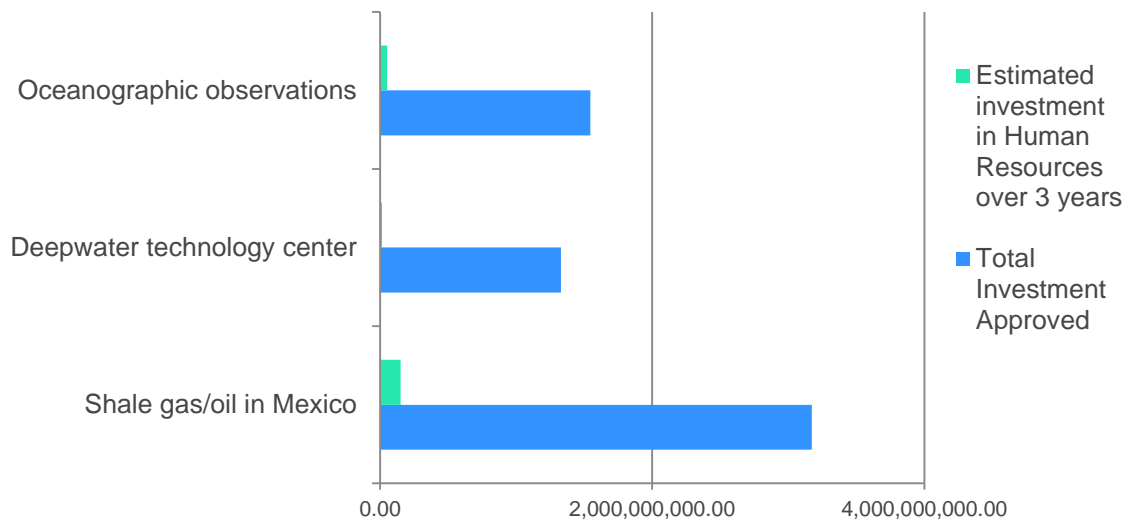


FIGURE 3: SUPPORT FOR HUMAN RESOURCE FORMATION FROM MEXICO'S HYDROCARBONS FUND IN PESOS (JANUARY 2013 - JUNE 2014)

SOURCE: PROGRAMA ESTRATÉGICO DE FORMACIÓN DE RECURSOS HUMANOS (PEFRHME)



In addition, the education secretariat plans to implement an energy-related scholarship program for technical education with 3,000 to 5,000 scholarships per year, and will promote competition for these awards among students studying energy in public higher education programs. In 2014, CONACYT reported a total of 6,595 scholarship recipients enrolled in high quality programs directly related to energy and 409 Mexican scholarship recipients studying these topics at foreign universities.¹⁰ These programs are generally designed from an academic perspective and do not include instruction in the day-to-day skills needed to perform energy sector jobs. To attract talented students to the energy sector, the program will also strengthen science education at the primary and secondary level, where significant improvement is needed. In the obligatory 2012 teacher evaluation, across the country teachers scored the lowest in science with an average grade of 47.4%.¹¹ The technical committee tasked with evaluating the effectiveness of the strategic program will monitor the percentage of graduates with advanced degrees and technical education in energy-related topics who have benefitted from the program, tracking the number of energy sector-related theses and regional energy expositions.

FIGURE 4: PROJECTIONS FOR ENERGY SECTOR RESEARCHERS AND SCHOLARSHIP RECIPIENTS
SOURCE: PROGRAMA ESTRATÉGICO DE FORMACIÓN DE RECURSOS HUMANOS (PEFRHME)

	2014	2015	2016	2017	2018
Researchers in the National System of Researchers (SNI)	558	667	800	960	1,152
CONACYT Researchers	46	55	66	79	95
Advanced Degree Scholarship Recipients	7,004	7,704	8,475	9,322	10,255

International Cooperation Helps Mexico to Apply Best Practices

International cooperation and exchange, coordinated by the foreign relations secretariat, will also play an important role in developing the energy sector. As part of the strategic program, the secretariat will seek agreements and incentivize participation in international commissions, conferences and expositions related to the energy sector. Mexico's Proyecta 100 Mil program aims to send 100,000 students to study in the United States by 2018 and receive 50,000 US students in Mexico. In a separate initiative, US President Barack Obama has also prioritized sending students from the United States to Latin America in his 100,000 Strong in the Americas program, with the goal of an educational exchange of 100,000 students in each direction by 2020.^{12 13}

Mexico and the United States also have educational exchange initiatives that focus specifically on science and technology cooperation, many involving both the United States' National Science Foundation and Mexico's CONACYT. The Bilateral Forum on Higher Education, Innovation and Research, an

agreement between Mexico and the United States, works to promote mobility of students, academics and research and develop strategic areas of interest for both countries. Priority sectors include science, technology, aerospace, biotech, medical science and devices, engineering, water and mathematics. Already, 300 Mexican students have been sent to US technical and community college training programs in California, Texas and Arizona to be trained in drilling as a first step to linking these important actors in workforce development.¹⁴ Mexican government scholarships for foreign students to study in the country in 2016 will prioritize applications for programs related to the energy sector. Both the United States and Mexican governments have prioritized educational cooperation in the energy sector, with the United States well placed to share best practices in linking industry and education to create a competitive regional workforce. The United States and Mexico are also considering a pilot program for joint certifications in the energy field.

Conclusion

The lack of graduates with the day-to-day skills needed to perform energy sector jobs could become a significant hurdle to the successful implementation of the energy reform. In order to bridge the skills gap, Mexico's government should continue to work with the private sector to address bottlenecks. The key areas of focus should include:

1. Increasing internships, on-the-job training and certifications will help prepare students to succeed post-graduation, in both specialized technical roles and jobs requiring an advanced degree. Certification programs should be designed to train and test students in the technical skills needed to perform energy sector jobs. Universities should direct their curricula toward these skills by preparing students for the certification exams. Companies also play an important role in developing human capital by creating training programs and utilizing local workforce and service providers. Regulators will also need special training programs on how to design and enforce regulatory guidelines.
2. To make the sector more dynamic and competitive, diversity must be a priority. Women in particular should be encouraged to study energy-related fields, for example through more targeted scholarship programs as well as initiatives in primary and secondary school encouraging inclusive participation in STEM education. Socio-economic diversity should also be promoted through targeted scholarship programs and increasing the accessibility of energy sector educational programs.
3. The United States can serve as an important resource to Mexico in terms of sharing best practices in linking industry with technical and academic degrees, including programs for full-time students and continuing education for professionals. In addition, expanding educational exchanges with the United States would help Mexican students to acquire practical language and technical skills needed for energy sector jobs. Increased bilateral collaboration between all levels of education (high school, vocational, bachelors and advanced degrees) will help build a uniquely competitive regional workforce.

REFERENCES

1. Rodrigo Castaneda Valle and Cuauhtemoc Rebolledo Gómez, "Mexico," in "Education at a Glance 2013: OECD Indicators," *Organisation for Economic Co-operation and Development* (2013): 4, doi: 10.1787/eag-2013-61-en.
2. Eduardo Olaberría and Valéry Dugain, "Sharing the Fruits of Growth with all Mexicans," *Organisation for Economic Co-operation and Development* (2015): 20-21, doi: 10.1787/18151973.
3. Sean Dougherty, "Boosting Growth and Reducing Informality in Mexico," *Organisation for Economic Co-operation and Development* (2015): 32, doi: 10.1787/5js4w28dnn28-en.
4. Secretaría de Energía (SENER), Secretaría de Educación Pública (SEP), and Consejo Nacional de Ciencia y Tecnología (CONACYT), "Programa Estratégico de Formación de Recursos Humanos en Materia Energética," *Gobierno de México* (2014).
5. Blanca Heredia and Daniela Rubio, "Inglés y desigualdad social en México," in "Sorry. El aprendizaje del inglés en México," *Mexicanos Primero* (2015): 28.
6. Nathaniel Hoffman, "Study Abroad: U.S.-Mexico Seek Stronger Academic Ties," *The Blue Review*, July 14, 2010.
7. Olaberría and Dugain, "Sharing the Fruits of Growth with all Mexicans," 17.
8. Deloitte Touche Tohmatsu Limited, "Taxation and Investment in Mexico 2014," *Deloitte International Tax Source* (2014): 23-24.
9. Mariano Ruiz Funes, "Retos para la proveeduría nacional en hidrocarburos," *El Financiero*, May 14, 2015.
10. SENER, SEP and CONACYT, "Programa Estratégico de Formación de Recursos Humanos en Materia Energética".
11. Jennifer L. O'Donoghue, "¿En apoyo a las escuelas? El gasto y la calidad educativa en México," in "(Mal)gasto: Estado de la Educación en México 2013," *Mexicanos Primero* (2013): 162.
12. Consejo Nacional de Ciencia y Tecnología (CONACYT), "Becas de Inversión en el Conocimiento 2015-2016," *Gobierno de México* (2014).
13. The White House. Office of the Press Secretary, "Fact Sheet: Educational Exchanges for the 21st Century: 100,000 Strong in the Americas and Science without Borders," *United States Government*, April 9, 2012.
14. Nathaniel Hoffman, "Study Abroad: U.S.-Mexico Seek Stronger Academic Ties".

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